LEARNE2I / PRIORITY PRACTICE

JEE Main 2025 Session 2

Physics
Chapter-wise practice collection

> **300 questions** / NCERT chapter navigation
> Chapter and topic priority guide, followed by questions and an answer key.

Start with the priority guide, then practise chapter by chapter. Enter a numerical value where no options are given; follow the units and precision specified in the question.

Solutions on your phone

Scan to choose a chapter or question. You can also download all three solutions PDFs together.

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Open the PDF bookmarks panel on the left to jump between chapters. The chapter links in the guide are clickable too.

YOUR PRACTICE ROADMAP

Chapter & topic priorities

For this Session 2 collection, begin with **Wave Optics; Ray Optics and Optical Instruments; Current Electricity**. These chapters have the largest share of the selected questions.

Practice weight = questions selected from a chapter / 300. Topic percentages use that chapter's question count. These are practice priorities from the prediction output, not guaranteed exam marks or probabilities.

NCERT chapter / leading topics	Priority	Questions	Weight
Units and Measurements Vernier calipers: 2 (50.0%) / Dimensional analysis: 1 (25.0%) / Significant figures: 1 (25.0%)	Consolidate	1-4 (4)	1.3%
Motion in a Straight Line Kinematics: 8 (50.0%) / Equations of motion: 6 (37.5%) / Motion graphs: 1 (6.3%) / More topics in chapter guide	Focus first	5-20 (16)	5.3%
Motion in a Plane Equations of motion: 3 (42.9%) / Projectile motion: 2 (28.6%) / Vectors and relative motion: 2 (28.6%)	Next	21-27 (7)	2.3%
Laws of Motion Newtonian mechanics: 8 (80.0%) / Friction: 1 (10.0%) / Newton's second law: 1 (10.0%)	Next	28-37 (10)	3.3%
Work, Energy and Power Work-energy theorem: 10 (58.8%) / Work and energy: 7 (41.2%)	Focus first	38-54 (17)	5.7%
System of Particles and Rotational Motion Momentum and rotation: 4 (50.0%) / Rotational dynamics: 4 (50.0%)	Next	55-62 (8)	2.7%
Gravitation Acceleration due to gravity: 2 (100.0%)	Consolidate	63-64 (2)	0.7%
Mechanical Properties of Solids Elasticity: 6 (75.0%) / Longitudinal strain: 1 (12.5%) / Young's modulus: 1 (12.5%)	Next	65-72 (8)	2.7%
Thermal Properties of Matter Thermal properties: 2 (66.7%) / Calorimetry: 1 (33.3%)	Consolidate	73-75 (3)	1.0%
Thermodynamics First law of thermodynamics: 7 (46.7%) / Thermodynamic processes: 4 (26.7%) / Thermodynamics: 2 (13.3%) / More topics in chapter guide	Focus first	76-90 (15)	5.0%
Kinetic Theory Kinetic molecular theory: 7 (63.6%) / Degrees of freedom and equipartition: 2 (18.2%) / Ideal gas law: 1 (9.1%) / More topics in chapter guide	Next	91-101 (11)	3.7%

NCERT chapter / leading topics	Priority	Questions	Weight
Oscillations Oscillatory motion: 2 (66.7%) / Simple harmonic motion: 1 (33.3%)	Consolidate	102-104 (3)	1.0%
Waves Wave motion: 23 (100.0%)	Focus first	105-127 (23)	7.7%
Electric Charges and Fields Electric field: 4 (44.4%) / Electric fields and forces: 3 (33.3%) / Electric Charges and Fields: 1 (11.1%) / More topics in chapter guide	Next	128-136 (9)	3.0%
Electrostatic Potential and Capacitance Electric potential and capacitors: 3 (100.0%)	Consolidate	137-139 (3)	1.0%
Current Electricity Electric circuits: 13 (52.0%) / Ohm's law: 5 (20.0%) / Circuit analysis: 4 (16.0%) / More topics in chapter guide	Focus first	140-164 (25)	8.3%
Moving Charges and Magnetism Magnetic force and field: 10 (50.0%) / Magnetic field due to currents: 4 (20.0%) / Ampere's circuital law: 2 (10.0%) / More topics in chapter guide	Focus first	165-184 (20)	6.7%
Magnetism and Matter Magnetic dipoles: 1 (50.0%) / Magnetism and Matter: 1 (50.0%)	Consolidate	185-186 (2)	0.7%
Electromagnetic Induction Inductance and induced emf: 9 (39.1%) / Faraday's law: 7 (30.4%) / Mutual inductance: 4 (17.4%) / More topics in chapter guide	Focus first	187-209 (23)	7.7%
Alternating Current Series LCR resonance: 4 (66.7%) / AC circuits: 2 (33.3%)	Next	210-215 (6)	2.0%
Electromagnetic Waves Electromagnetic spectrum: 2 (50.0%) / Electromagnetic waves: 2 (50.0%)	Consolidate	216-219 (4)	1.3%
Ray Optics and Optical Instruments Lens formula: 21 (77.8%) / Geometrical optics: 4 (14.8%) / Mirror formula: 1 (3.7%) / More topics in chapter guide	Focus first	220-246 (27)	9.0%
Wave Optics Young's double-slit interference: 24 (80.0%) / Interference of light: 2 (6.7%) / Wave Optics: 2 (6.7%) / More topics in chapter guide	Focus first	247-276 (30)	10.0%
Dual Nature of Radiation and Matter Photoelectric equation: 6 (42.9%) / de Broglie wavelength: 3 (21.4%) / Dual Nature of Radiation and Matter: 2 (14.3%) / More topics in chapter guide	Focus first	277-290 (14)	4.7%
Atoms Excitation and ionisation energy: 1 (100.0%)	Consolidate	291-291 (1)	0.3%
Nuclei Nuclear fission: 1 (50.0%) / Radioactive decay law: 1 (50.0%)	Consolidate	292-293 (2)	0.7%

NCERT chapter / leading topics	Priority	Questions	Weight
Semiconductor Electronics: Materials, Devices and Simple Circuits Logic gates: 2 (50.0%) / Electronic circuits and logic gates: 1 (25.0%) / Semiconductor devices: 1 (25.0%)	Consolidate	294-297 (4)	1.3%
Communication Systems Historical appendix / omitted source chapter Communication systems: 2 (66.7%) / Amplitude modulation: 1 (33.3%)	Historical appendix	298-300 (3)	1.0%

How to use the priorities

1. Rank chapters by their selected question counts. Ties follow NCERT book order.
2. Focus first: chapters starting within the first 70% of selected, non-historical questions. Next: the following 20%. Consolidate: the remainder. A chapter crossing a threshold stays together.
3. Topic counts use the question's existing core concept, falling back to topic and then chapter. Each question is counted once. Full topic lists begin each chapter.
4. Historical/omitted chapters stay in a separate appendix. Their presence is not a recommendation that they are in the target examination syllabus.

Names follow NCERT Classes XI and XII. Practical chemistry is identified as a laboratory-manual section. Percentages are rounded and may not add to exactly 100.0%. Chapters with no selected questions are not listed; this does not mean they have no exam importance.

Chapter naming references: NCERT textbooks.

CHAPTER 01 / PHYSICS

Units and Measurements

Questions 1-4 / 4 selected / 1.3% practice weight / Consolidate

Topics to prioritise in this collection

- Vernier calipers: 2 questions / 50.0% of this chapter
- Dimensional analysis: 1 question / 25.0% of this chapter
- Significant figures: 1 question / 25.0% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 1 View solution online

In a vernier calliper, when both jaws touch each other, zero of the vernier scale shifts towards left and its 4th division coincides exactly with a certain division on main scale. If 50 vernier scale divisions equal to 49 main scale divisions and zero error in the instrument is 0.04 mm then how many main scale divisions are there in 1 cm ?

A. 40

B. 5

C. 20

D. 10

NTA

Question 2 View solution online

A vernier callipers has 20 divisions on the vernier scale, which coincides with 19th division on the main scale. The least count of the instrument is 0.1 mm . One main scale division is equal to..... mm .

A. 1

B. 0.5

C. 2

D. 5

Question 3 View solution online

Match List-I with List-II.

List-I (Number)	List-II (Significant figures)
(a) 1001	(i) 4
(b) 010.1	(ii) 3
(c) 100.100	(iii) 6
(d) 0.0010010	(iv) 5

Choose the correct answer from the options given below:

A. (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

B. (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

C. (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

D. (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Question 4 View solution online

In an experiment to measure focal length (f) of convex lens, the least counts of the measuring scales for the position of object (u) and for the position of image (v) are Δu and Δv, respectively. The error in the measurement of the focal length of the convex lens will be :

A. $\frac{\Delta u}{u}+\frac{\Delta v}{v}$

B. $f^2\left[\frac{\Delta u}{u^2}+\frac{\Delta v}{v^2}\right]$

C. $2f\left[\frac{\Delta u}{u}+\frac{\Delta v}{v}\right]$

D. $f\left[\frac{\Delta u}{u}+\frac{\Delta v}{v}\right]$

CHAPTER 02 / PHYSICS

Motion in a Straight Line

Questions 5-20 / 16 selected / 5.3% practice weight / Focus first

Topics to prioritise in this collection

- Kinematics: 8 questions / 50.0% of this chapter
- Equations of motion: 6 questions / 37.5% of this chapter
- Motion graphs: 1 question / 6.3% of this chapter
- Uniformly accelerated motion: 1 question / 6.3% of this chapter

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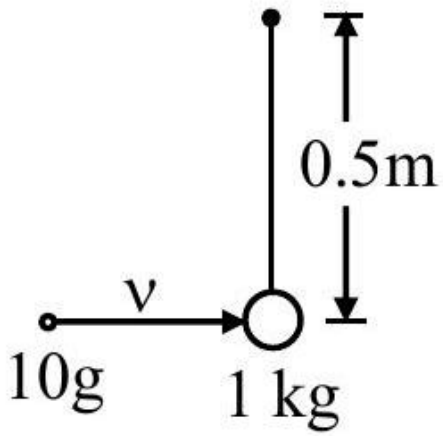
Question 5 View solution online

A bullet of 10 g , moving with velocity v, collides head-on with the stationary bob of a pendulum and recoils with velocity $100\ \mathrm{m/s}$. The length of the pendulum is 0.5 m and mass of the bob is 1 kg . The minimum value of $v =$ $\mathrm{m/s}$ so that the pendulum describes a circle. (Assume the string to be inextensible and $g = 10\ \mathrm{m/s^2}$)



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 6 View solution online

A ball of mass 0.5 kg is dropped from the height of 10 m . The height, at which the magnitude of velocity becomes equal to the magnitude of acceleration due to gravity, is m. (Use g $= 10\ \mathrm{m/s^2}$).

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 7 View solution online

An object is thrown vertically upwards. At its maximum height, which of the following quantity becomes zero ?

A. Momentum

B. Potential energy

C. Acceleration

D. Force

Question 8 View solution online

A ball is thrown vertically upward with an initial velocity of $150\ \mathrm{m/s}$. The ratio of velocity after 3 s and 5 s is $\frac{x+1}{x}$. The value of x is ..... .Take ($\mathrm{g = 10\ m/s^2}$).

A. 6

B. 5

C. -5

D. 10

Question 9 View solution online

A body is projected from the ground at an angle of $45°$ with the horizontal. Its velocity after 2 s is $20\ \mathrm{ms^{-1}}$. The maximum height reached by the body during its motion is m . (use $\mathrm{g = 10\ ms^{-2}}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 10 View solution online

Two balls A and B are placed at the top of 180 m tall tower. Ball A is released from the top at $\mathbf{t = 0}$ s. Ball B is thrown vertically down with an initial velocity ' u ' at $t = 2$ s. After a certain time, both balls meet 100 m above the ground. Find the value of ' u ' in $\mathbf{ms^{-1}}$. [use $\mathbf{g = 10\ ms^{-2}}$] :

A. 10

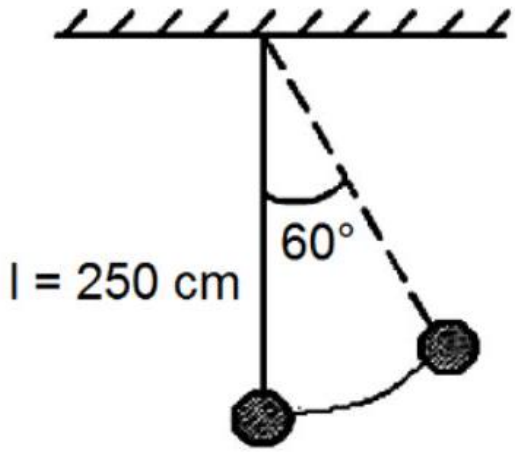
B. 15

C. 20

D. 30

Question 11 View solution online

A pendulum is suspended by a string of length 250 cm . The mass of the bob of the pendulum is 200 g . The bob is pulled aside until the string is at $60°$ with vertical as shown in the figure. After releasing the bob. the maximum velocity attained by the bob will be $\mathbf{ms^{-1}}$.
(if $\mathbf{g = 10\ m/s^2}$)



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 12 View solution online

A small toy starts moving from the position of rest under a constant acceleration. If it travels a distance of 10 m in t s ,. the distance travelled by the toy in the next t s will be :

A. 10 m

B. 20 m

C. 30 m

D. 40 m

Question 13 View solution online

A body travels 102.5 m in $\mathbf{n^{th}}$ second and 115.0 m in $\mathbf{(n+2)^{th}}$ second. The acceleration is :

A. $\mathbf{9\ m/s^2}$

B. $\mathbf{6.25\ m/s^2}$

C. $\mathbf{12.5\ m/s^2}$

D. $\mathbf{5\ m/s^2}$

Question 14 View solution online

A body of mass M thrown horizontally with velocity v from the top of the tower of height H touches the ground at a distance of 100 m from the foot of the tower. A body of mass 2 M thrown at a velocity $\frac{v}{2}$ from the top of the tower of height 4 H will touch the ground at a distance of m.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 15 View solution online

A body is performing simple harmonic with an amplitude of 10 cm . The velocity of the body was tripled by air Jet when it is at 5 cm from its mean position. The new amplitude of vibration is $\sqrt{\mathbf{x}}$ cm . The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 16 View solution online

A body is moving with constant speed, in a circle of radius 10 m . The body completes one revolution in 4 s . At the end of 3rd second, the displacement of body (in m) from its starting point is:

A. 15π

B. $10\sqrt{2}$

C. 30

D. 5π

Question 17 View solution online

A child stands on the edge of the cliff 10 m above the ground and throws a stone horizontally with an initial speed of $5\ ms^{-1}$. Neglecting the air resistance, the speed with which the stone hits the ground will be ..... ms^{-1} (given, $g = 10\ ms^{-2}$).

A. 15

B. 20

C. 30

D. 25

Question 18 View solution online

A body of mass 2 kg is initially at rest. It starts moving unidirectionally under the influence of a source of constant power P. Its displacement in 4 s is $\frac{1}{3}\alpha^2\sqrt{Pm}$. The value of α will be .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 19 View solution online

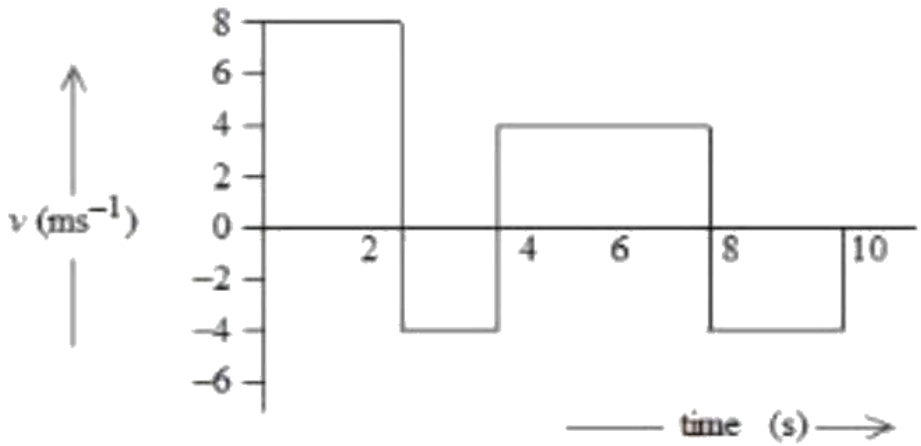
A tennis ball is dropped on to the floor from a height of 9.8 m . It rebounds to a height 5.0 m . Ball comes in contact with the floor for 0.2 s . The average acceleration during contact is ms^{-2}
(Given $g = 10\ ms^{-2}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 20 View solution online

The velocity time graph of a body moving in a straight line is shown in figure.The ratio of displacement to distance travelled by the body in time 0 to 10 s is :



A. 1 : 1

B. 1 : 2

C. 1 : 3

D. 1 : 4

Motion in a Plane

Topics to prioritise in this collection

- Equations of motion: 3 questions / 42.9% of this chapter
- Projectile motion: 2 questions / 28.6% of this chapter
- Vectors and relative motion: 2 questions / 28.6% of this chapter

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Question 21 View solution online

A body is projected at $t = 0$ with a velocity $10\ ms^{-1}$ at an angle of $60°$ with the horizontal. The radius of curvature of its trajectory at $t = 1\ s$ is R . Neglecting air resistance and taking acceleration due to gravity $g = 10\ ms^{-2}$, the value of R is :

A. 2.5 m

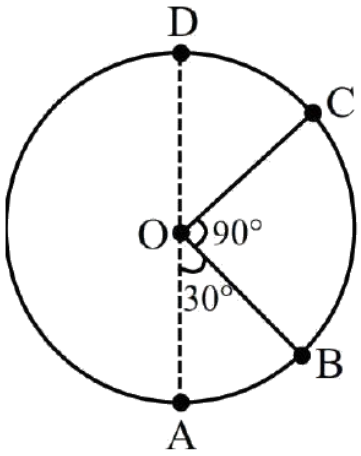
B. 10.3 m

C. 2.8 m

D. 5.1 m

Question 22 View solution online

A body of mass 100 g is moving in circular path of radius 2 m on vertical plane as shown in figure. The velocity of the body at point A is $10\ \mathrm{m/s}$. The ratio of its kinetic energies at point B and C is :(Take acceleration due to gravity as $10\ \mathrm{m/s^2}$)



A. $\frac{2+\sqrt{3}}{3}$

B. $\frac{2+\sqrt{2}}{3}$

C. $\frac{3+\sqrt{3}}{2}$

D. $\frac{3-\sqrt{2}}{2}$

Question 23 View solution online

A projectile is projected at $30°$ from horizontal with initial velocity $40\ \mathrm{ms^{-1}}$. The velocity of the projectile at $t = 2\ \mathrm{s}$ from the start will be:(Given $g = 10\ \mathrm{m/s^2}$)

A. $20\sqrt{3}\ \mathrm{ms^{-1}}$

B. $40\sqrt{3}\ \mathrm{ms^{-1}}$

C. $20\ \mathrm{ms^{-1}}$

D. Zero

Question 24 View solution online

A man carrying a monkey on his shoulder does cycling smoothly on a circular track of radius 9 m and completes 120 revolutions in 3 minutes. The magnitude of centripetal acceleration of monkey is (in $\mathbf{m/s^2}$) :

A. zero

B. $16\pi^2\ \mathbf{ms^{-2}}$

C. $4\pi^2\ \mathbf{ms^{-2}}$

D. $57600\pi^2\ \mathbf{ms^{-2}}$

Question 25 View solution online

A car is moving with a constant speed of $\mathbf{20\ m/s}$ in a circular horizontal track of radius 40 m . A bob is suspended from the roof of the car by a massless string. The angle made by the string with the vertical will be: (Take $\mathbf{g = 10\ m/s^2}$)

A. $\frac{\pi}{3}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{6}$

Question 26 View solution online

The resultant of two vectors $\vec{A}$ and $\vec{B}$ is perpendicular to $\vec{A}$ and its magnitude is half that of $\vec{B}$. The angle between vectors $\vec{A}$ and $\vec{B}$ is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 27 View solution online

Magnitude of resultant of two vectors $\vec{P}$ and $\vec{Q}$ is equal to magnitude of $\vec{P}$. Find the angle between $\vec{Q}$ and resultant of $2\vec{P}$ and $\vec{Q}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Laws of Motion

Questions 28-37 / 10 selected / 3.3% practice weight / Next

Topics to prioritise in this collection

- Newtonian mechanics: 8 questions / 80.0% of this chapter
- Friction: 1 question / 10.0% of this chapter
- Newton's second law: 1 question / 10.0% of this chapter

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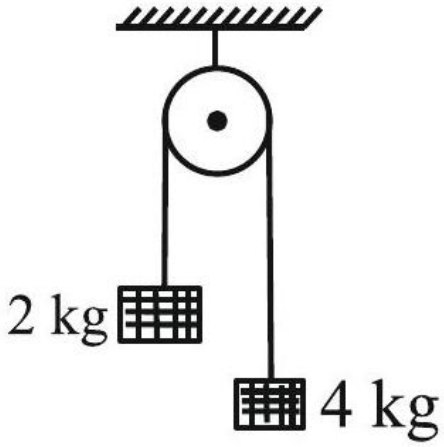
Question 28 View solution online

Two blocks of mass 2 kg and 4 kg are connected by a metal wire going over a smooth pulley as shown in figure. The radius of wire is $\mathbf{4.0 \times 10^{-5}}$ m and Young's modulus of the metal is $\mathbf{2.0 \times 10^{11}\ N/m^2}$. The longitudinal strain developed in the wire is $\frac{1}{\alpha\pi}$. The value of α is . [Use $\mathbf{g = 10\ m/s^2}$)



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 29 View solution online

A block starts moving up an inclined plane of inclination 30° with an initial velocity of v_0. It comes back to its initial position with velocity $\frac{v_0}{2}$. The value of the coefficient of kinetic friction between the block and the inclined plane is close to $\frac{I}{1000}$. The nearest integer to I is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 30 View solution online

A bullet of mass 0.1 kg moving horizontally with speed $400\ ms^{-1}$ hits a wooden block of mass 3.9 kg kept on a horizontal rough surface. The bullet gets embedded into the block and moves 20 m before coming to rest. The coefficient of friction between the block and the surface is ..... .(Given $g = 10\ ms^2$)

A. 0.50

B. 0.90

C. 0.65

D. 0.25

Question 31 View solution online

A mass of 10 kg is suspended vertically by a rope of length 5 m from the roof. A force of 30 N is applied at the middle point of rope in horizontal direction. The angle made by upper half of the rope with vertical is $\theta = \tan^{-1}\left(x \times 10^{-1}\right)$. The value of x is .
(Given $g = 10\ m/s^2$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 32 View solution online

A rectangular block of mass 5 kg attached to a horizontal spiral spring executes simple harmonic motion of amplitude 1 m and time period 3.14 s . The maximum force exerted by spring on block is N.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 33 View solution online

A force acts for 20 s on a body of mass 20 kg , starting from rest, after which the force ceases and then body describes 50 m in the next 10 s . The value of force will be:

A. 40 N

B. 5 N

C. 20 N

D. 10 N

Question 34 View solution online

A block is fastened to a horizontal spring. The block is pulled to a distance $x = 10\ \text{cm}$ from its equilibrium position (at $\mathbf{x = 0}$) on a frictionless surface from rest. The energy of the block at $x = 5\ \text{cm}$ is 0.25 J . The spring constant of the spring is Nm^{-1}

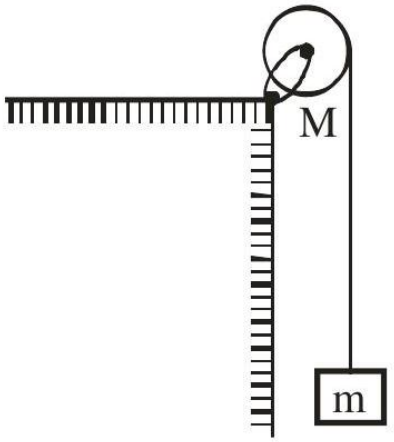
Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 35 View solution online

A uniform disc with mass $M = 4\ \mathrm{kg}$ and radius $R = 10$ cm is mounted on a fixed horizontal axle as shown in figure. A block with mass $\mathrm{m} = 2\ \mathrm{kg}$ hangs from a massless cord that is wrapped around the rim of the disc. During the fall of the block, the cord does not slip and there is no friction at the axle. The tension in the cord is N.

$\left(\text{Take } \mathrm{g} = 10\ \mathrm{ms}^{-2}\right)$



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 36 View solution online

A metal block of mass m is suspended from a rigid support through a metal wire of diameter 14 mm . The tensile stress developed in the wire under equilibrium state is $7 \times 10^5 \mathrm{Nm}^{-2}$. The value of mass m is kg.

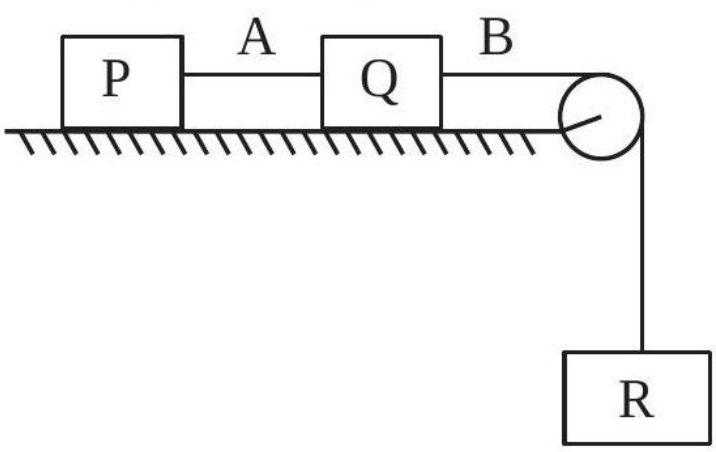
(Take, $\mathrm{g} = 9.8\ \mathrm{ms}^{-2}$ and $\pi = \frac{22}{7}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 37 View solution online

Each of three blocks $\mathbf{P, Q}$ and R shown in figure has a mass of 3 kg . Each of the wire A and B has cross-sectional area $\mathbf{0.005\ cm^2}$ and Young's modulus $\mathbf{2 \times 10^{11}\ N\ m^{-2}}$. Neglecting friction, the longitudinal strain on wire B is $\times 10^{-4}$. (Take $\mathbf{g = 10\ m/s^2}$)



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Work, Energy and Power

Questions 38-54 / 17 selected / 5.7% practice weight / Focus first

Topics to prioritise in this collection

- Work-energy theorem: 10 questions / 58.8% of this chapter
- Work and energy: 7 questions / 41.2% of this chapter

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Question 38 View solution online

A body at rest is moved along a horizontal straight line by a machine delivering a constant power. The distance moved by the body in time ' t ' is proportional to :

A. $t^{\frac{3}{2}}$

B. $t^{\frac{1}{2}}$

C. $t^{\frac{1}{4}}$

D. $t^{\frac{3}{4}}$

Question 39 View solution online

The bob of a pendulum was released from a horizontal position. The length of the pendulum is 10 m . If it dissipates 10% of its initial energy against air resistance, the speed with which the bob arrives at the lowest point is : [Use, $g : 10\ ms^{-2}$]

A. $6\sqrt{5}\ ms^{-1}$

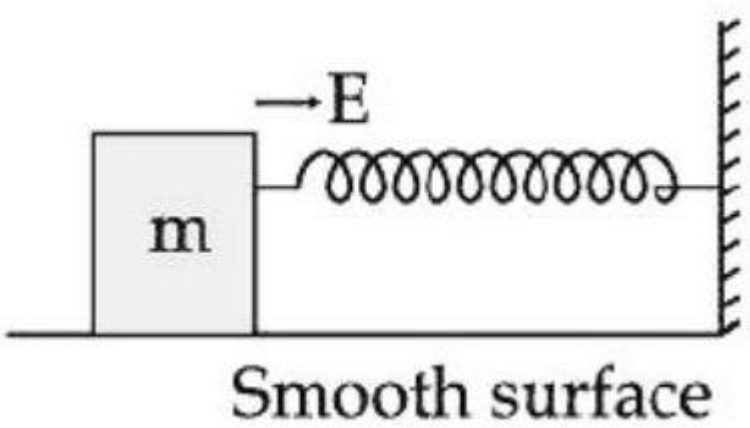
B. $5\sqrt{6}\ ms^{-1}$

C. $5\sqrt{5}\ ms^{-1}$

D. $2\sqrt{5}\ ms^{-1}$

Question 40 View solution online

A block of mass ' m ' (as shown in figure) moving with kinetic energy E compresses a spring through a distance 25 cm when, its speed is halved. The value of spring constant of used spring will be $\mathbf{nENm^{-1}}$ for $\mathbf{n} =$.



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 41 View solution online

A body of mass 2 kg is driven by an engine delivering a constant power of $\mathbf{1\ J/s}$. The body starts from rest and moves in a straight line. After 9 seconds, the body has moved a distance (in m)

.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 42 View solution online

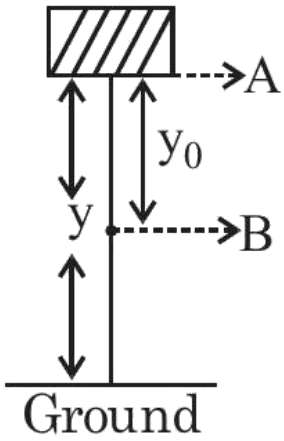
An object of mass 0.2 kg executes simple harmonic motion along x axis with frequency of $\left(\frac{25}{\pi}\right)$ Hz. At the position $x = \mathbf{0.04\ m}$ the object has kinetic energy 0.5 J and potential energy 0.4 J . The amplitude of oscillation is cm.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 43 View solution online

In the given figure, the block of mass m is dropped from the point 'A'. The expression for kinetic energy of block when it reaches point ' B ' is :



A. $\frac{1}{2}mgy_0^2$

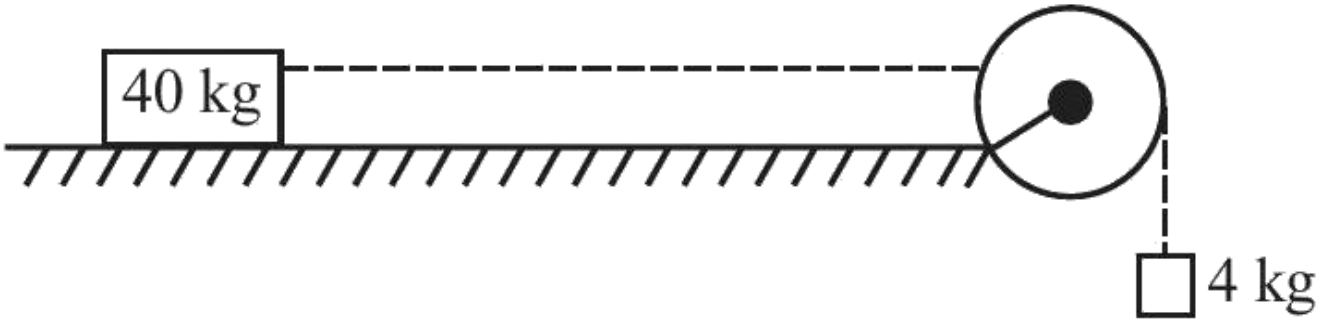
B. $\frac{1}{2}mgy^2$

C. $mg(y-y_0)$

D. mgy_0

Question 44 View solution online

A block of mass 40 kg slides over a surface, when a mass of 4 kg is suspended through an inextensible massless string passing over frictionless pulley as shown below. The coefficient of kinetic friction between the surface and block is 0.02 . The acceleration of block is. (Given $g = 10\ ms^{-2}$.)



A. $1\ ms^{-2}$

B. $1/5\ ms^{-2}$

C. $4/5\ ms^{-2}$

D. $8/11\ ms^{-2}$

Question 45 View solution online

A player caught a cricket ball of mass 150 g moving at a speed of $20\ \mathrm{m/s}$. If the catching process is completed in 0.1 s , the magnitude of force exerted by the ball on the hand of the player is:

A. 150 N

B. 3 N

C. 30 N

D. 300 N

Question 46 View solution online

A wooden block of mass 5 kg rests on soft horizontal floor. When an iron cylinder of mass 25 kg is placed on the top of the block, the floor yields and the block and the cylinder together go downwith an acceleration of $0.1\ \mathrm{ms}^{-2}$. The action force of the system on the floor is equal to:

A. 297 N

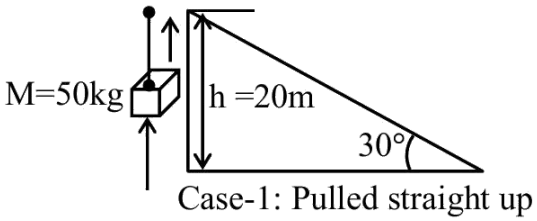
B. 294 N

C. 291 N

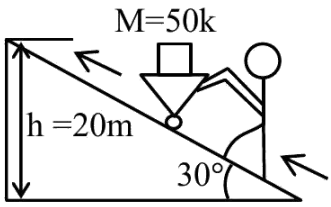
D. 196 N

Question 47 View solution online

A body of mass 50 kg is lifted to a height of 20 m from the ground in the two different ways as shown in the figures. The ratio of work done against the gravity in both the respective cases, will be:Case-2: Along the ramp



Case-1: Pulled straight up



A. $1:1$

B. $2:1$

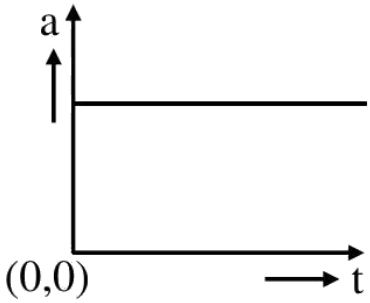
C. $\sqrt{3}:2$

D. $1:2$

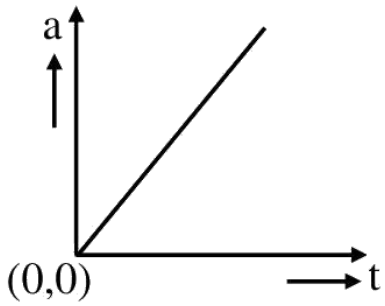
Question 48 View solution online

A wooden block, initially at rest on the ground, is pushed by a force which increases linearly with time t. Which of the following curve best describes acceleration of the block with time :

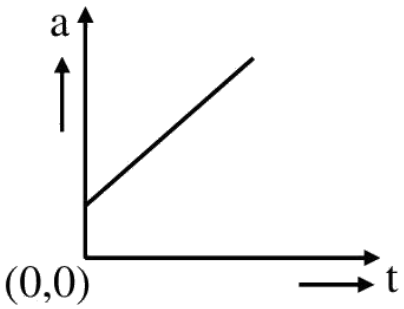
A.



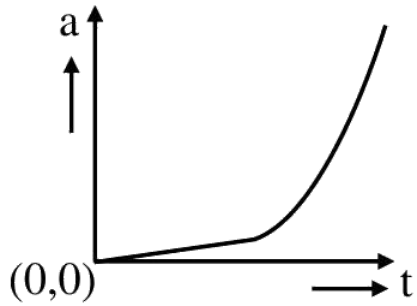
B.



C.



D.



Question 49 View solution online

A block of mass 5 kg is placed at rest on a table of rough surface. Now, if a force of 30 N is applied in the direction parallel to surface of the table, the block slides through a distance of 50 m in an interval of time 10 s . Coefficient of kinetic friction is (given, $\mathbf{g = 10\ ms^{-2}}$):

A. 0.60

B. 0.25

C. 0.75

D. 0.50

Question 50 View solution online

A spherical body of mass 2 kg starting from rest acquires a kinetic energy of 10000 J at the end of $\mathbf{5^{th}}$ second. The force acted on the body is N.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 51 View solution online

A body of mass 10 kg is moving with an initial speed of $\mathbf{20\ m/s}$. The body stops after 5 s due to friction between body and the floor. The value of the coefficient of friction is: (Take acceleration due to gravity $g = 10\ \mathbf{ms^{-2}}$)

A. 0.3

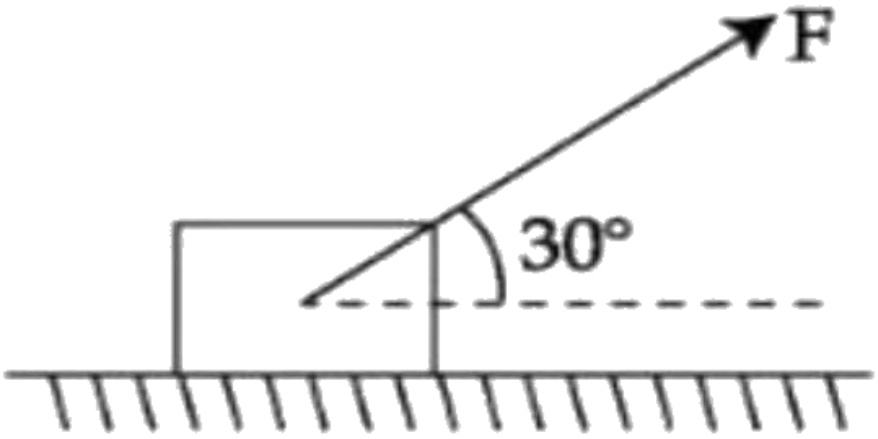
B. 0.5

C. 0.2

D. 0.4

Question 52 View solution online

As shown in the figure a block of mass 10 kg lying on a horizontal surface is pulled by a force F acting at an angle $\mathbf{30°}$, with horizontal. For $\mu_s = 0.25$, the block will just start to move for the value of F : [Given $\mathbf{g = 10\ ms^{-2}}$]



A. 20 N

B. 33.3 N

C. 25.2 N

D. 35.7 N

Question 53 View solution online

A bi convex lens of focal length 10 cm is cut in two identical parts along a plane perpendicular to the principal axis. The power of each lens after cut is D.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 54 View solution online

The radius of curvature of each surface of a convex lens having refractive index 1.8 is 20 cm . The lens is now immersed in a liquid of refractive index 1.5. The ratio of power of lens in air to its power in the liquid will be $x : 1$. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

System of Particles and Rotational Motion

Questions 55-62 / 8 selected / 2.7% practice weight / Next

Topics to prioritise in this collection

- Momentum and rotation: 4 questions / 50.0% of this chapter
- Rotational dynamics: 4 questions / 50.0% of this chapter

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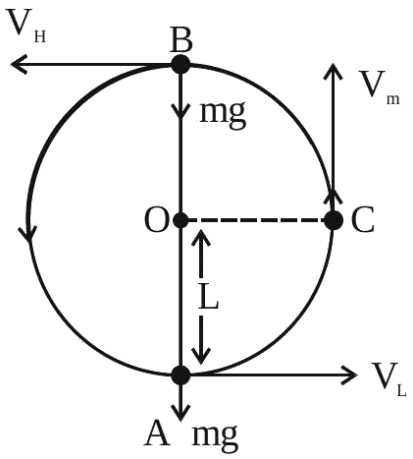
Question 55 View solution online

A bob of mass ' m ' is suspended by a light string of length ' L '. It is imparted a minimum horizontal velocity at the lowest point A such that it just completes half circle reaching the top most position B. The ratio of kinetic energies $\frac{(\text{K.E.})_A}{(\text{K.E.})_B}$ is :



A. $3:2$

B. $5:1$

C. $2:5$

D. $1:5$

Question 56 View solution online

A block of mass 10 kg is suspended from a string of length 4 m . When pulled by a force F along horizontal from the midpoint. The upper half of the string makes 45° with the vertical, value of F is

A. $100\ \mathrm{N}$

B. 90 N

C. $75\ \mathrm{N}$

D. 70 N

Question 57 View solution online

A 2 kg steel rod of length 0.6 m is clamped on a table vertically at its lower end and is free to rotate in vertical plane. The upper end is pushed so that the rod falls under gravity, Ignoring the friction due to clamping at its lower end, the speed of the free end of rod when it passes through its lowest position is ___ ms^{-1}. (Take $\mathrm{g} = 10\ \mathrm{ms}^{-2}$)

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 58 View solution online

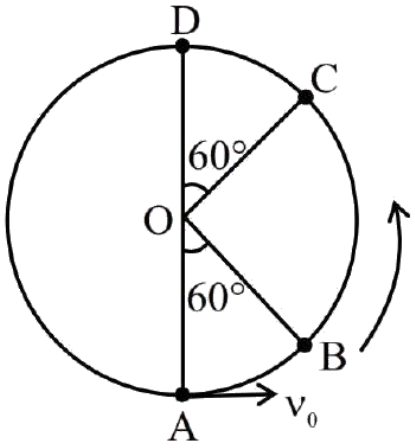
A string of area of cross-section $4\ \mathrm{mm}^2$ and length 0.5 is connected with a rigid body of mass 2 kg . The body is rotated in a vertical circular path of radius 0.5 m . The body acquires a speed of $5\ \mathrm{m/s}$ at the bottom of the circular path. Strain produced in the string when the body is at the bottom of the circle is $\times 10^{-5}$. (Use Young's modulus $10^{11}\ \mathrm{N/m}^2$ and $\mathrm{g} = 10\ \mathrm{m/s}^2$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 59 View solution online

A bob of mass m is suspended at a point O by a light string of length l and left to perform vertical motion (circular) as shown in figure. Initially, by applying horizontal velocity v_0 at the point ' A '. the string becomes slack when, the bob reaches at the point ' D '. The ratio of the kinetic energy of the bob at the points B and C is ..... .



A. 2

B. 1

C. 4

D. 3

Question 60 View solution online

A stone of mass 900 g is tied to a string and moved in a vertical circle of radius 1 m making 10 rpm . The tension in the string, when the stone is at the lowest point is (if $\pi^2 = 9.8$ and $g = 9.8\ m/s^2$)

A. 97 N

B. 9.8 N

C. 8.82 N

D. 17.8 N

Question 61 View solution online

A metal wire of length 0.5 m and cross-sectional area $10^{-4}\ \mathrm{m}^2$ has breaking stress $5 \times 10^8 \mathrm{Nm}^{-2}$. A block of 10 kg is attached at one end of the string and is rotating in a horizontal circle. The maximum linear velocity of block will be ms^{-1}.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 62 View solution online

A ball is dropped from a height of 20 m . If the coefficient of restitution for the collision between ball and floor is 0.5, after hitting the floor, the ball rebounds to a height of m

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Gravitation

Questions 63-64 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

- Acceleration due to gravity: 2 questions / 100.0% of this chapter

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Question 63 View solution online

The acceleration due to gravity at height h above the earth if $h \ll R$ (radius of earth) is given by

A. $g' = g\left(1 - \frac{2h}{R}\right)$

B. $g' = g\left(1 - \frac{2h^2}{R^2}\right)$

C. $g' = g\left(1 - \frac{h}{2R}\right)$

D. $g' = g\left(1 - \frac{h^2}{2R^2}\right)$

Question 64 View solution online

The weight of a body on the earth is 400 N . Then weight of the body when taken to a depth half of the radius of the earth will be:

A. Zero

B. 300 N

C. 100 N

D. 200 N

Mechanical Properties of Solids

Questions 65-72 / 8 selected / 2.7% practice weight / Next

Topics to prioritise in this collection

- Elasticity: 6 questions / 75.0% of this chapter
- Longitudinal strain: 1 question / 12.5% of this chapter
- Young's modulus: 1 question / 12.5% of this chapter

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Question 65 View solution online

A uniform heavy rod of mass 20 kg . Cross sectional area $0.4\ \mathrm{m}^2$ and length 20 m is hanging from a fixed support. Neglecting the lateral contraction, the elongation in the rod due to its own weight is $\mathrm{x} \times 10^{-9}\ \mathrm{m}$. The value of x is .
:(Given. Young's modulus $\mathrm{Y} = 2 \times 10^{11} \mathrm{Nm}^{-2}$ and $\mathrm{g} = 10\ \mathrm{ms}^{-2}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 66 View solution online

One end of a metal wire is fixed to a ceiling and a load of 2 kg hangs from the other end. A similar wire is attached to the bottom of the load and another load of 1 kg hangs from this lower wire. Then the ratio of longitudinal strain of upper wire to that of the lower wire will be .
[Area of cross section of wire $= 0.005\ \mathrm{cm}^2$, $\mathrm{Y} = 2 \times 10^{11} \mathrm{Nm}^{-2}$ and $\mathrm{g} = 10\ \mathrm{ms}^{-2}$]

Numerical answer: _____

Enter the requested value or coefficient rounded to the nearest integer (0 decimal places).

Question 67 View solution online

The speed of a transverse wave passing through a string of length 50 cm and mass 10 g is $60\ \mathrm{ms}^{-1}$. The area of cross-section of the wire is $2.0\ \mathrm{mm}^2$ and its Young's modulus is $1.2 \times 10^{11}\mathrm{Nm}^{-2}$. The extension of the wire over its natural length due to its tension will be $x \times 10^{-5}\ \mathrm{m}$. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 68 View solution online

A 100 m long wire having cross-sectional area $6.25 \times 10^{-4}\ \mathrm{m}^2$ and Young's modulus is $10^{10}\mathrm{Nm}^{-2}$ is subjected to a load of 250 N , then the elongation in the wire will be:

A. $4 \times 10^{-3}\ \mathrm{m}$

B. $6.25 \times 10^{-3}\ \mathrm{m}$

C. $6.25 \times 10^{-6}\ \mathrm{m}$

D. $4 \times 10^{-4}\ \mathrm{m}$

Question 69 View solution online

In a Young's double slit experiment, the slits are separated by 0.3 mm and the screen is 1.5 m away from the plane of slits. Distance between fourth bright fringes on both sides of central bright is 2.4 cm . The frequency of light used is $\times 10^{14}\ \mathrm{Hz}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 70 View solution online

In a Young's double slit experiment, the intensity at a point is $\left(\frac{1}{4}\right)^{\mathrm{th}}$ of the maximum intensity, the minimum distance of the point from the central maximum is $\mu\mathrm{m}$.
(Given : $\lambda = 600\ \mathrm{nm},\ \mathrm{d} = 1.0\ \mathrm{mm}, \mathrm{D} = 1.0\ \mathrm{m}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 71 View solution online

A steel wire having a radius of 2.0 mm , carrying a load of 4 kg , is hanging from a ceiling. Given that $\mathbf{g = 3.1\pi\ ms^{-2}}$, what will be the tensile stress that would be developed in the wire?

A. $4.8 \times 10^6 \mathrm{Nm}^{-2}$

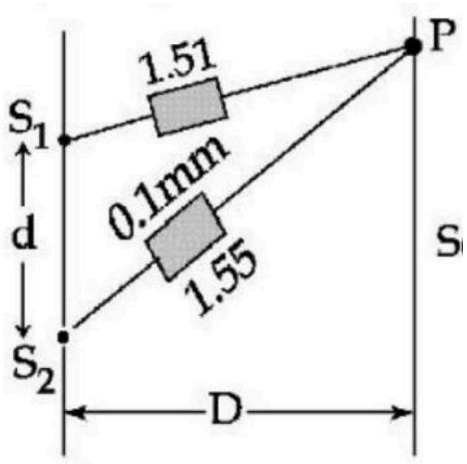
B. $3.1 \times 10^6 \mathrm{Nm}^{-2}$

C. $5.2 \times 10^6 \mathrm{Nm}^{-2}$

D. $6.2 \times 10^6 \mathrm{Nm}^{-2}$

Question 72 View solution online

In Young's double slit experiment, two slits S_1 and S_2 are ' d ' distance apart and the separation from slits to screen is D (as shown in figure). Now if two transparent slabs of equal thickness 0.1 mm but refractive index 1.51 and 1.55 are introduced in the path of beam ($\lambda = 4000\backslash\mathrm{AA}$) from S_1 and S_2 respectively. The central bright fringe spot will shift by number of fringes.



creen

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Thermal Properties of Matter

Questions 73-75 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Thermal properties: 2 questions / 66.7% of this chapter
- Calorimetry: 1 question / 33.3% of this chapter

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Question 73 View solution online

Two moles a monoatomic gas is mixed with six moles of a diatomic gas. The molar specific heat of the mixture at constant volume is :

A. $\frac{9}{4}R$

B. $\frac{7}{4}R$

C. $\frac{3}{2}R$

D. $\frac{5}{2}\mathrm{R}$

Question 74 View solution online

0.056 kg of Nitrogen is enclosed in a vessel at a temperature of $127^{\circ}\mathrm{C}$. The amount of heat required to double the speed of its molecules is k cal. (Take $\mathrm{R}=2\mathrm{calmole}^{-1}\ \mathrm{K}^{-1}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 75 View solution online

A heat engine operates with the cold reservoir at temperature 324 K .

The minimum temperature of the hot reservoir, if the heat engine takes 300 J heat from the hot reservoir and delivers 180 J heat to the cold reservoir per cycle, is K.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Thermodynamics

Questions 76-90 / 15 selected / 5.0% practice weight / Focus first

Topics to prioritise in this collection

- First law of thermodynamics: 7 questions / 46.7% of this chapter
- Thermodynamic processes: 4 questions / 26.7% of this chapter
- Thermodynamics: 2 questions / 13.3% of this chapter
- Carnot engine: 1 question / 6.7% of this chapter
- Work done by a gas: 1 question / 6.7% of this chapter

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Question 76 View solution online

A diatomic gas with rigid molecules does 10 J of work when expanded at constant pressure. What would be the heat energy absorbed by the gas, in this process?

A. 30 J

B. 35 J

C. 25 J

D. 40 J

Question 77 View solution online

A diatomic gas $(\gamma = 1.4)$ does 200 J of work when it is expanded isobarically. The heat given to the gas in the process is :

A. 850 J

B. 800 J

C. 600 J

D. 700 J

Question 78 View solution online

n moles of an ideal gas with constant volume heat capacity C_V undergo an isobaric expansion by certain volume. The ratio of the work done in the process, to the heat supplied is :

A. $\frac{4nR}{C_V+nR}$

B. $\frac{nR}{C_V+nR}$

C. $\frac{4nR}{C_V-nR}$

D. $\frac{nR}{C_V-nR}$

Question 79 View solution online

The temperature of 3.00 mol of an ideal diatomic gas is increased by 40.0 °C without changing the pressure of the gas. The molecules in the gas rotate but do not oscillate. If the ratio of change in internal energy of the gas to the amount of workdone by the gas is $\frac{x}{10}$. Then the value of x (round off to the nearest integer) is ___. (Given $\mathbf{R = 8.31\ J\ mol^{-1}\ K^{-1}}$)

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 80 View solution online

A sample of gas with $\gamma = 1.5$ is taken through an adiabatic process in which the volume is compressed from $1200\ cm^3$ to $300\ cm^3$. If the initial pressure is 200 kPa . The absolute value of the workdone by the gas in the process = J.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 81 View solution online

A diatomic gas $(\gamma = 1.4)$ does 100 J of work in an isobaric expansion. The heat given to the gas is :

A. 350 J

B. 490 J

C. 150 J

D. 250 J

Question 82 View solution online

A mixture of one mole of monoatomic gas and one mole of a diatomic gas (rigid) are kept at room temperature $(27^{\circ}C)$. The ratio of specific heat of gases at constant volume respectively is:

A. $\frac{7}{5}$

B. $\frac{3}{2}$

C. $\frac{3}{5}$

D. $\frac{5}{3}$

Question 83 View solution online

A sample of gas at temperature T is adiabatically expanded to double its volume. Adiabatic constant for the gas is $\gamma = 3/2$. The work done by the gas in the process is : $(\mu = 1$ mole $)$

A. $RT[\sqrt{2} - 2]$

B. $RT[1 - 2\sqrt{2}]$

C. $RT[2\sqrt{2} - 1]$

D. $RT[2 - \sqrt{2}]$

Question 84 View solution online

7 mole of certain monoatomic ideal gas undergoes a temperature increase of 40 K at constant pressure. The increase in the internal energy of the gas in this process is(Given $R = 8.3 JK^{-1}\ mol^{-1}$)

A. 5810 J

B. 3486 J

C. 11620 J

D. 6972 J

Question 85 View solution online

Read the following statements :A. When small temperature difference between a liquid and its surrounding is doubled the rate of loss of heat of the liquid becomes twice.B. Two bodies P and Q having equal surface areas are maintained at temperature $10^{\circ}C$ and $20^{\circ}C$. The thermal radiation emitted in a given time by P and Q are in the ratio $1:1.15$C. A carnot Engine working between 100 K and 400 K has an efficiency of 75% D. When small temperature difference between a liquid and its surrounding is quadrupled, the rate of loss of heat of the liquid becomes twice.Choose the correct answer from the options given below:

A. A, B, C only

B. A, B only

C. A, C only

D. B, C, D only

Question 86 View solution online

A thermally insulated vessel contains an ideal gas of molecular mass M and ratio of specific heats 1.4. Vessel is moving with speed v and is suddenly brought to rest. Assuming no heat is lost to the surrounding and vessel temperature of the gas increases by : ($R =$ universal gas constant)

A. $\frac{Mv^2}{7R}$

B. $\frac{Mv^2}{5R}$

C. $2\frac{Mv^2}{7R}$

D. $7\frac{Mv^2}{5R}$

Question 87 View solution online

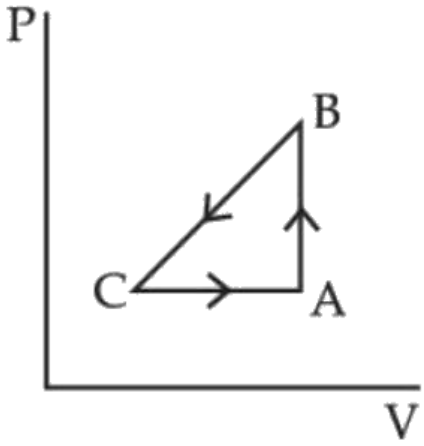
A diatomic gas $(\gamma = 1.4)$ does 400 J of work when it is expanded isobarically. The heat given to the gas in the process is J.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 88 View solution online

A sample of an ideal gas is taken through the cyclic process ABCA as shown in figure. It absorbs, 40 J of heat during the part AB , no heat during BC and rejects 60 J of heat during CA . A work 50 J is done on the gas during the part BC . The internal energy of the gas at A is 1560 J . The work done by the gas during the part CA is:



A. 20 J

B. 30 J

C. -30 J

D. -60 J

Question 89 View solution online

An ideal gas goes from an initial state to final state. During the process, the pressure of gas increases linearly with temperature (A) The work done by gas during the process is zero. (B) The heat added to gas is different from change in its internal energy (C) The volume of the gas is increased (D) The internal energy of the gas is increased (E) The process is isochoric (constant volume process)Choose the correct answer from the options given below :-

A. A, B, C, D Only

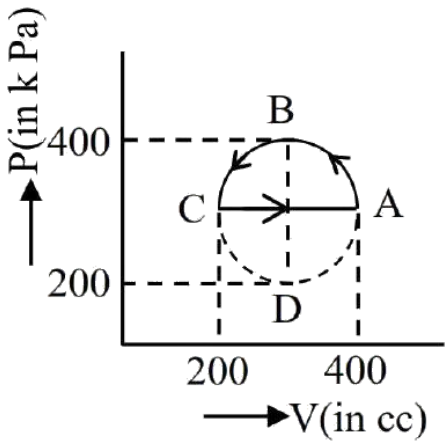
B. A, D, E Only

C. E Only

D. A, C Only

Question 90 View solution online

The magnitude of heat exchanged by a system for the given cyclic process ABCA (as shown in figure) is (in SI unit)



A. 10π

B. 5π

C. zero

D. 40π

Kinetic Theory

Questions 91-101 / 11 selected / 3.7% practice weight / Next

Topics to prioritise in this collection

- Kinetic molecular theory: 7 questions / 63.6% of this chapter
- Degrees of freedom and equipartition: 2 questions / 18.2% of this chapter
- Ideal gas law: 1 question / 9.1% of this chapter
- Kinetic Theory of Gases: 1 question / 9.1% of this chapter

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Question 91 View solution online

Two gases Ar (40) and Xe (131) at equal temperature have the same number density. Their diameters are 0.07 nm and 0.10 nm respectively. Find the ratio of their mean free time

A. 1.03

B. 2.04

C. 2.09

D. 2.49

Question 92 View solution online

The average translational kinetic energy of $\mathbf{N_2}$ gas molecules at ___ °C becomes equal to the K.E. of an electron accelerated from rest through a potential difference of 0.1 volt. (Given $\mathbf{k_B = 1.38 \times 10^{-23}\ J/K}$) (Fill the nearest integer).

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 93 View solution online

A gas mixture consists of 8 moles of argon and 6 moles of oxygen at temperature T. Neglecting all vibrational modes, the total internal energy of the system is

A. 29 RT

B. 20 RT

C. 27 RT

D. 21 RT

Question 94 View solution online

The volume V of an enclosure contains a mixture of three gases, 16 g of oxygen, 28 g of nitrogen and 44 g of carbon dioxide at absolute temperature T. Consider R as universal gas constant. The pressure of the mixture of gases is :

A. $\frac{88RT}{V}$

B. $\frac{3RT}{V}$

C. $\frac{5}{2}\frac{\mathrm{RT}}{\mathrm{V}}$

D. $\frac{4RT}{V}$

Question 95 View solution online

If one mole of the polyatomic gas is having two vibrational modes and β is the ratio of molar specific heats for polyatomic gas $\left(\beta = \frac{C_P}{C_V}\right)$ then the value of β is :

A. 1.02

B. 1.2

C. 1.25

D. 1.35

Question 96 View solution online

The temperature of a gas is $-78^{\circ}C$ and the average translational kinetic energy of its molecules is K . The temperature at which the average translational kinetic energy of the molecules of the same gas becomes 2 K is :

A. $-39^{\circ}C$

B. $117^{\circ}C$

C. $127^{\circ}C$

D. $-78^{\circ}C$

Question 97 View solution online

A vessel contains 14 g of nitrogen gas at a temperature of $27^{\circ}C$. The amount of heat to be transferred to the gap to double the r.m.s. speed of its molecules will be : (Take $R = 8.32\ J\ mol^{-1}k^{-1}$)

A. 2229 J

B. 5616 J

C. 9360 J

D. $13,104\ J$

Question 98 View solution online

Energy of 10 non rigid diatomic molecules at temperature T is :

A. $\frac{7}{2}RT$

B. $70\ K_BT$

C. 35 RT

D. $35\ K_BT$

Question 99 View solution online

According to kinetic theory of gases,A. The motion of the gas molecules freezes at $0°C$B. The mean free path of gas molecules decreases if the density of molecules is increased.C. The mean free path of gas molecules increases if temperature is increased keeping pressure constant.D. Average kinetic energy per molecule per degree of freedom is $\frac{3}{2}k_BT$ (for monoatomic gases)Choose the most appropriate answer from the options given below:

A. A and C only

B. B and C only

C. A and B only

D. C and D only

Question 100 View solution online

(A flask contains Hydrogen and Argon in the ratio $2:1$ by mass. The temperature of the mixture is $30°C$. The ratio of average kinetic energy per molecule of the two gases (K argon $/K$ hydrogen) is: (Given: Atomic Weight of $Ar = 39.9$)

A. 1

B. 2

C. $\frac{39.9}{2}$

D. 39.9

Question 101 View solution online

The temperature of an ideal gas is increased from 200 K to 800 K . If r.m.s. speed of gas at 200 K is v_0. Then, r.m.s. speed of the gas at 800 K will be:

A. v_0

B. $4v_0$

C. $\frac{v_0}{4}$

D. $2v_0$

Oscillations

Questions 102-104 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Oscillatory motion: 2 questions / 66.7% of this chapter
- Simple harmonic motion: 1 question / 33.3% of this chapter

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Question 102 View solution online

A rod of mass ' M ' and length ' 2 L ' is suspended at its middle by a wire. It exhibits torsional oscillations; If two masses each of ' m ' are attached at distance ' $\mathbf{L/2}$ ' from its centre on both sides, it reduces the oscillation frequency by $\mathbf{20\%}$. The value of ratio $\mathbf{m/M}$ is close to :

A. 0.17

B. 0.37

C. 0.57

D. 0.77

Question 103 View solution online

A mass 0.9 kg , attached to a horizontal spring, executes SHM with an amplitude $\mathbf{A_1}$. When this mass passes through its mean position, then a smaller mass of 124 g is placed over it and both masses move together with amplitude $\mathbf{A_2}$. If the ratio $\frac{A_1}{A_2}$ is $\frac{\alpha}{\alpha-1}$, then the value of α will be .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 104 View solution online

A pendulum of length 2 m consists of a wooden bob of mass 50 g . A bullet of mass 75 g is fired towards the stationary bob with a speed v. The bullet emerges out of the bob with a speed $\frac{v}{3}$ and the bob just completes the vertical circle. The value of v is ms^{-1}. (if $g = 10\ \mathrm{m/s^2}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Waves

Questions 105-127 / 23 selected / 7.7% practice weight / Focus first

Topics to prioritise in this collection

- Wave motion: 23 questions / 100.0% of this chapter

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Question 105 View solution online

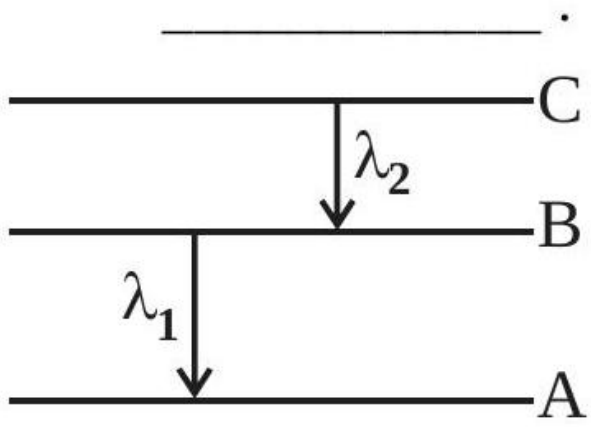
A beam of electromagnetic radiation of intensity $6.4 \times 10^{-5}\ \mathrm{W/cm^2}$ is comprised of wavelength, $\lambda = 310\ \mathrm{nm}$. It falls normally on a metal (work function 2 eV) of surface area $1\ \mathrm{cm^2}$. If one in 10^3 photons ejects an electron, total number of electrons ejected in $1s$ is 10^x ($hc = 1240\mathrm{eV} - nm, 1\mathrm{eV} = 1.6 \times 10^{-19}\ \mathrm{J}$), then the value of x is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 106 View solution online

As per given figure $\mathbf{A}, \mathbf{B}$ and C are the first, second and third excited energy level of hydrogen atom respectively. If the ratio of the two wavelengths (i.e. $\left(\frac{\lambda_1}{\lambda_2}\right)$ is $\frac{7}{4n}$, then the value of n will be



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 107 View solution online

A monochromatic light is incident on a hydrogen sample in ground state. Hydrogen atoms absorb a fraction of light and subsequently emit radiation of six different wavelengths. The frequency of incident light is $\mathbf{x} \times \mathbf{10^{15}}$ **Hz**. The value of x is

. (Given $\mathbf{h = 4.25 \times 10^{-15} eVs}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 108 View solution online

A fringe width of 6 mm was produced for two slits separated by 1 mm apart. The screen is placed 10 m away. The wavelength of light used is ' x ' nm . The value of ' x ' to the nearest integer is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 109 View solution online

Monochromatic light of wavelength 500 nm is used in Young's double slit experiment. An interference pattern is obtained on a screen When one of the slits is covered with a very thin glass plate (refractive index $= 1.5$), the central maximum is shifted to a position previously occupied by the 4th bright fringe. The thickness of the glass-plate is

μ**m**.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 110 View solution online

In a YDSE interference pattern obtained with light of wavelength $\lambda_1 = 500$ **nm**, 15 fringes are obtained on a certain segment of screen. If number of fringes for light of wavelength λ_2 on same segment of screen is 10 , then the value of λ_2 (in nm) is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 111 View solution online

In a Young's double slit experiment, an angular width of the fringe is $0.35°$ on a screen placed at 2 m away for particular wavelength of 450 nm . The angular width of the fringe, when whole system is immersed in a medium of refractive index $7/5$, is $\frac{1}{\alpha}$. The value of α is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 112 View solution online

In a Young's double slit experiment, the intensities at two points, for the path differences $\frac{\lambda}{4}$ and $\frac{\lambda}{3}$ (λ being the wavelength of light used) are I_1 and I_2 respectively. If I_0 denotes the intensity produced by each one of the individual slits, then $\frac{I_1+I_2}{I_0} =$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 113 View solution online

Two wavelengths λ_1 and λ_2 are used in Young's double slit experiment $\lambda_1 = 450\ \text{nm}$ and $\lambda_2 = 650\ \text{nm}$. The minimum order of fringe produced by λ_2 which overlaps with the fringe produced by λ_1 is n . The value of n is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 114 View solution online

In a Young's double slit experiment, a laser light of 560 nm produces an interference pattern with consecutive bright fringes' separation of 7.2 mm . Now another light is used to produce an interference pattern with consecutive bright fringes' separation of 8.1 mm . The wavelength of second light is nm.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 115 View solution online

In Young's double slit experiment, carried out with light of wavelength $5000\AA$, the distance between the slits is 0.3 mm and the screen is at 200 cm from the slits. The central maximum is at $x = 0$ cm. The value of x for third maxima is mm .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 116 View solution online

In a double slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the plane of slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-3} cm. If the distance between the slits is 1 mm , then the wavelength of the light will be nm.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 117 View solution online

A parallel beam of monochromatic light of wavelength $5000\AA$ is incident normally on a single narrow slit of width 0.001 mm . The light is focused by convex lens on screen, placed on its focal plane. The first minima will be formed for the angle of diffraction of (degree).

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 118 View solution online

A beam of light consisting of two wavelengths $7000\AA$ and $5500\AA$ is used to obtain interference pattern in Young's double slit experiment. The distance between the slits is 2.5 mm and the distance between the plane of slits and the screen is 150 cm . The least distance from the central fringe, where the bright fringes due to both the wavelengths coincide, is $n \times 10^{-5}$ m. The value of n is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 119 View solution online

In a single slit diffraction pattern, a light of wavelength $6000\AA$ is used. The distance between the first and third minima in the diffraction pattern is found to be 3 mm when the screen in placed 50 cm away from slits. The width of the slit is $\times 10^{-4}$ m.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 120 View solution online

In Young's double slit experiment, monochromatic light of wavelength $5000\AA$ is used. The slits are 1.0 mm apart and screen is placed at 1.0 m away from slits. The distance from the centre of the screen where intensity becomes half of the maximum intensity for the first time is $\times 10^{-6}$ m.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 121 View solution online

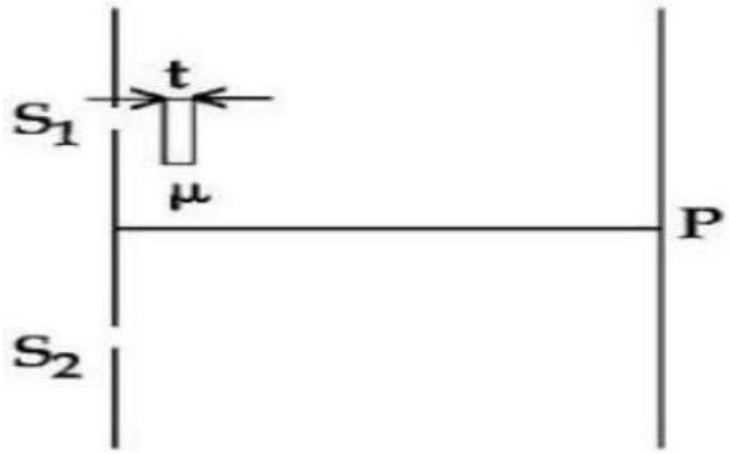
In Young's double slit experiment the two slits are 0.6 mm distance apart. Interference pattern is observed on a screen at a distance 80 cm from the slits. The first dark fringe is observed on the screen directly opposite to one of the slits. The wavelength of light will be nm.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 122 View solution online

As shown in the figure, in Young's double slit experiment, a thin plate of thickness $t = 10\mu$ m and refractive index $\mu = 1.2$ is inserted infront of slit S_1. The experiment is conducted in air ($\mu = 1$) and uses a monochromatic light of wavelength $\lambda = 500$ nm. Due to the insertion of the plate, central maxima is shifted by a distance of $x\beta_0$. β_0 is the fringe-width befor the insertion of the plate. The value of the x is .

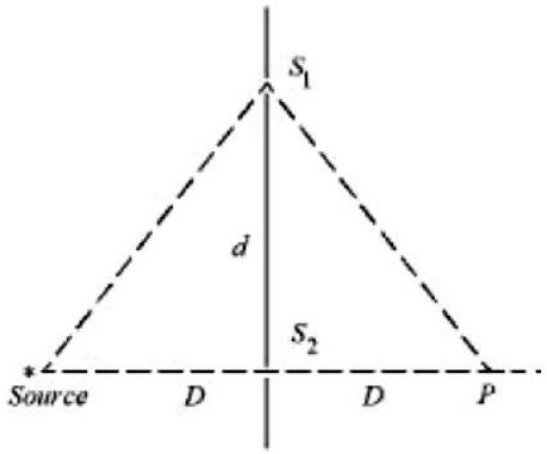


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 123 View solution online

In a double slit experiment shown in figure, when light of wavelength 400 nm is used, dark fringe is observed at P . If $D = 0.2$ m, the minimum distance between the slits S_1 and S_2 is mm .



Numerical answer: _____

Enter the requested value to 1 decimal places. Use the units and scaling stated in the question.

Question 124 View solution online

Two slits are 1 mm apart and the screen is located 1 m away from the slits. A light wavelength 500 nm is used. The width of each slit to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern is $\ldots\ldots\ldots\times 10^{-4}$ m.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 125 View solution online

White light is passed through a double slit and interference is observed on a screen 1.5 m away. The separation between the slits is 0.3 mm . The first violet and red fringes are formed 2.0 mm and 3.5 mm away from the central white fringes. The difference in wavelengths of red and voilet light is
nm.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 126 View solution online

If Rydberg's constant is R, the longest wavelength of radiation in Paschen series will be $\frac{\alpha}{7R}$, where $\alpha =$
.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 127 View solution online

In a single slit experiment, a parallel beam of green light of wavelength 550 nm passes through a slit of width 0.20 mm . The transmitted light is collected on a screen 100 cm away. The distance of first order minima from the central maximum will be $x \times 10^{-5}$ m. The value of x is :

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Electric Charges and Fields

Questions 128-136 / 9 selected / 3.0% practice weight / Next

Topics to prioritise in this collection

- Electric field: 4 questions / 44.4% of this chapter
- Electric fields and forces: 3 questions / 33.3% of this chapter
- Electric Charges and Fields: 1 question / 11.1% of this chapter
- Electrostatic charge and fields: 1 question / 11.1% of this chapter

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Question 128 View solution online

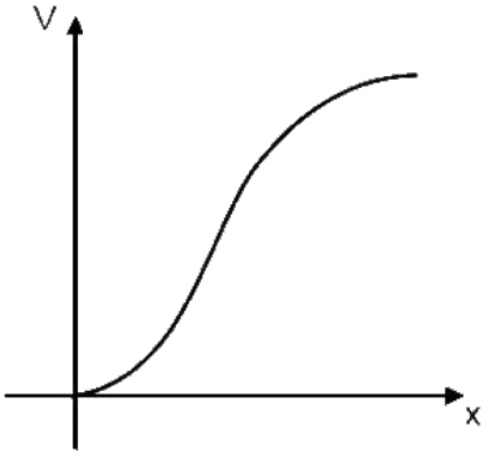
Two small spheres each of mass 10 mg are suspended from a point by threads 0.5 m long. They are equally charged and repel each other to a distance of 0.20 m . Then charge on each of the sphere is $\frac{a}{21} \times 10^{-8}\mathrm{C}$. The value of 'a' will be .

Numerical answer: _____

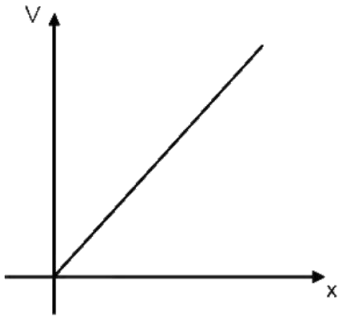
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 129 View solution online

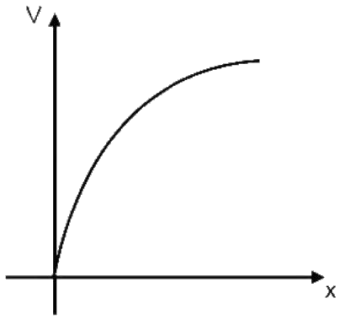
A charge particle of mass m and charge q is released from rest in uniform electric fiel(4) Its graph between velocity (v) and distance (x) will be :



A.

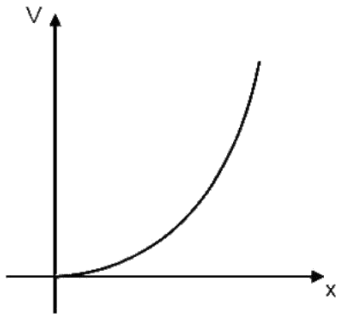


B.



C.

D.



Question 130 View solution online

A proton is moving undeflected in a region of crossed electric and magnetic fields at a constant speed of $2 \times 10^5\ \mathrm{ms}^{-1}$. When the electric field is switched off, the proton moves along a circular path of radius 2 cm . The magnitude of electric field is $x \times 10^4\ \mathrm{N/C}$. the value of x is .
Take the mass of the proton $= 1.6 \times 10^{-27}\ \mathrm{kg}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 131 View solution online

Two uniformly charged spherical conductors A and B of radii 5 mm and 10 mm are separated by a distance of 2 cm . If the spheres are connected by a conducting wire, then in equilibrium condition, the ratio of the magnitudes of the electric fields at the surface of the sphere A and B will be :

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:4$

Question 132 View solution online

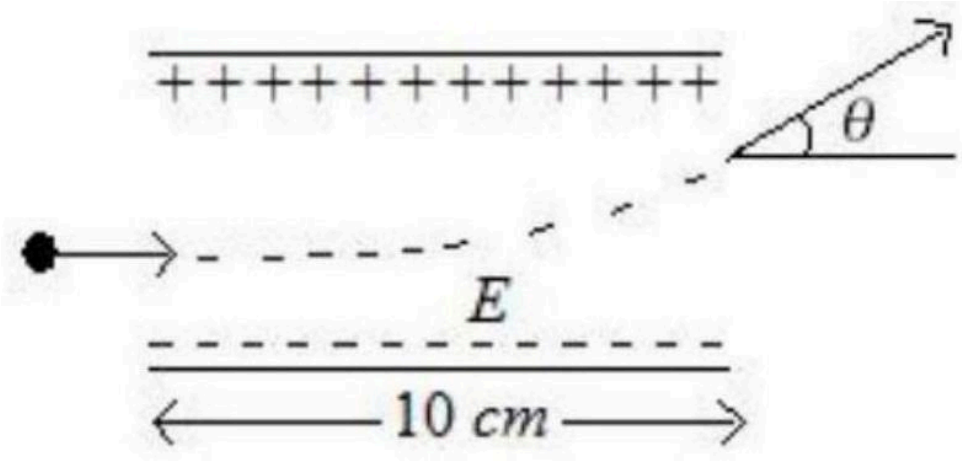
A particle of mass 1 mg and charge q is lying at the mid-point of two stationary particles kept at distance '2 m' when each is carrying same charge 'q'. If the free charged particle is displaced from its equilibrium position through distance 'x' $(\mathrm{x} \ll 1\ \mathrm{m})$. The particle executes SHM. Its angular frequency of oscillation will be ___ $\times 10^5 \mathrm{rad/s}$ if $\mathrm{q}^2 = 10\mathrm{C}^2$

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 133 View solution online

A uniform electric field of $10\ \mathrm{N/C}$ is created between two parallel charged pates (as shown in figure). An electron enters the field symmetrically between the plates with a kinetic energy 0.5 eV . The length of each pate is 10 cm . The angle (θ) of deviation of the path of electron as it comes out of the field is (in degree).

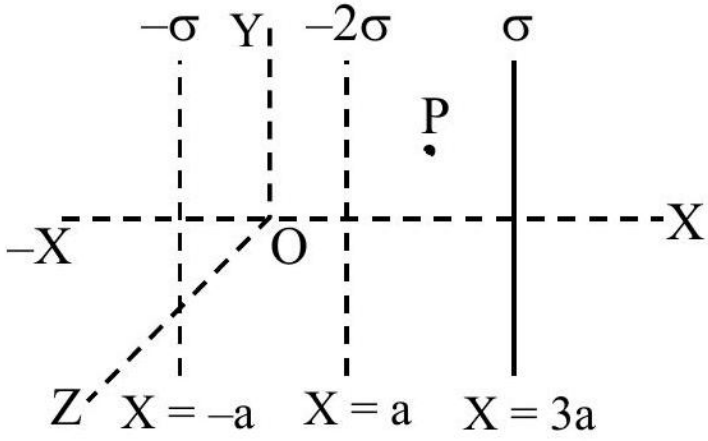


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 134 View solution online

Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is $\frac{x\sigma}{\epsilon_0}$. The value of x is (all quantities are measured in SI units).



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 135 View solution online

Two charges q and 3 q are separated by a distance ' r ' in air. At a distance x from charge q, the resultant electric field is zero. The value of x is :

A. $\frac{(1+\sqrt{3})}{r}$

B. $\frac{r}{3(1+\sqrt{3})}$

C. $\frac{r}{(1+\sqrt{3})}$

D. $r(1+\sqrt{3})$

Question 136 View solution online

Match List-I with List-II.

List-I	List-II
(A) Electric field inside (r > 0) of a uniformly charged spherical shell	(III) 0
(B) Electric field at distance r > 0 from a uniformly charged infinite plane sheet	(II) $\frac{\sigma}{2\varepsilon_0}$
(C) Electric field outside (r > 0) of a uniformly charged spherical shell	(IV) $\frac{\sigma}{\varepsilon_0 r^2}$
(D) Electric field between two oppositely charged infinite plane parallel sheets	(I) $\frac{\sigma}{\varepsilon_0}$

Choose the correct answer from the options given below:

A. (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

B. (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

C. (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

D. (A)-(III), (B)-(II), (C)-(IV), (D)-(I)

Electrostatic Potential and Capacitance

Questions 137-139 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Electric potential and capacitors: 3 questions / 100.0% of this chapter

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Question 137 View solution online

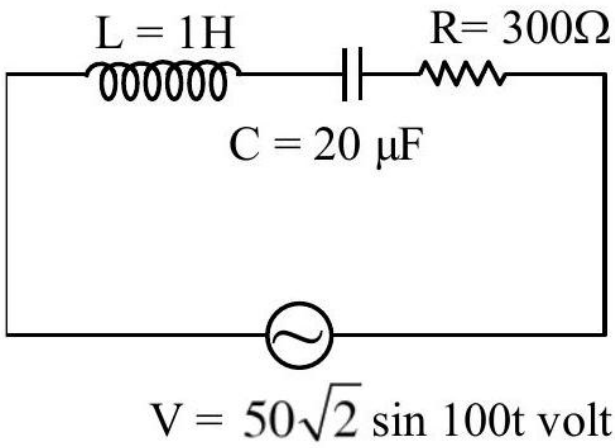
A parallel plate capacitor consisting of two circular plates of radius 10 cm is being charged by a constant current of 0.15 A . If the rate of change of potential difference between the plates is $7 \times 10^8\ \mathrm{V/s}$ then the integer value of the distance between the parallel plates is -
$\left(\text{Take, } \epsilon_0 = 9 \times 10^{-12}\ \frac{\mathrm{F}}{\mathrm{m}}, \pi = \frac{22}{7}\right)$ $\mu\mathrm{m}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 138 View solution online

An ac source is connected in given series LCR circuit. The rms potential difference across the capacitor of $20\mu\ \mathrm{F}$ is V.



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 139 View solution online

An alternating emf $\mathbf{E = 110\sqrt{2}\sin 100t}$ volt is applied to a capacitor of $\mathbf{2\mu\ F}$, the rms value of current in the circuit is mA .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Current Electricity

Questions 140-164 / 25 selected / 8.3% practice weight / Focus first

Topics to prioritise in this collection

- Electric circuits: 13 questions / 52.0% of this chapter
- Ohm's law: 5 questions / 20.0% of this chapter
- Circuit analysis: 4 questions / 16.0% of this chapter
- Equivalent resistance: 1 question / 4.0% of this chapter
- Kirchhoff laws: 1 question / 4.0% of this chapter
- Meter bridge: 1 question / 4.0% of this chapter

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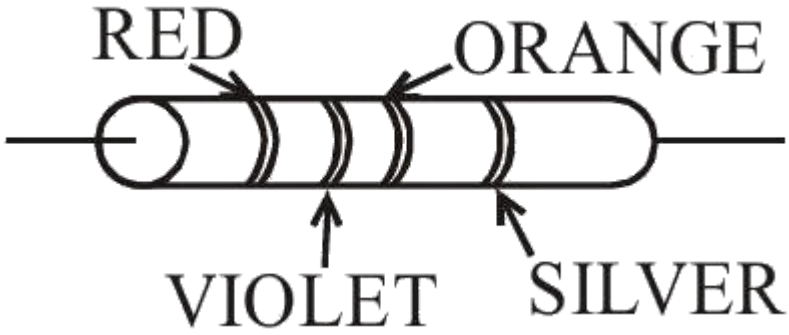
Question 140

View solution online

A resistance is shown in the figure. Its value and tolerance are given respectively by:



A. $27\ K\Omega, 20\%$

B. $270\ K\Omega, 5\%$

C. $270\ K\Omega, 10\%$

D. $27\ K\Omega, 10\%$

Question 141 View solution online

The energy dissipated by a resistor is 10 mJ in 1 s when an electric current of 2 mA flows through it. The resistance is Ω.
(Round off to the Nearest Integer)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 142 View solution online

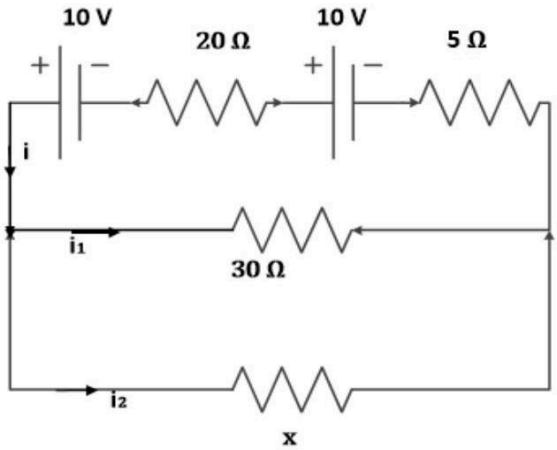
A battery of unknown emf connected to a potentiometer has balancing length 560 cm . If a resistor of resistance 10Ω is connected in parallel with the cell the balancing length change by 60 cm . If the internal resistance of the cell is $\frac{n}{10}\Omega$, the value of ' n ' is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 143 View solution online

Two batteries (connected in series) of same emf 10 V of internal resistances 20Ω and 5Ω are connected to a load resistance of 30Ω. Now an unknown resistance x is connected in parallel to the load resistance. Find value of x so that potential drop of battery having internal resistance 20Ω becomes zero.

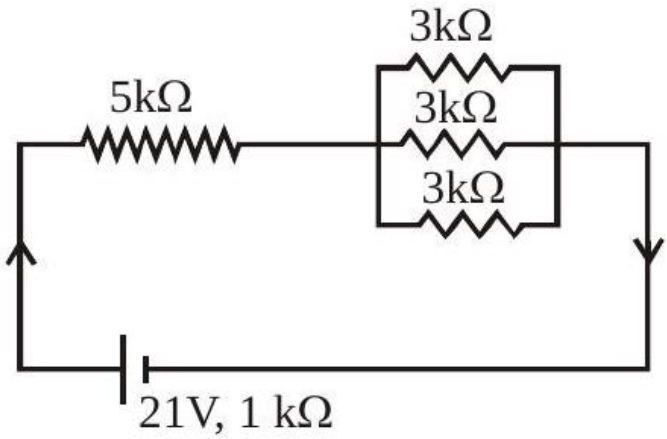


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 144 View solution online

In the figure given, the electric current flowing through the $5k\Omega$ resistor is ' x ' mA .



The value of x to the nearest integer is

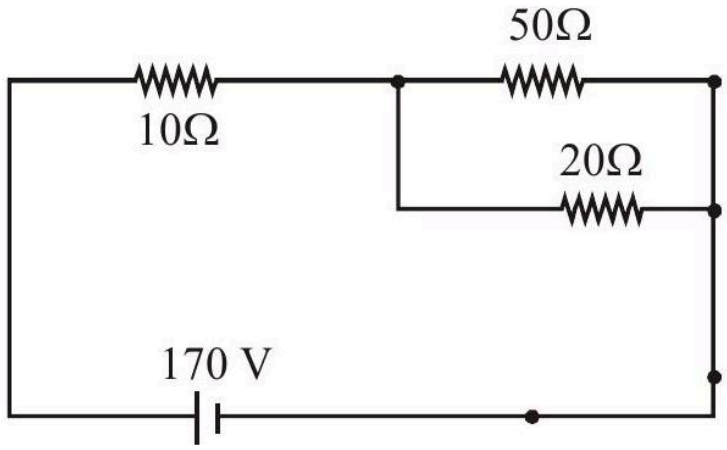
.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 145 View solution online

The voltage across the 10Ω resistor in the given circuit is x volt.



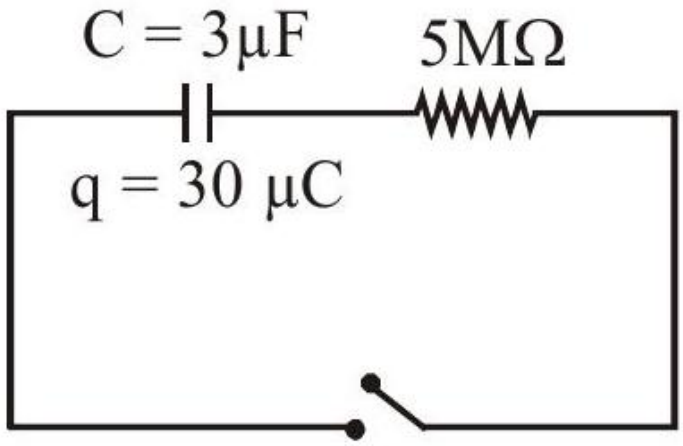
The value of ' x ' to the nearest integer is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 146 View solution online

The circuit shown in the figure consists of a charged capacitor of capacity $3\mu\ \mathrm{F}$ and a charge of $30\mu\mathrm{C}$. At time $t = 0$, when the key is closed, the value of current flowing through the $5\mathrm{M}\Omega$ resistor is ' x ' $\mu - \mathrm{A}$. The value of ' x to the nearest integer is .

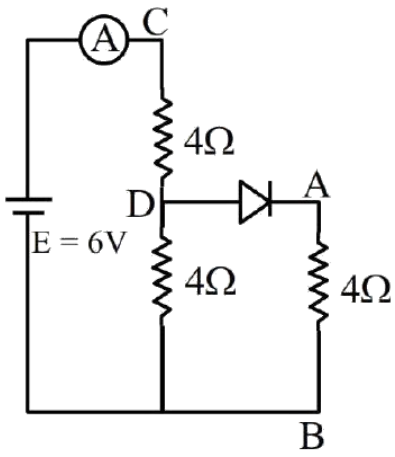


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 147 View solution online

Refer to the circuit diagram given in the figure, which of the following observation are correct?A. Total resistance of circuit is 6Ω.B. Current in Ammeter is 1 AC. Potential across AB is 4 Volts.D. Potential across CD is 4 Volts.E. Total resistance of the circuit is 8Ω.Choose the correct answer from the options given below:



A. A, B and D only

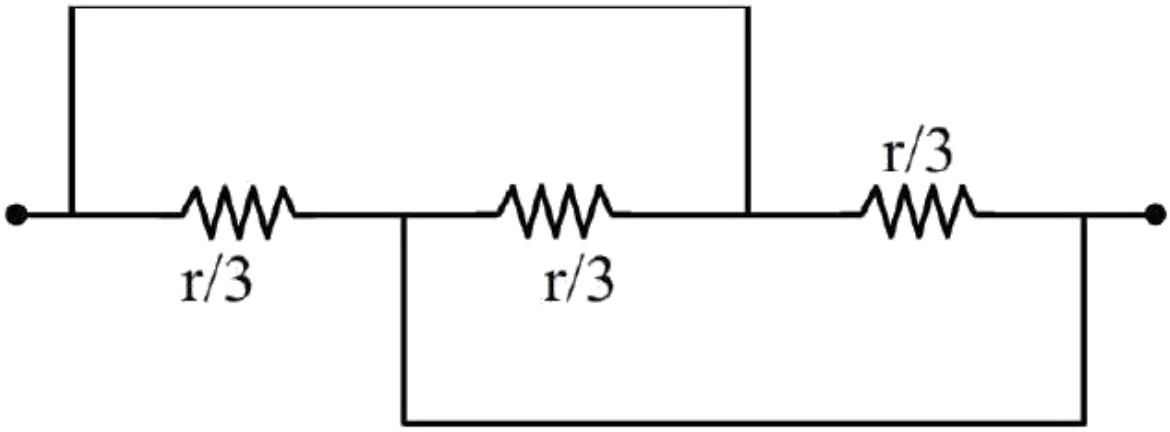
B. A, C and D only

C. B, C and E only

D. A, B and C only

Question 148 View solution online

Find the equivalent resistance between two ends of the following circuit.



A. r

B. $\frac{r}{6}$

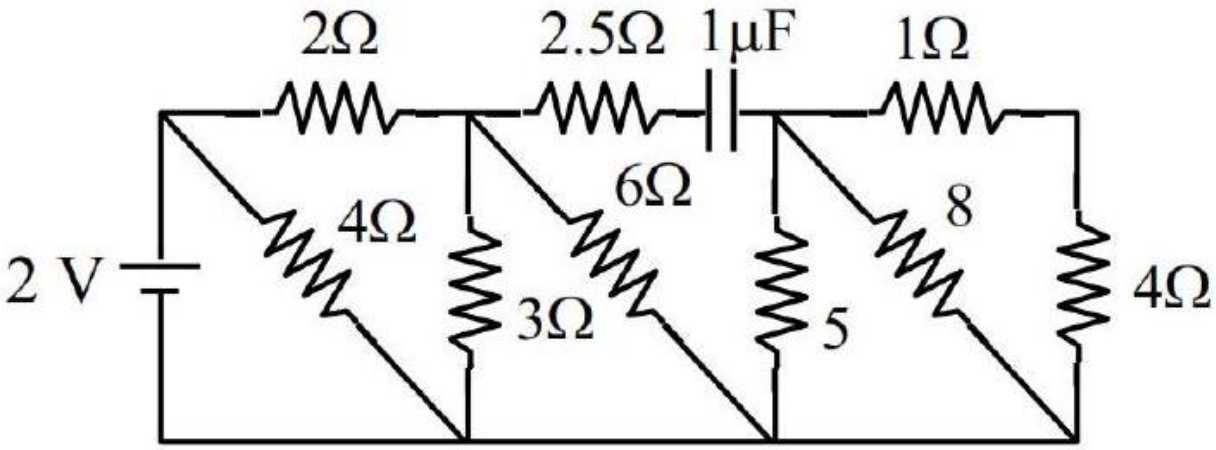
C. $\frac{r}{9}$

D. $\frac{r}{3}$

Question 149 View solution online

The net current flowing in the given circuit is

A.

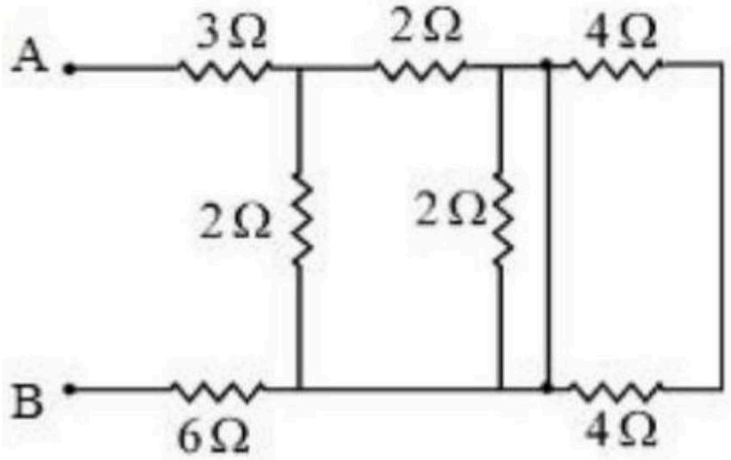


Numerical answer: _____

Enter an integer (0 digits after the decimal point). Round to the nearest integer where requested; enter the coefficient of any power of ten shown in the question.

Question 150 View solution online

In the given circuit, the equivalent resistance between the terminal A and B is **Ω**.

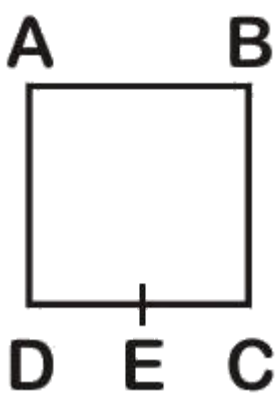


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 151 View solution online

A wire of resistance R is bent to form a square $ABCD$ as shown in the figure. The effective resistance between E and C is(E is mid-point of arm CD)



A. $\frac{3}{4}R$

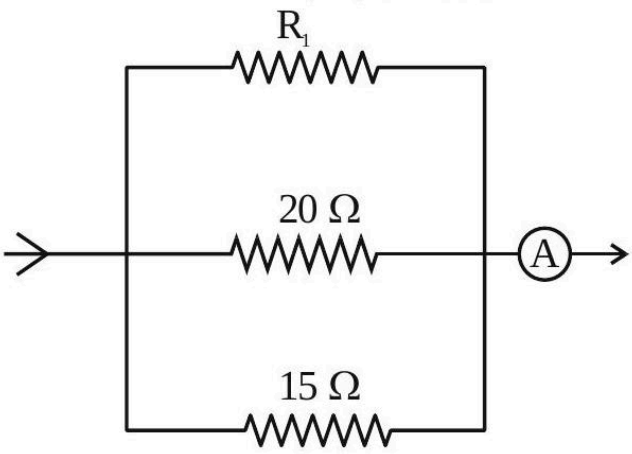
B. R

C. $\frac{1}{16}R$

D. $\frac{7}{64}\mathrm{R}$

Question 152 View solution online

In the given circuit, the current flowing through the resistance 20Ω is 0.3 A , while the ammeter reads 0.9 A . The value of $\mathrm{R_1}$ is Ω.



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 153 View solution online

A wire of length 10 cm and radius $\sqrt{7} \times 10^{-4}$ m connected across the right gap of a meter bridge. When a resistance of 4.5Ω is connected on the left gap by using a resistance box, the balance length is found to be at 60 cm from the left end. If the resistivity of the wire is $\mathrm{R} \times 10^{-7} \Omega$ m, then value of R is :

A. 63

B. 70

C. 66

D. 35

Question 154 View solution online

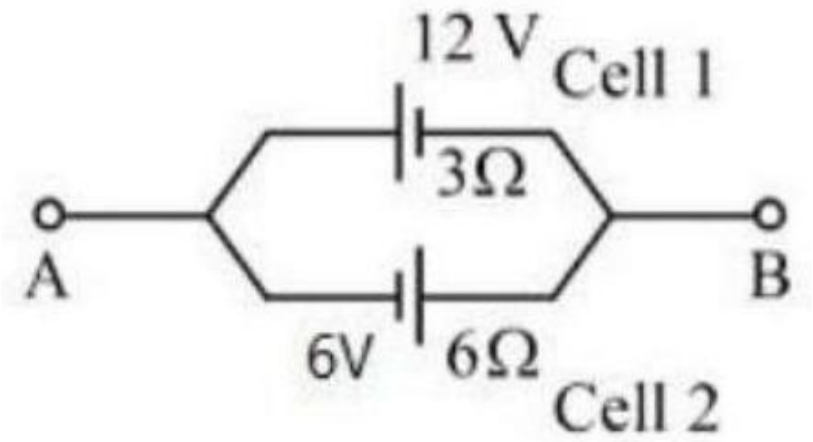
First, a set of n equal resistors of 10Ω each are connected in series to a battery of emf 20 V and internal resistance 10Ω. A current I is observed to flow. Then, the n resistors are connected in parallel to the same battery. It is observed that the current is increased 20 times, then the value of n is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 155 View solution online

Two cells are connected between points A and B as shown. Cell 1 has emf of 12 V and internal resistance of 3Ω. Cell 2 has emf of 6 V and internal resistance of 6Ω. An external resistor R of 4Ω is connected across A and B. The current flowing through R will be A.



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 156 View solution online

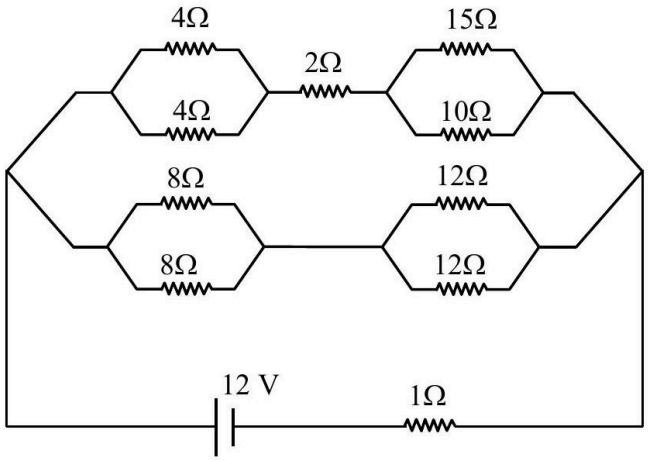
A uniform conducting wire of length is 24 a , and resistance R is wound up as a current carrying coil in the shape of an equilateral triangle of side ' a ' and then in the form of a square of side ' a '. The coil is connected to a voltage source V_0. The ratio of magnetic moment of the coils in case of equilateral triangle to that for square is $1 : \sqrt{y}$ where y is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 157 View solution online

The voltage drop across 15Ω resistance in the given figure will be V.

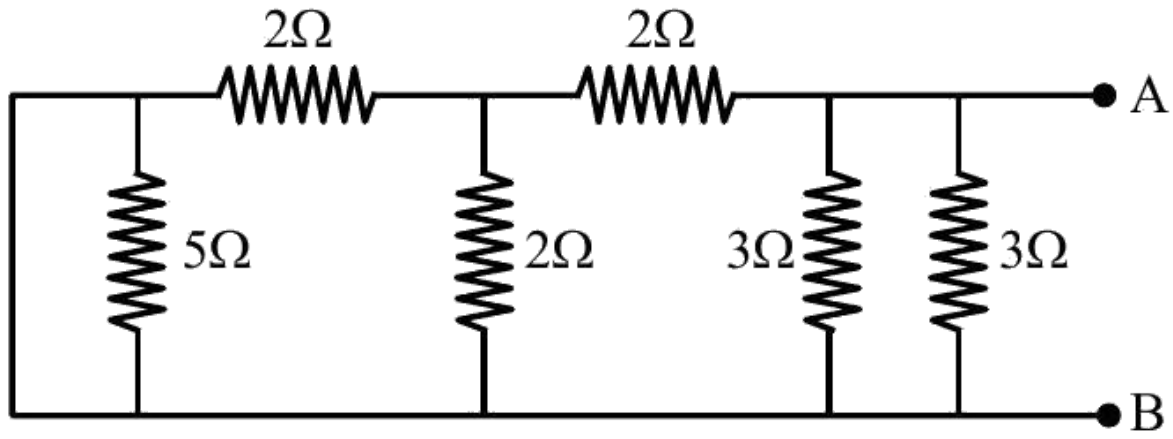


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 158 View solution online

The equivalent resistance of the given circuit between the terminals A and B is :



A. 0Ω

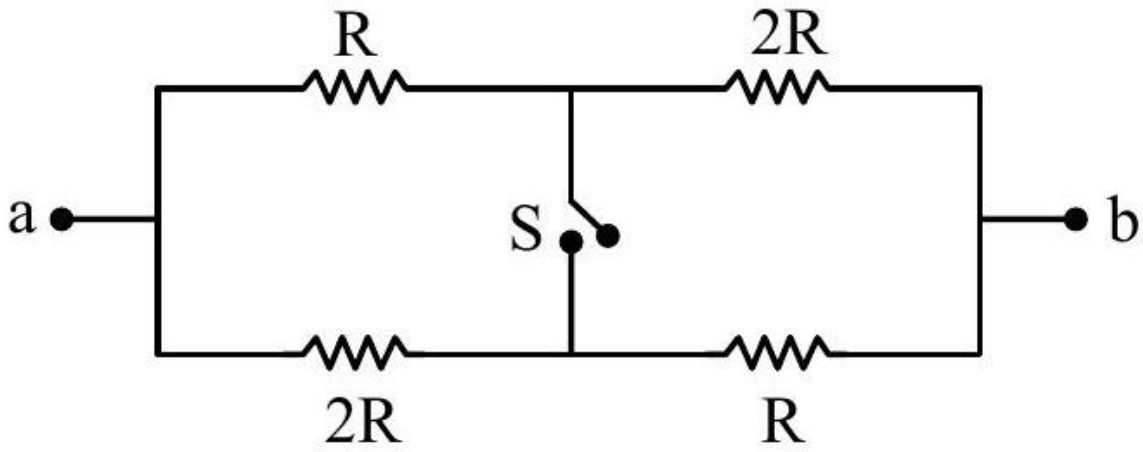
B. 3Ω

C. $\frac{9}{2}\Omega$

D. 1Ω

Question 159 View solution online

The ratio of the equivalent resistance of the network (shown in figure) between the points a and b when switch is open and switch is closed is $x : 8$. The value of x is .

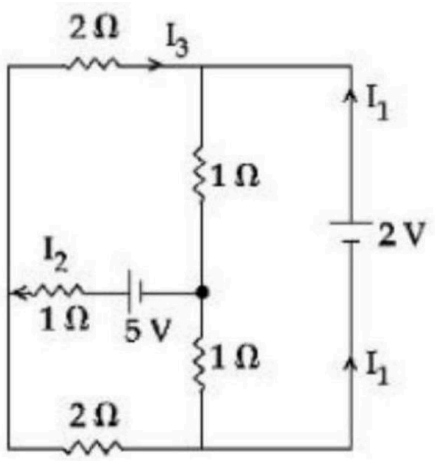


Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 160 View solution online

In the following circuit, the magnitude of current I_1, is A.



Numerical answer: _____

Enter the current in amperes to 1 decimal place.

Question 161 View solution online

An insulated copper wire of 100 turns is wrapped around a wooden cylindrical core of the crosssectional area $24\ cm^2$. The two ends of the wire are connected to a resistor. The total resistance in the circuit is 12Ω. If an externally applied uniform magnetic field in the core along its axis changes from 1.5 T in one direction to 1.5 T in the opposite direction, the charge flowing through a point in the circuit during the change of magnetic field will be

mC .

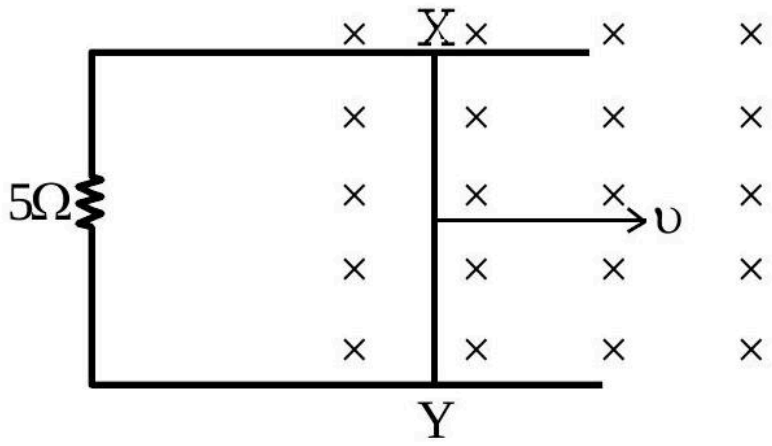
Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 162 View solution online

A 1 m long metal rod XY completes the circuit as shown in figure. The plane of the circuit is perpendicular to the magnetic field of flux density 0.15 T . If the resistance of the circuit is 5Ω, the force needed to move the rod in direction, as indicated, with a constant speed of $4\ \mathrm{m/s}$ will be

10^{-3} N.



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 163 View solution online

Two wires A and B are made up of the same material and have the same mass. Wire A has radius of 2.0 mm and wire B has radius of 4.0 mm . The resistance of wire B is 2Ω. The resistance of wire A is Ω.

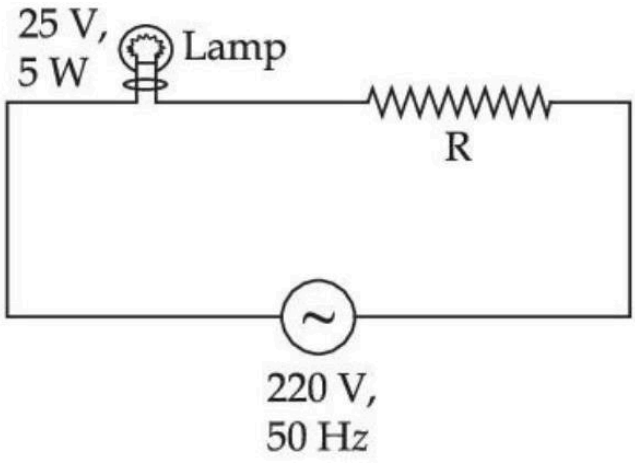
Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 164 View solution online

A $220\ V, 50\ Hz$ AC source is connected to a 25 V , 5 W lamp and an additional resistance R in series (as shown in figure) to run the lamp at its peak brightness, then the value of R (in ohm) will be

.



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Moving Charges and Magnetism

Questions 165-184 / 20 selected / 6.7% practice weight / Focus first

Topics to prioritise in this collection

- Magnetic force and field: 10 questions / 50.0% of this chapter
- Magnetic field due to currents: 4 questions / 20.0% of this chapter
- Ampere's circuital law: 2 questions / 10.0% of this chapter
- Biot-Savart law: 2 questions / 10.0% of this chapter
- Motion of a charged particle in a magnetic field: 1 question / 5.0% of this chapter
- Moving-coil galvanometer: 1 question / 5.0% of this chapter

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Question 165 View solution online

A solenoid of 1200 turns is wound uniformly in a single layer on a glass tube 2 m long and 0.2 m in diameter. The magnetic intensity at the center of the solenoid when a current of 2 A flows through it is?

A. $2.4 \times 10^3\ \mathrm{A\ m^{-1}}$

B. $1.2 \times 10^3\ \mathrm{A\ m^{-1}}$

C. $2.4 \times 10^{-3}\ \mathrm{A\ m^{-1}}$

D. $1\ \mathrm{A\ m^{-1}}$

Question 166 View solution online

Two particles X and Y having equal charges are being accelerated through the same potential difference. Thereafter they enter normally in a region of uniform magnetic field and describes circular paths of radii R_1 and R_2 respectively. The mass ratio of X and Y is :

A. $\left(\frac{\mathrm{R_2}}{\mathrm{R_1}}\right)^2$

B. $\left(\frac{R_1}{R_2}\right)^2$

C. $\left(\frac{R_1}{R_2}\right)$

D. $\left(\frac{R_2}{R_1}\right)$

Question 167 View solution online

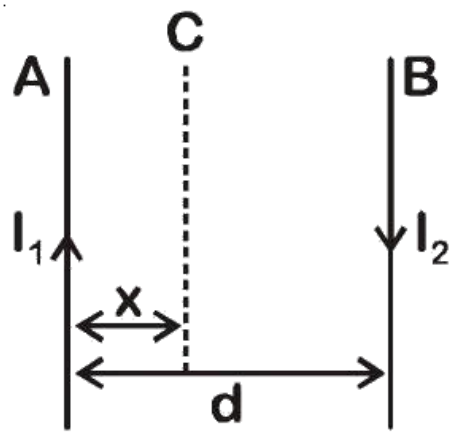
A sing1y ionized magnesium atom (A24) ion is accelerated to kinetic energy 5 keV and is projected perpendicularly into a magnetic field B of the magnitude 0.5 T . The radius of path formed will be cm.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 168 View solution online

Two wires A and B are carrying currents I_1 and I_2 as shown in the figure. The separation between them is d. A third wire C carrying a current I is to be kept parallel to them at a distance x from A such that the net force acting on it is zero. The possible values of x are :



A. $x = \pm\frac{I_1 d}{(I_1 - I_2)}$

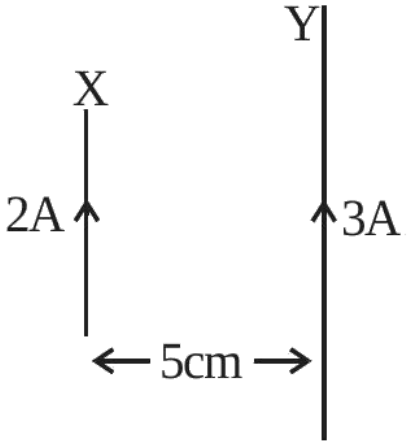
B. $x = \left(\frac{I_1}{I_1+I_2}\right)d$ and $x = \left(\frac{I_2}{I_1-I_2}\right)d$

C. $x = \left(\frac{I_2}{I_1+I_2}\right)d$ and $x = \left(\frac{I_2}{I_1-I_2}\right)d$

D. $x = \left(\frac{I_1}{I_1-I_2}\right)d$ and $x = \left(\frac{I_2}{I_1+I_2}\right)d$

Question 169 View solution online

A wire X of length 50 cm carrying a current of 2 A is placed parallel to a long wire Y of length 5 m . The wire Y carries a current of 3 A . The distance between two wires is 5 cm and currents flow in the same direction. The force acting on the wire Y is :



A. 1.2×10^{-5} N directed towards wire X .

B. 1.2×10^{-4} N directed away from wire X .

C. 1.2×10^{-4} N directed towards wire X .

D. 2.4×10^{-5} N directed towards wire X .

Question 170 View solution online

An emf of 0.08 V is induced in a metal rod of length 10 cm held normal to a uniform magnetic field of 0.4 T , when moves with a velocity of:

A. $2\ \mathrm{ms}^{-1}$

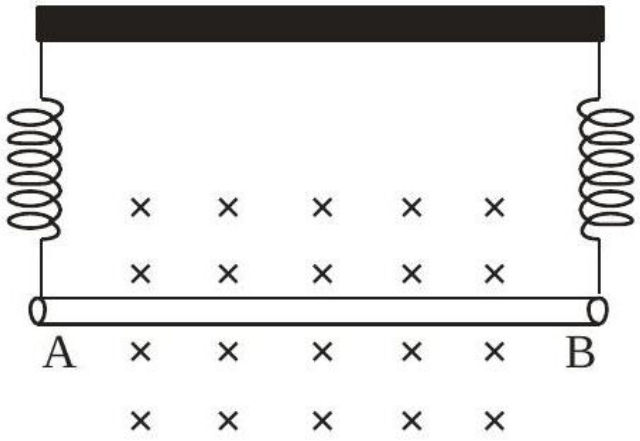
B. $3.2\ \mathrm{ms}^{-1}$

C. $0.5\ \mathrm{ms}^{-1}$

D. $20\ \mathrm{ms}^{-1}$

Question 171 View solution online

A straight wire AB of mass 40 g and length 50 cm is suspended by a pair of flexible leads in uniform magnetic field of magnitude 0.40 T as shown in the figure. The magnitude of the current required in the wire to remove the tension in the supporting leads is A. (Take $\mathbf{g = 10\ ms^{-2}}$).



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 172 View solution online

Two long straight wires P and Q carrying equal current 10 A each were kept parallel to each other at 5 cm distance. Magnitude of magnetic force experienced by 10 cm length of wire P is F_1 - If distance between wires is halved and currents on them are doubled, force F_2 on 10 cm length of wire P will be:

A. $\frac{F_1}{8}$

B. $8\ \mathrm{F_1}$

C. $10F_1$

D. $\frac{F_1}{10}$

Question 173 View solution online

A long straight wire of circular cross-section (radius a) is carrying steady current I. The current I is uniformly distributed across this cross-section. The magnetic field is

A. Zero in the region $\mathbf{r < a}$ and inversely proportional to r in the region $r > a$

B. Inversely proportional to r in the region $r < a$ and uniform throughout in the region $\mathbf{r > a}$

C. Directly proportional to r in the region $\mathbf{r < a}$ and inversely proportional to r in the region $r > a$

D. Uniform in the region $\mathbf{r < a}$ and inversely proportional to distance r from the axis, in the region $\mathbf{r > a}$

Question 174 View solution online

A 20 cm long metallic rod is rotated with 210 rpm about an axis normal to the rod passing through its one end. The order end of the rod is in contact with a circular metallic ring. A constant and uniform magnetic field 0.2 T parallel to the axis exists everywhere. The emf developed between the centre and the ring is mV .

Take $\pi = \frac{22}{7}$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 175 View solution online

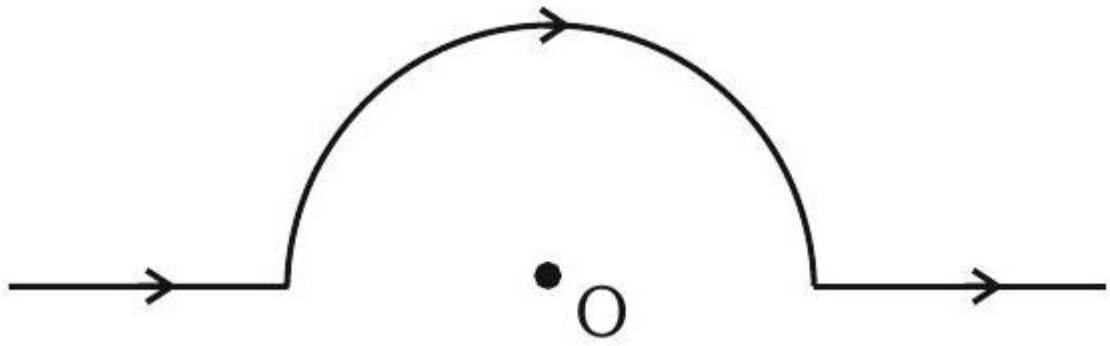
A coil having 100 turns, area of $5 \times 10^{-3}\ \mathrm{m}^2$, carrying current of 1 mA is placed in uniform magnetic field of 0.20 T such a way that plane of coil is perpendicular to the magnetic field. The work done in turning the coil through $90°$ is μJ.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 176 View solution online

A straight wire carrying a current of 14 A is bent into a semicircular are of radius 2.2 cm as shown in the figure. The magnetic field produced by the current at the centre (O) of the arc is $\times 10^{-4}$ T



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 177 View solution online

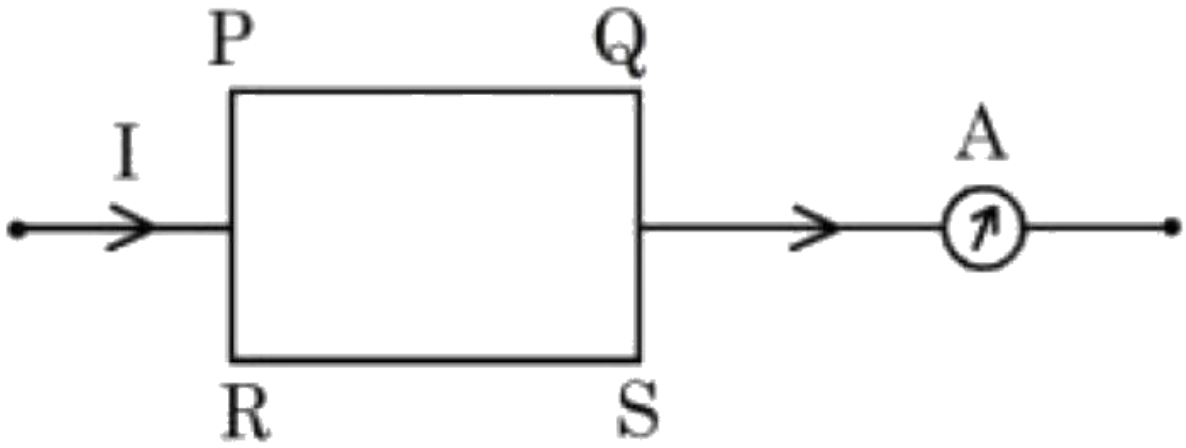
Two long parallel wires carrying currents 8 A and 15 A in opposite directions are placed at a distance of 7 cm from each other. A point P is at equidistant from both the wires such that the lines joining the point P to the wires are perpendicular to each other. The magnitude of magnetic field at P is $\times 10^{-6}$ T (Given : $\sqrt{2} = 1 \cdot 4$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 178 View solution online

A current carrying rectangular loop $PQRS$ is made of uniform wire. The length $PR = QS = 5$ cm and $= RS = 100$ cm. If ammeter current reading changes from I to $2I$, the ratio of magnetic forces per unit length on the wire PQ due to wire RS in the two cases respectively ($f_{PQ}^{I} : f_{PQ}^{2I}$) is:



A. $1:2$

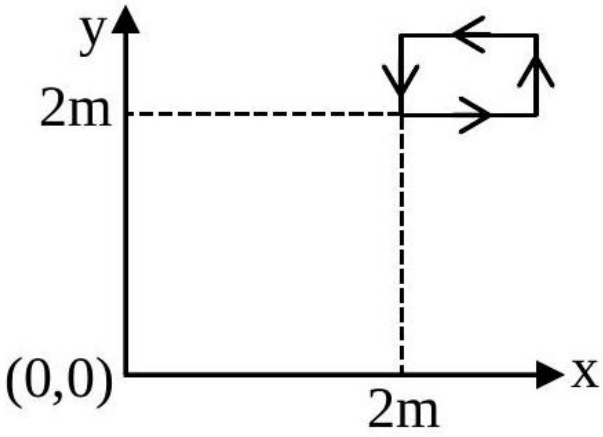
B. $1:3$

C. $1:4$

D. $1:5$

Question 179 View solution online

The magnetic field existing in a region is given by $\vec{B} = 0.2(1 + 2x)\hat{k}T$. A square loop of edge 50 cm carrying 0.5 A current is placed in $x - y$ plane with its edges parallel to the $x - y$ axes, as shown in figure. The magnitude of the net magnetic force experienced by the loop is mN .



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 180 View solution online

A rod with circular cross-section area $2\ cm^2$ and length 40 cm is wound uniformly with 400 turns of an insulated wire. If a current of 0.4 A flows in the wire windings, the total magnetic flux produced inside windings is $4\pi \times 10^{-6}\ Wb$. The relative permeability of the rod is(Given : Permeability of vacuum $\mu_0 = 4\pi \times 10^{-7} NA^{-2}$)

A. $\frac{5}{16}$

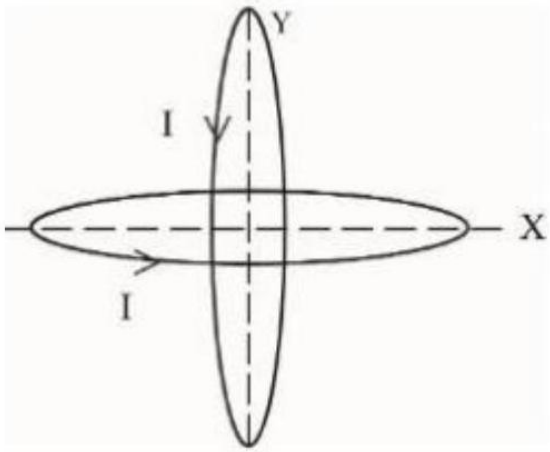
B. 12.5

C. 125

D. $\frac{32}{5}$

Question 181 View solution online

Two identical circular wires of radius 20 cm and carrying current $\sqrt{2}\ \mathbf{A}$ are placed in perpendicular planes as shown in figure. The net magnetic field at the centre of the circular wire is $\times 10^{-8}$ T. (Take $\pi = 3.14$)



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 182 View solution online

An electron in a hydrogen atom revolves around its nucleus with a speed of $6.76 \times 10^{6}\ \mathbf{ms}^{-1}$ in an orbit of radius $0.52\ \mathbf{A}^{\circ}$. The magnetic field produced at the nucleus of the hydrogen atom is T.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 183 View solution online

The magnetic field inside a 200 turns solenoid of radius 10 cm is $2.9 \times 10^{-4}\mathbf{Tesla}$. If the solenoid carries a current of 0.29 A , then the length of the solenoid is $\pi\mathbf{cm}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 184 View solution online

An electron with energy 0.1 keV moves at right angle to the earth's magnetic field of $1 \times 10^{-4} \mathrm{Wbm}^{-2}$. The frequency of revolution of the electron will be(Take mass of electron $= 9.0 \times 10^{-31}\ \mathrm{kg}$)

A. $1.6 \times 10^{5}\ \mathrm{Hz}$

B. $5.6 \times 10^{5}\ \mathrm{Hz}$

C. $2.8 \times 10^{6}\ \mathrm{Hz}$

D. $1.8 \times 10^{6}\ \mathrm{Hz}$

Magnetism and Matter

Questions 185-186 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

- Magnetic dipoles: 1 question / 50.0% of this chapter
- Magnetism and Matter: 1 question / 50.0% of this chapter

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Question 185 View solution online

Match List-I with List-II.

List-I	List-II
(A) Magnetic induction	(III) Gauss
(B) Magnetic intensity	(IV) Ampere meter
(C) Magnetic flux	(II) Weber
(D) Magnetic moment	(I) Ampere meter^2

Choose the correct answer from the options given below:

A. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

B. (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

C. (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

D. (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

Question 186 View solution online

The coercivity of a magnet is 5×10^3 A/m. The amount of current required to be passed in a solenoid of length 30 cm and the number of turns 150 , so that the magnet gets demagnetised when inside the solenoid is .A.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Electromagnetic Induction

Questions 187-209 / 23 selected / 7.7% practice weight / Focus first

Topics to prioritise in this collection

- Inductance and induced emf: 9 questions / 39.1% of this chapter
- Faraday's law: 7 questions / 30.4% of this chapter
- Mutual inductance: 4 questions / 17.4% of this chapter
- Electromagnetic Induction: 2 questions / 8.7% of this chapter
- Self-inductance: 1 question / 4.3% of this chapter

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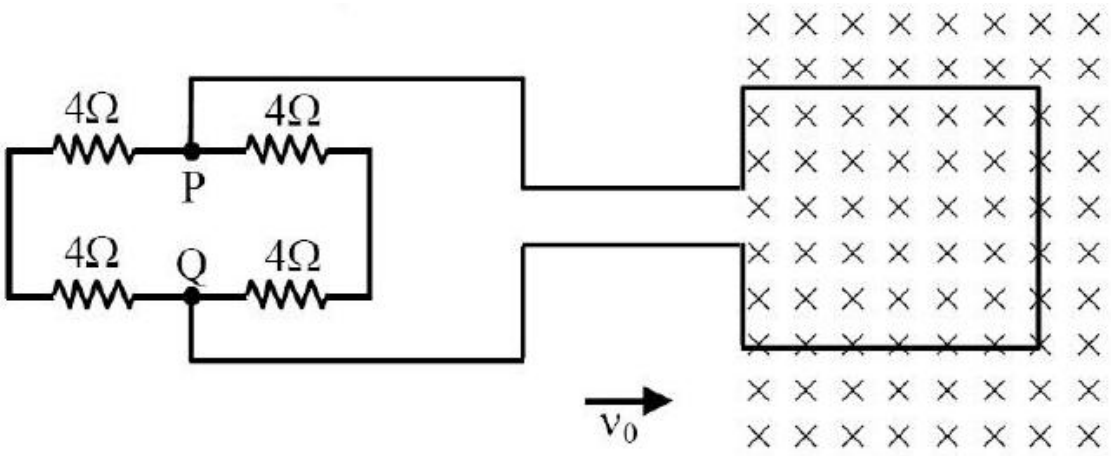
Question 187 View solution online

A square loop of side 20 cm and resistance 1Ω is moved towards right with a constant speed v_0. The right arm of the loop is in a uniform magnetic field of 5T. The field is perpendicular to the plane of the loop and is going into it. The loop is connected to a network of resistors each of value 4Ω. What should be the value of v_0 so that a steady current of 2 mA flows in the loop ?



A. 1 m/s

B. 1 cm/s

C. 10^2 m/s

D. 10^{-2} cm/s

Question 188 View solution online

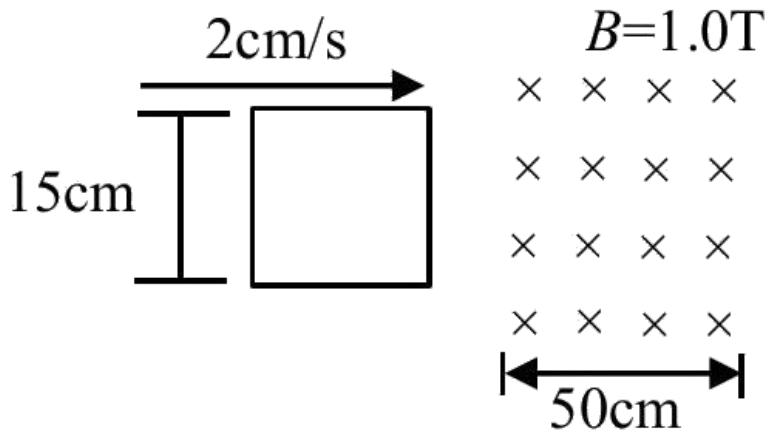
A square loop of side 10 cm and resistance 0.7Ω is placed vertically in east-west plane. A uniform magnetic field of 0.20 T is set up across the plane in north east direction. The magnetic field is decreased to zero in 1 s at a steady rate. Then, magnitude of induced emf is $\sqrt{x} \times 10^{-3}$ V. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 189 View solution online

A square loop of side 15 cm being moved towards right at a constant speed of $2\ cm/s$ as shown in figure. The front edge enters the 50 cm wide magnetic field at $t = 0$. The value of induced emf in the loop at $t = 10\ s$ will be :



A. 0.3 mV

B. 4.5 mV

C. zero

D. 3 mV

Question 190 View solution online

A wire of length 1 m moving with velocity $8\ m/s$ at right angles to a magnetic field of 2 T . The magnitude of induced emf, between the ends of wire will be

A. 20 V

B. 8 V

C. 12 V

D. 16 V

Question 191 View solution online

A conducting circular loop of radius $\frac{10}{\sqrt{\pi}}$ cm is placed perpendicular to a uniform magnetic field of 0.5 T . The magnetic field is decreased to zero in 0.5 s at a steady rate. The induced emf in the circular loop at 0.25 s is:

A. $\mathrm{emf} = 1\mathrm{mV}$

B. $\mathrm{emf} = 5\mathrm{mV}$

C. $\mathrm{emf} = 100\mathrm{mV}$

D. $\mathrm{emf} = 10\mathrm{mV}$

Question 192 View solution online

A certain elastic conducting material is stretched into a circular loop. It is placed with its plane perpendicular to a uniform magnetic field $\mathrm{B} = 0.8\ \mathrm{T}$. When released the radius of the loop starts shrinking at a constant rate of $2\mathrm{cms}^{-1}$. The induced emf in the loop at an instant when the radius of the loop is 10 cm will be mV . (Given $\mathrm{g} = 10\ \mathrm{ms}^{-2}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 193 View solution online

A square loop of area $25\ \mathrm{cm}^2$ has a resistance of 10Ω. The loop is placed in uniform magnetic field of magnitude 40.0 T. The plane of loop is perpendicular to the magnetic field. The work done in pulling the loop out of the magnetic field slowly and uniformly in 1.0 sec , will be

A. $1.0 \times 10^{-3}\ \mathrm{J}$

B. $2.5 \times 10^{-3}\ \mathrm{J}$

C. $5 \times 10^{-3}\ \mathrm{J}$

D. $1.0 \times 10^{-4}\ \mathrm{J}$

Question 194 View solution online

A conducting circular loop is placed in a uniform magnetic field of 0.4 T with its plane perpendicular to the field. Somehow, the radius of the loop starts expanding at a constant rate of $1\ \mathrm{mm/s}$. The magnitude of induced emf in the loop at an instant when the radius of the loop is 2 cm will be

$\mu\mathrm{V}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 195 View solution online

A square loop of side 2.0 cm is placed inside a long solenoid that has 50 turns per centimetre and carries a sinusoidally varying current of amplitude 2.5 A and angular frequency $700\mathrm{rads}^{-1}$. The central axes of the loop and solenoid coincide. The amplitude of the emf induced in the loop is $\mathrm{x} \times 10^{-4}\ \mathrm{V}$. The value of x is

(Take, $\pi = \frac{22}{7}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 196 View solution online

When a dc voltage of 100 V is applied to an inductor, a dc current of 5 A flows through it. When an ac voltage of 200 V peak value is connected to inductor, its inductive reactance is found to be $20\sqrt{3}\Omega$. The power dissipated in the circuit is W.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 197 View solution online

For a given series LCR circuit it is found that maximum current is drawn when value of variable capacitance is 2.5 nF . If resistance of 200Ω and 100 mH inductor is being used in the given circuit. The frequency of ac source is $\times 10^3$ Hz. (given $\pi^2 = 10$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 198 View solution online

When a coil is connected across a 20 V dc supply, it draws a current of 5 A. When connected across a 20 V, 50 Hz ac supply, it draws a current of 4 A. The self-inductance of the coil is _____ mH. (Take $\pi = 3$.)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 199 View solution online

The current in an inductor is given by $I = (3t + 8)$ where t is in second. The magnitude of induced emf produced in the inductor is 12 mV . The selfinductance of the inductor mH .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 200 View solution online

In a coil, the current changes from -2 A to +2 A in 0.2 s and induces an emf of 0.1 V . The selfinductance of the coil is :

A. 5 mH

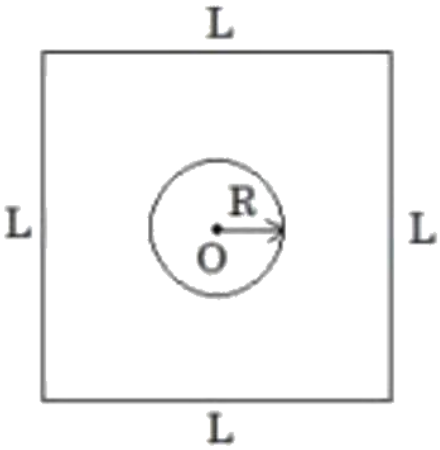
B. 1 mH

C. 2.5 mH

D. 4 mH

Question 201 View solution online

Find the mutual inductance in the arrangement, when a small circular loop of wire of radius ' R ' is placed inside a large square loop of wire of side ($L \gg R$). The loops are coplanar and their centers coincide :



A. $M = \frac{\sqrt{2}\mu_0 R^2}{L}$

B. $M = \frac{2\sqrt{2}\mu_0 R}{L^2}$

C. $M = \frac{\sqrt{2}\mu_0 R}{L^2}$

D. $M = \frac{2\sqrt{2}\mu_0 R^2}{L}$

Question 202 View solution online

A small square loop of side ' a ' and one turn is placed inside a larger square loop of side b and one turn ($b \gg a$). The two loops are coplanar with their centres coinciding. If a current I is passed in the square loop of side ' b ', then the coefficient of mutual inductance between the two loops is :

A. $\frac{\mu_0}{4\pi} 8\sqrt{2} \frac{a^2}{b}$

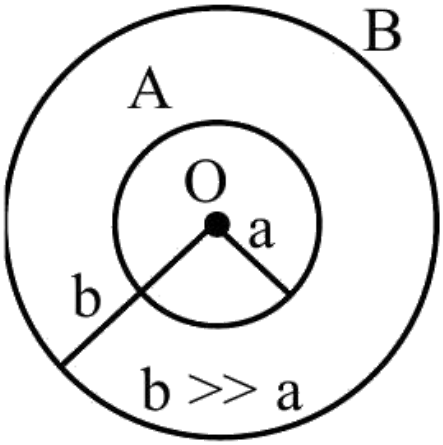
B. $\frac{\mu_0}{4\pi} \frac{8\sqrt{2}}{a}$

C. $\frac{\mu_0}{4\pi} 8\sqrt{2} \frac{\mathrm{b}^2}{\mathrm{a}}$

D. $\frac{\mu_0}{4\pi} \frac{8\sqrt{2}}{\mathrm{b}}$

Question 203 View solution online

Two conducting circular loops A and B are placed in the same plane with their centres coinciding as shown in figure. The mutual inductance between them is:



A. $\frac{\mu_0 \pi a^2}{2b}$

B. $\frac{\mu_0}{2\pi} \cdot \frac{b^2}{a}$

C. $\frac{\mu_0 \pi b^2}{2a}$

D. $\frac{\mu_0}{2\pi} \cdot \frac{a^2}{b}$

Question 204 View solution online

A small square loop of wire of side ℓ is placed inside a large square loop of wire of side L ($\mathbf{L} = \ell^2$). The loops are coplanar and their centers coinside. The value of the mutual inductance of the system is $\sqrt{\mathbf{x}} \times 10^{-7}\mathbf{H}$, where $\mathbf{x} =$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 205 View solution online

In a series LCR circuit, a resistor of 300Ω, a capacitor of 25 nF and an inductor of 100 mH are used. For maximum current in the circuit, the angular frequency of the ac source is $\times 10^4$ radians $\mathbf{s}^{-1}$.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 206 View solution online

Match List-I with List-II.

List-I	List-II
(A) $\oint \vec{B} \cdot \vec{dl} = \mu_0 i_c + \mu_0 \varepsilon_0 \frac{d\phi_E}{dt}$	(IV) Ampere–Maxwell law
(B) $\oint \vec{E} \cdot \vec{dl} = \frac{d\phi_B}{dt}$	(III) Faraday law
(C) $\oint \vec{E} \cdot \overrightarrow{dA} = \frac{Q}{\varepsilon_0}$	(I) Gauss' law for electricity
(D) $\oint \vec{B} \cdot \overrightarrow{dA} = 0$	(II) Gauss' law for magnetism

Choose the correct answer from the options given below:

A. A-IV, B-I, C-III, D-II

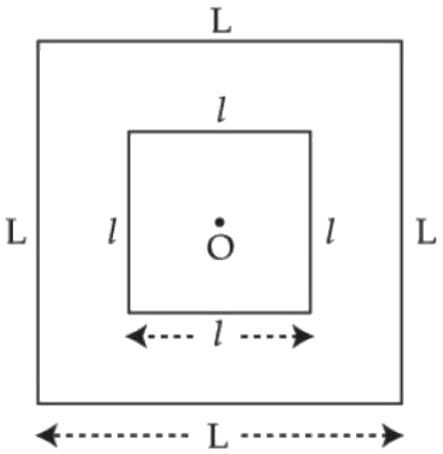
B. A-II, B-III, C-I, D-IV

C. A-IV, B-III, C-I, D-II

D. A-I, B-II, C-III, D-IV

Question 207 View solution online

A small square loop of wire of side l is placed inside a large square loop of wire $\mathbf{L}(\mathbf{L} \gg l)$. Both loops are coplanar and their centres coincide at point O as shown in figure. The mutual inductance of the system is :



A. $\frac{2\sqrt{2}\mu_0 \mathrm{L}^2}{\pi\ell}$

B. $\frac{\mu_0\ell^2}{2\sqrt{2}\pi \mathrm{L}}$

C. $\frac{2\sqrt{2}\mu_0\ell^2}{\pi \mathrm{L}}$

D. $\frac{\mu_0 \mathrm{L}^2}{2\sqrt{2}\pi\ell}$

Question 208 View solution online

Match List-I with List-II.

List-I	List-II
(A) Gauss's law of magnetostatics	(II) $\oint \vec{B} \cdot \vec{da} = 0$
(B) Faraday's law of electromagnetic induction	(III) $\oint \vec{E} \cdot \vec{dl} = -\frac{d}{dt} \int \vec{B} \cdot \vec{da}$
(C) Ampere's law	(IV) $\oint \vec{B} \cdot \vec{dl} = \mu_0 I$
(D) Gauss's law of electrostatics	(I) $\oint \vec{E} \cdot \vec{da} = \frac{1}{\varepsilon_0} \int \rho \, dV$

Choose the correct answer from the options given below:

A. A-I, B-III, C-IV, D-II

B. A-III, B-IV, C-I, D-II

C. A-IV, B-II, C-III, D-I

D. A-II, B-III, C-IV, D-I

Question 209 View solution online

Match List-I with List-II.

List-I	List-II
(a) Gauss's Law in Electrostatics	(i) $\oint \vec{E} \cdot d\vec{s} = \frac{q}{\epsilon_0}$
(b) Faraday's Law	(ii) $\oint \vec{E} \cdot d\vec{l} = -\frac{d\phi_B}{dt}$
(c) Gauss's Law in Magnetism	(iii) $\oint \vec{B} \cdot d\vec{A} = 0$
(d) Ampere-Maxwell Law	(iv) $\oint \vec{B} \cdot d\vec{l} = \mu_0 i_c + \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$

Choose the correct answer from the options given below:

A. A-IV, B-I, C-II, D-III

B. A-II, B-III, C-IV, D-I

C. A-III, B-IV, C-I, D-II

D. A-I, B-II, C-III, D-IV

Alternating Current

Questions 210-215 / 6 selected / 2.0% practice weight / Next

Topics to prioritise in this collection

- Series LCR resonance: 4 questions / 66.7% of this chapter
- AC circuits: 2 questions / 33.3% of this chapter

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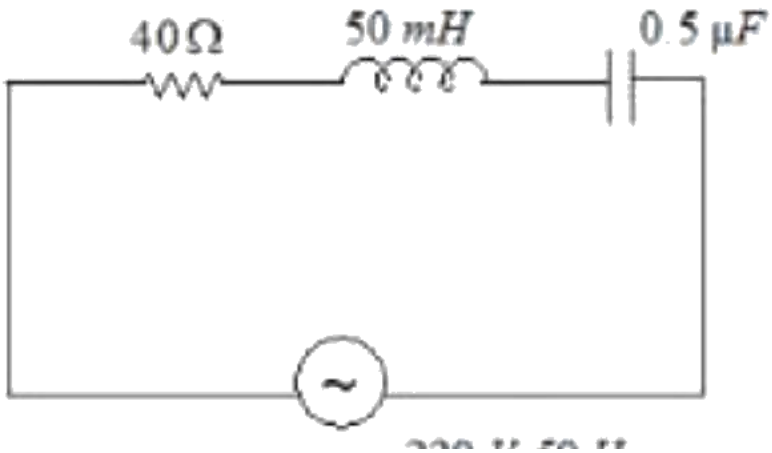
Question 210 View solution online

For the given figures, choose the correct options:(a)(b) $\mathbf{220\ V, 50\ Hz}$



A. At resonance, current in (b) is less than that in (a)

B. The rms current in circuit (b) can never be larger than that in (a)

C. The rms current in figure(a) is always equal to that in figure (b)

D. The rms current in circuit (b) can be larger than that in (a)

Question 211 View solution online

At a certain temperature, the degrees of freedom per molecule for gas is 8 . The gas performs 150 J of work when it expands under constant pressure. The amount of heat absorbed by the gas will be

J.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 212 View solution online

A series LCR circuit is subjected to an AC signal of $200\ V, 50\ Hz$. If the voltage across the inductor $(L = 10mH)$ is 31.4 V , then the current in this circuit is ..... :

A. 68 A

B. 63 A

C. 10 A

D. 10 mA

Question 213 View solution online

A LCR circuit is at resonance for a capacitor C , inductance L and resistance R . Now the value of resistance is halved keeping all other parameters same. The current amplitude at resonance will be now:

A. Zero

B. double

C. same

D. halved

Question 214 View solution online

Given below are two statements :Statement I: In an LCR series circuit, current is maximum at resonance.Statement II : Current in a purely resistive circuit can never be less than that in a series LCR circuit when connected to same voltage source.In the light of the above statements, choose the correct from the options given below :

A. Statement I is true but Statement II is false

B. Statement I is false but Statement II is true

C. Both Statement I and Statement II are true

D. Both Statement I and Statement II are false

Question 215 View solution online

A alternating current at any instant is given by $i = \left[6 + \sqrt{56}\sin\left(100\pi t + \frac{\pi}{3}\right)\right]$ A. The rms value of the current is A.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Electromagnetic Waves

Questions 216-219 / 4 selected / 1.3% practice weight / Consolidate

Topics to prioritise in this collection

- Electromagnetic spectrum: 2 questions / 50.0% of this chapter
- Electromagnetic waves: 2 questions / 50.0% of this chapter

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Question 216 View solution online

An antenna is mounted on a 400 m tall building. What will be the wavelength of signal of signal that can be radiated effectively by the transmission tower upto a range of 44 km ?

A. 37.8 m

B. 605 m

C. 75.6 m

D. 302 m

Question 217 View solution online

A plane electromagnetic wave with frequency of 30 MHz travels in free space. At particular point in space and time, electric field is $6\ \mathrm{V/m}$. The magnetic field at this point will be $x \times 10^{-8}\ \mathrm{T}$. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 218 View solution online

Match List I with List II of Electromagnetic waves with corresponding wavelength range :

List I
(A) Microwave
(B) Ultraviolet
(C) X-Ray
(D) Infra-red

List II

(I) 400 nm to 1 nm
(II) 1 nm to 10^{-3} nm
(III) 1 mn to 700 nm
(IV) 0.1 m to 1 mm

Choose the correct answer from the options given below :

A. -(I), (B)-(IV), (C)-(II), (D)-(III)

B. (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

C. (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

D. (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

Question 219 View solution online

A plane EM wave is propagating along x direction. It has a wavelength of 4 mm . If electric field is in y direction with the maximum magnitude of $60 \mathrm{Vm}^{-1}$, the equation for magnetic field is:

A. $\mathrm{B_z = 60 \sin\left[\frac{\pi}{2}\left(x - 3 \times 10^8 t\right)\right]\hat{k}T}$

B. $\mathrm{B_z = 2 \times 10^{-7} \sin\left[\frac{\pi}{2} \times 10^3\left(x - 3 \times 10^8 t\right)\right]\hat{k}T}$

C. $\mathrm{B_x = 60 \sin\left[\frac{\pi}{2}\left(x - 3 \times 10^8 t\right)\right]\hat{i}T}$

D. $\mathrm{B_z = 2 \times 10^{-7} \sin\left[\frac{\pi}{2}\left(x - 3 \times 10^8 t\right)\right]\hat{k}T}$

Ray Optics and Optical Instruments

Questions 220-246 / 27 selected / 9.0% practice weight / Focus first

Topics to prioritise in this collection

- Lens formula: 21 questions / 77.8% of this chapter
- Geometrical optics: 4 questions / 14.8% of this chapter
- Mirror formula: 1 question / 3.7% of this chapter
- Prism and dispersion: 1 question / 3.7% of this chapter

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Question 220 View solution online

A thin cylindrical rod of length 10 cm is placed horizontally on the principle axis of a concave mirror of focal length 20 cm . The rod is placed in a such a way that mid point of the rod is at 40 cm from the pole of mirror. The length of the image formed by the mirror will be $\frac{x}{3}$ cm. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 221 View solution online

A ray of light passing through a prism $(\mu = \sqrt{3})$ suffers minimum deviation. It is found that the angle of incidence is double the angle of refraction within the prism. Then, the angle of prism is ___ (in degrees)

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 222 View solution online

The diffraction pattern of a light of wavelength 400 nm diffracting from a slit of width 0.2 mm is focused on the focal plane of a convex lens of focal length 100 cm . The width of the 1st secondary maxima will be :

A. 2 mm

B. 2 cm

C. 0.02 mm

D. 0.2 mm

Question 223 View solution online

A thin plano convex lens made of glass of refractive index 1.5 is immersed in a liquid of refractive index 1.2. When the plane side of the lens is silver coated for complete reflection, the lens immersed in the liquid behaves like a concave mirror of focal length 0.2 m . The radius of curvature of the curved surface of the lens is :-

A. 0.15 m

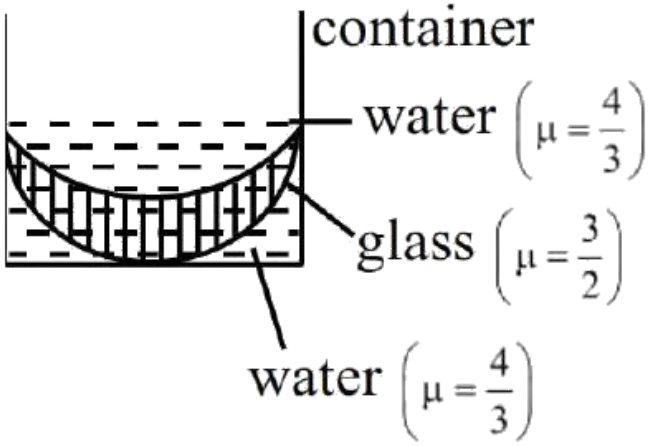
B. 0.10 m

C. 0.20 m

D. 0.25 m

Question 224 View solution online

In the diagram given below, there are three lenses formed. Considering negligible thickness of each of them as compared to $[R_1]$ and $[R_2]$, i.e., the radii of curvature for upper and lower surfaces of the glass lens, the power of the combination is



A. $-\frac{1}{6}\left(\frac{1}{|R_1|} + \frac{1}{|R_2|}\right)$

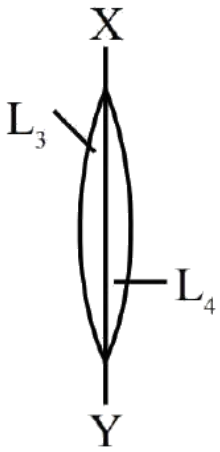
B. $-\frac{1}{6}\left(\frac{1}{|R_1|} - \frac{1}{|R_2|}\right)$

C. $\frac{1}{6}\left(\frac{1}{|R_1|} + \frac{1}{|R_2|}\right)$

D. $\frac{1}{6}\left(\frac{1}{|R_1|} - \frac{1}{|R_2|}\right)$

Question 225 View solution online

Two identical symmetric double convex lenses of focal length f are cut into two equal parts L_1, L_2 by AB plane and L_3, L_4 by XY plane as shown in figure respectively. The ratio of focal lengths of lenses L_1 and L_3 isOR



A. $1:4$

B. $1:1$

C. $2:1$

D. $1:2$

Question 226 View solution online

A plano-convex lens having radius of curvature of first surface 2 cm exhibits focal length of f_1 in air. Another plano-convex lens with first surface radius of curvature 3 cm has focal length of f_2 when it is immersed in a liquid of refractive index 1.2. If both the lenses are made of same glass of refractive index 1.5, the ratio of f_1 and f_2 will be :-

A. $3:5$

B. $1:3$

C. $1:2$

D. $2:3$

Question 227 View solution online

For the thin convex lens, the radii of curvature are at 15 cm and 30 cm respectively. The focal length the lens is 20 cm . The refractive index of the material is :

A. 1.2

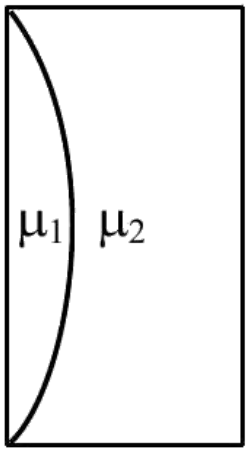
B. 1.4

C. 1.5

D. 1.8

Question 228 View solution online

Curved surfaces of a plano-convex lens of refractive index μ_1 and a plano-concave lens of refractive index μ_2 have equal radius of curvature as shown in figure. Find the ratio of radius of curvature to the focal length of the combined lenses.



A. $\frac{1}{\mu_2-\mu_1}$

B. $\mu_1-\mu_2$

C. $\frac{1}{\mu_1-\mu_2}$

D. $\mu_2-\mu_1$

Question 229 View solution online

A plano-convex lens (focal length f_2, refractive index μ_2, radius of curvature R) fits exactly into a plano-concave lens (focal length f_1, refractive index μ_1, radius of curvature R). Their plane surfaces are parallel to each other. Then, the focal length of the combination will be :

A. $f_1 - f_2$

B. $f_1 + f_2$

C. $\frac{R}{\mu_2 - \mu_1}$

D. $\frac{2f_1 f_2}{f_1 + f_2}$

Question 230 View solution online

A convex lens is put 10 cm from a light source and it makes a sharp image on a screen, kept 10 cm from the lens. Now a glass block (refractive index 1.5) of 1.5 cm thickness is placed in contact with the light source. To get the sharp image again, the screen is shifted by a distance d . Then d is :

A. 0.55 cm away from the lens

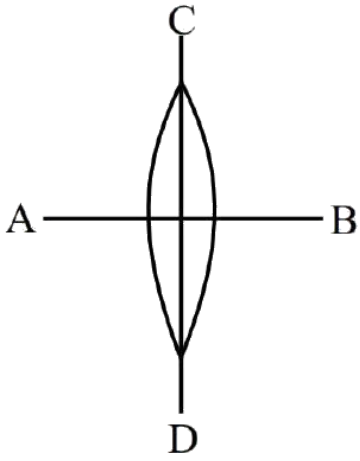
B. 1.1 cm away from the lens

C. 0.55 cm towards the lens

D. 0

Question 231 View solution online

A symmetric thin biconvex lens is cut into four equal parts by two planes AB and CD as shown in figure. If the power of original lens is 4D then the power of a part of the divided lens is



A. 8 D

B. 4 D

C. D

D. 2 D

Question 232 View solution online

A convex lens mode of glass (refractive index $= 1.5$) has focal length 24 cm in air. When it is totally immersed in water (refractive index $= \mathbf{1.33}$), its focal length changes to

A. 72 cm

B. 96 cm

C. 24 cm

D. 48 cm

Question 233 View solution online

The thickness at the centre of a plano convex lens is 3 mm and the diameter is 6 cm . If the speed of light in the material of the lens is $\mathbf{2 \times 10^8\ ms^{-1}}$. The focal length of the lens is..... .

A. 0.30 cm

B. 15 cm

C. 1.5 cm

D. 30 cm

Question 234 View solution online

In a long glass tube, mixture of two liquids A and B with refractive indices 1.3 and 1.4 respectively, forms a convex refractive meniscus towards A . If an object placed at 13 cm from the vertex of the meniscus in A forms an image with a magnification of ' -2 ' then the radius of curvature of meniscus is :

A. 1 cm

B. $\frac{1}{3}$ cm

C. $\frac{2}{3}$ cm

D. $\frac{4}{3}$ cm

Question 235 View solution online

A plano convex lens of refractive index μ_1 and focal length f_1 is kept in contact with another plano concave lens of refractive index μ_2 and focal length f_2. If the radius of curvature of their spherical faces is R each and $f_1 = 2f_2$, then μ_1 and μ_2 are related as :

A. $\mu_1 + \mu_2 = 3$

B. $2\mu_1 - \mu_2 = 1$

C. $2\mu_2 - \mu_1 = 1$

D. $3\mu_2 - 2\mu_1 = 1$

Question 236 View solution online

A monochromatic light of wavelength $6000\text{\AA}$ is incident on the single slit of width 0.01 mm . If the diffraction pattern is formed at the focus of the convex lens of focal length 20 cm , the linear width of the central maximum is :

A. 60 mm

B. 24 mm

C. 120 mm

D. 12 mm

Question 237 View solution online

Given is a thin convex lens of glass (refractive index μ) and each side having radius of curvature R. One side is polished for complete reflection. At what distance from the lens, an object be placed on the optic axis so that the image gets formed on the object itself.

A. R/μ

B. $R/(2\mu - 3)$

C. $\mu \mathrm{R}$

D. $R/(2\mu - 1)$

Question 238 View solution online

A convex lens of refractive index 1.5 and focal length 18 cm in air is immersed in water. The change in focal length of the lens will be cm
(Given refractive index of water $= \frac{4}{3}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 239 View solution online

The power of a lens (biconvex) is $1.25\ \mathrm{m}^{-1}$ in particular medium. Refractive index of the lens is 1.5 and radii of curvature are 20 cm and 40 cm respectively. The refractive index of surrounding medium :

A. 1.0

B. $\frac{9}{7}$

C. $\frac{3}{2}$

D. $\frac{4}{3}$

Question 240 View solution online

A thin prism P_1 with angle $4°$ made of glass having refractive index 1.54, is combined with another thin prism $\mathbf{P_2}$ made of glass having refractive index 1.72 to get dispersion without deviation. The angle of the prism $\mathbf{P_2}$ in degrees is

A. 4

B. 3

C. $16/3$

D. 1.5

Question 241 View solution online

The refractive index of a converging lens is 1.4. What will be the focal length of this lens if it is placed in a medium of same refractive index ? (Assume the radii of curvature of the faces of lens are R_1 and R_2 respectively)

A. 1

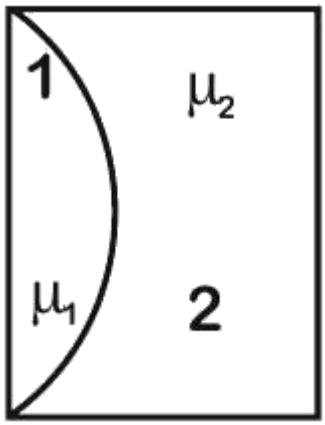
B. Infinite

C. $\frac{R_1R_2}{R_1-R_2}$

D. Zero

Question 242 View solution online

One plano-convex and one plano-concave lens of same radius of curvature ' R ' but of different materials are joined side by side as shown in the figure. If the refractive index of the material of 1 is μ_1 and that of 2 is μ_2, then the focal length of the combination is :



A. $\frac{R}{2(\mu_1-\mu_2)}$

B. $\frac{R}{2-(\mu_1-\mu_2)}$

C. $\frac{R}{\mu_1-\mu_2}$

D. $\frac{2R}{\mu_1-\mu_2}$

Question 243 View solution online

When a beam of white light is allowed to pass through convex lens parallel to principal axis, the different colours of light converge at different point on the principle axis after refraction. This is called:

A. Spherical aberration

B. Polarisation

C. Chromatic aberration

D. Scattering

Question 244 View solution online

A convex lens of focal length 40 cm forms an image of an extended source of light on a photoelectric cell. A current I is produced. The lens is replaced by another convex lens having the same diameter but focal length 20 cm . The photoelectric current now is :

A. $\frac{I}{2}$

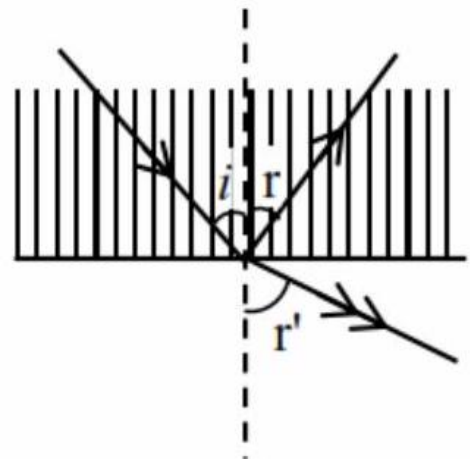
B. 4 I

C. 2 I

D. I

Question 245 View solution online

A ray of light passes from a denser medium to a rarer medium at an angle of incidence i. The reflected and refracted rays make an angle of 90° with each other. The angle of reflection and refraction are respectively r and r'. The critical angle is given by :



A. $\sin^{-1}(\cot r)$

B. $\tan^{-1}(\sin i)$

C. $\sin^{-1}(\tan r')$

D. $\sin^{-1}(\tan r)$

Question 246 View solution online

An effective power of a combination of 5 identical convex lenses which are kept in contact along the principal axis is 25 D . Focal length of each of the convex lens is :

A. 20 cm

B. 50 cm

C. 500 cm

D. 25 cm

Wave Optics

Questions 247-276 / 30 selected / 10.0% practice weight / Focus first

Topics to prioritise in this collection

- Young's double-slit interference: 24 questions / 80.0% of this chapter
- Interference of light: 2 questions / 6.7% of this chapter
- Wave Optics: 2 questions / 6.7% of this chapter
- Single-slit diffraction: 1 question / 3.3% of this chapter
- Young double-slit interference: 1 question / 3.3% of this chapter

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Question 247 View solution online

In YDSE path difference at a point on the screen is 8λ. Find ratio of intensity at this point with maximum intensity.

A. 0.533

B. 0.853

C. 0.234

D. 0.123

Question 248 View solution online

A single slit of width a is illuminated by a monochromatic light of wavelength 600 nm . The value of 'a' for which first minimum appears at $\theta = 30^\circ$ on the screen will be :

A. $0.6\mu\,\mathrm{m}$

B. $1.2\mu\,\mathrm{m}$

C. $1.8\mu\,\mathrm{m}$

D. $3\mu\,\mathrm{m}$

Question 249 View solution online

Young's double slit interference apparatus is immersed in a liquid of refractive index 1.44. It has slit separation of 1.5 mm . The slits are illuminated by a parallel beam of light whose wavelength in air is 690 nm . The fringe-width on a screen placed behind the plane of slits at a distance of 0.72 m , will be :

A. 0.23 mm

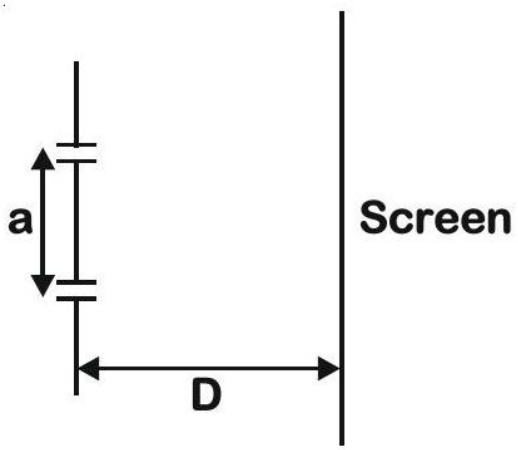
B. 0.33 mm

C. 0.63 mm

D. 0.46 mm

Question 250 View solution online

The figure shows a Young's double slit experimental setup. It is observed that when a thin transparent sheet of thickness t and refractive index μ is put in front of one of the slits, the central maximum gets shifted by a distance equal to n fringe widths. If the wavelength of light used is λ, t will be



A. $\frac{n\lambda}{\mu-1}$

B. $\frac{2D\lambda}{a(\mu-1)}$

C. $\frac{nD\lambda}{a(\mu-1)}$

D. $\frac{D\lambda}{a(\mu-1)}$

The original exam question had no correct option and was marked BONUS. For this corrected practice version, option 1 has been replaced with the correct value; the original statement and the other three options are retained.

Question 251 View solution online

In a double slit experiment, when a thin film of thickness t having refractive index μ is introduced in front of one of the slits, the maximum at the centre of the fringe pattern shifts by one fringe width. The value of t is (λ is the wavelength of the light used) :

A. $\frac{2\lambda}{(\mu-1)}$

B. $\frac{\lambda}{2(\mu-1)}$

C. $\frac{\lambda}{(2\mu-1)}$

D. $\frac{\lambda}{(\mu-1)}$

Question 252 View solution online

In Young's double slit experiment, light from two identical sources are superimposing on a screen. The path difference between the two lights reaching at a point on the screen is $\frac{7\lambda}{4}$. The ratio of intensity of fringe at this point with respect to the maximum intensity of the fringe is :

A. $1/2$

B. $3/4$

C. $1/3$

D. $1/4$

Question 253 View solution online

The Young's double slit interference experiment is performed using light consisting of 480 nm and 600 nm wavelengths to form interference patterns. The least number of the bright fringes of 480 nm light that are required for the first coincidence with the bright fringes formed by 600 nm light is :-

A. 4

B. 8

C. 6

D. 5

Question 254 View solution online

In young's double slit experiment, the fringe width is 12 mm . If the entire arrangement is placed in water of refractive index $\frac{4}{3}$, then the fringe width becomes (in mm)

A. 16

B. 9

C. 48

D. 12

Question 255 View solution online

The width of fringe is 2 mm on the screen in a double slits experiment for the light of wavelength of 400 nm . The width of the fringe for the light of wavelength 600 nm will be:

A. 4 mm

B. 1.33 mm

C. 3 mm

D. 2 mm

Question 256 View solution online

Interference fringes are observed on a screen by illuminating two thin slits 1 mm apart with a light source ($\lambda = 632.8\ \mathrm{nm}$). The distance between the screen and the slits is 100 cm . If a bright fringe is observed on screen at a distance of 1.27 mm from the central bright fringe, then the path difference between the waves, which are reaching this point from the slits is close to:

A. $2.05\mu\ \mathrm{m}$

B. 2.87 nm

C. 2 nm

D. $1.27\mu\ \mathrm{m}$

Question 257 View solution online

Using Young's double slit experiment, a monochromatic light of wavelength $5000\AA$ produces fringes of fringe width 0.5 mm . If another monochromatic light of wavelength $6000\AA$ is used and the separation between the slits is doubled, then the new fringe width will be :

A. 0.5 mm

B. 1.0 mm

C. 0.6 mm

D. 0.3 mm

Question 258 View solution online

In a double-slit experiment, green light ($5303\AA$) falls on a double slit having a separation of $19.44\mu\,\mathrm{m}$ and a width of $4.05\mu\,\mathrm{m}$. The number of bright fringes between the first and the second diffraction minima is :-

A. 09

B. 10

C. 04

D. 05

Question 259 View solution online

In a Young's double slit experiment, 16 fringes are observed in a certain segment of the screen when light of wavelength 700 nm is used. If the wavelength of light is changed to 400 nm , the number of fringes observed in the same segment of the screen would be:

A. 28

B. 24

C. 30

D. 18

Question 260 View solution online

In young's double slit experiment performed using a monochromatic light of wavelength λ, when a glass plate $(\mu = 1.5)$ of thickness $x\lambda$ is introduced in the path of the one of the interfering beams, the intensity at the position where the central maximum occurred previously remains unchanged. The value of x will be:

A. 3

B. 2

C. 1.5

D. 0.5

Question 261 View solution online

In a Young's double slit experiment, light of 500 nm is used to produce an interference pattern. When the distance between the slits is 0.05 mm , the angular width (in degree) of the fringes formed on the distance screen is close to :

A. 0.17°

B. 0.07°

C. 0.57°

D. 1.7°

Question 262 View solution online

In a Young's double slit experiment with slit separation 0.1 mm , one observes a bright fringe at angle $\frac{1}{40}$ rad by using light of wavelength λ_1. When the light of wavelength λ_2 is used a bright fringe is seen at the same angle in the same set up. Given that λ_1 and λ_2 are in visible range (380 nm to 740 nm), their values are :

A. $380\ \text{nm}, 500\ \text{nm}$

B. $625\ \text{nm}, 500\ \text{nm}$

C. $380\ \text{nm}, 525\ \text{nm}$

D. $400\ \text{nm}, 500\ \text{nm}$

Question 263 View solution online

In a Young's double slit experiment, the ratio of the slit's width is $4:1$. The ratio of the intensity of maxima to minima, close to the central fringe on the screen, will be :

A. $(\sqrt{3}+1)^4:16$

B. $4:1$

C. $25:9$

D. $9:1$

Question 264 View solution online

In Young's double slit arrangement, slits are separated by a gap of 0.5 mm , and the screen is placed at a distance of 0.5 m from them. The distance between the first and the third bright fringe formed when the slits are illuminated by a monochromatic light of $5890\AA$ is :-

A. $1178\times10^{-9}\ \mathrm{m}$

B. $1178\times10^{-6}\ \mathrm{m}$

C. $1178\times10^{-12}\ \mathrm{m}$

D. $5890\times10^{-7}\ \mathrm{m}$

Question 265 View solution online

The width of one of the two slits in a Young's double slit experiment is 4 times that of the other slit. The ratio of the maximum of the minimum intensity in the interference pattern is :

A. $9:1$

B. $16:1$

C. $1:1$

D. $4:1$

Question 266 View solution online

In a Young's double slit experiment, the slits are placed 0.320 mm apart. Light of wavelength $\lambda = 500\ \text{nm}$ is incident on the slits. The total number of bright fringes that are observed in the angular range $-30° \leq \theta \leq 30°$ is:

A. 320

B. 641

C. 321

D. 640

Question 267 View solution online

The width of one of the two slits in a Young's double slit experiment is three times the other slit. If the amplitude of the light coming from a slit is proportional to the slit-width, the ratio of minimum to maximum intensity in the interference pattern is x : 4 where x is ___.

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 268 View solution online

In a Young's double slit experiment, the path different, at a certain point on the screen, between two interfering waves is $\frac{1}{8}$ th of wavelength. The ratio of the intensity at this point to that at the centre of a brigth fringe is close to :

A. 0.94

B. 0.74

C. 0.85

D. 0.80

Question 269 View solution online

The width of one of the two slits in Young's double slit experiment is d while that of the other slit is xd . If the ratio of the maximum to the minimum intensity in the interference pattern on the screen is $9:4$ then what is the value of x ?(Assume that the field strength varies according to the slit width.)

A. 2

B. 3

C. 5

D. 4

Question 270 View solution online

In YDSE, separation between slits is 0.15 mm , distance between slits and screen is 1.5 m and wavelength of light is 589 nm . Then, fringe width is

A. 5.9 mm

B. 3.9 mm

C. $1.9\ \text{mm}$

D. 2.3 mm

Question 271 View solution online

In a Young's double slit experiment two slits are separated by 2 mm and the screen is placed one meter away. When a light of wavelength 500 nm is used, the fringe separation will be :

A. 0.75 mm

B. 0.50 mm

C. 1 mm

D. 0.25 mm

Question 272 View solution online

In the Young's double slit experiment, the distance between the slits varies in time as $d(t) = d_0 + a_0 \sin \omega t$; where d_0, ω and a_0 are constants. The difference between the largest fringe width and the smallest fringe width obtained over time is given as :

A. $\frac{2\lambda D(d_0)}{(d_0^2 - a_0^2)}$

B. $\frac{2\lambda D a_0}{(d_0^2 - a_0^2)}$

C. $\frac{\lambda D}{d_0^2} a_0$

D. $\frac{\lambda D}{d_0 + a_0}$

Question 273 View solution online

In a Young's double slit experiment, the width ofthe one of the slit is three times the other slit. The amplitude of the light coming from a slit is proportional to the slit-width. Find the ratio of the maximum to the minimum intensity in the interference pattern.

A. 4:1

B. 2:1

C. 3:1

D. $1:4$

Question 274 View solution online

In Young's double slits experiment, the position of 5th bright fringe from the central maximum is 5 cm . The distance between slits and screen is 1 m and wavelength of used monochromatic light is 600 nm . The separation between the slits is:

A. 48μ m

B. 36μ m

C. 12μ m

D. 60μ m

Question 275 View solution online

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).Assertion (A) : If Young's double slit experiment is performed in an optically denser medium than air, then the consecutive fringes come closer.Reason (R) : The speed of light reduces in an optically denser medium than air while its frequency does not change.In the light of the above statements, choose the most appropriate answer from the options given below:

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. (A) is false but (R) is true.

C. Both (A) and (R) are true but (R) is not the correct explanation of (A)

D. (A) is true but (R) is false.

Question 276 View solution online

Given below are two statements. On is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : In Young's double slit experiment, the fringes produced by red light are closer as compared to those produced by blue light.Reason (R) : The fringe width is directly proportional to the wavelength of light.In the light of above statements, choose the correct answer from the options given below :

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. (A) is false but (R) is true.

C. Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

D. (A) is true but (R) is false.

Dual Nature of Radiation and Matter

Questions 277-290 / 14 selected / 4.7% practice weight / Focus first

Topics to prioritise in this collection

- Photoelectric equation: 6 questions / 42.9% of this chapter
- de Broglie wavelength: 3 questions / 21.4% of this chapter
- Dual Nature of Radiation and Matter: 2 questions / 14.3% of this chapter
- Photon absorption and emission: 1 question / 7.1% of this chapter
- Photon energy and momentum: 1 question / 7.1% of this chapter
- Quantum nature of radiation: 1 question / 7.1% of this chapter

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Question 277 View solution online

A light beam of wavelength 500 nm is incident on a metal having work function of 1.25 eV, placed in a magnetic field of intensity B. The electrons emitted perpendicular to the magnetic field B, with maximum kinetic energy are bent into circular arc of radius 30 cm. The value of B is ___ $\times 10^{-7}$ T

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 278 View solution online

A metal plate of area $1 \times 10^{-4}\ m^2$ is illuminated by a radiation of intensity $16\ mW/m^2$. The work function of the metal is 5 eV . The energy of the incident photons is 10 eV and only 10% of it produces photo electrons. The number of emitted photo electrons per second and their maximum energy, respectively, will be : $\left[1eV = 1.6 \times 10^{-19}\ J\right]$

A. 10^{10} and 5 eV

B. 10^{14} and 10 eV

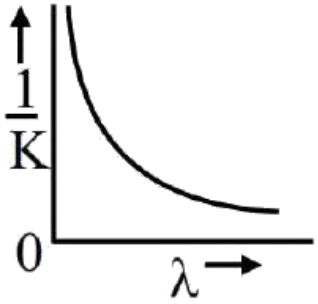
C. 10^{12} and 5 eV

D. 10^{11} and 5 eV

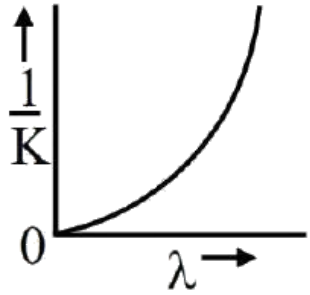
Question 279 View solution online

If λ and K are de Broglie Wavelength and kinetic energy, respectively, of a particle with constant mass. The correct graphical representation for the particle will be :-

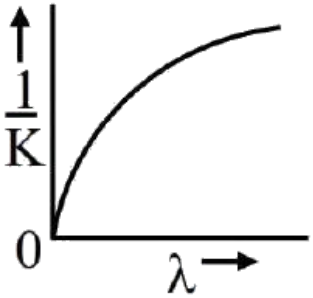
A.



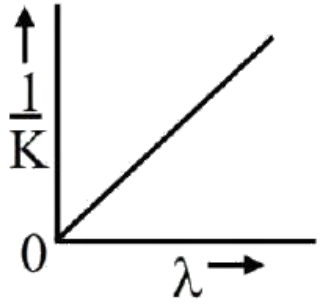
B.



C.



D.



Question 280 View solution online

Two photons of energy 4 eV and 4.5 eV are incident on two metals A and B respectively. The maximum kinetic energy for an ejected electron is T_A for A, and $T_B = T_A - 1.5\text{eV}$ for the metal B. The relation between the de-Broglie wavelengths of the ejected electron of A and B are $\lambda_B = 2\lambda_B$. The work function of the metal B is

A. 3 eV

B. 1.5 eV

C. 4.5 eV

D. 4 eV

Question 281 View solution online

Two stream of photons, possessing energies equal to twice and ten times the work function of metal are incident on the metal surface successively. The value of ratio of maximum velocities of the photoelectrons emitted in the two respective cases is $x : y$. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 282 View solution online

When light of frequency twice the threshold frequency is incident on the metal plate, the maximum velocity of emitted election is v_1. When the frequency of incident radiation is increased to five times the threshold value, the maximum velocity of emitted electron becomes v_2. If $v_2 = x\, v_1$, the value of x will be .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 283 View solution online

A parallel beam of light of wavelength 900 nm and intensity $100 Wm^{-2}$ is incident on a surface perpendicular to the beam. Tire number of photons crossing $1\ cm^2$ area perpendicular to the beam in one second is :

A. 3×10^{16}

B. 4.5×10^{16}

C. 4.5×10^{17}

D. 4.5×10^{20}

Question 284 View solution online

An atom absorbs a photon of wavelength 500 nm and emits another photon of wavelength 600 nm . The net energy absorbed by the atom in this process is $n \times 10^{-4} eV$. The value of n is .
[Assume the atom to be stationary during the absorption and emission process]
(Take $h = 6.6 \times 10^{-34} Js$ and $c = 3 \times 10^8\ m/s$).

Numerical answer: _____

Enter the requested value or coefficient rounded to the nearest integer (0 decimal places).

Question 285 View solution online

The de Broglie wavelength of an electron having kinetic energy E is λ. If the kinetic energy of electron becomes $\frac{E}{4}$, then its de-Broglie wavelength will be :

A. $\frac{\lambda}{\sqrt{2}}$

B. $\frac{\lambda}{2}$

C. 2λ

D. $\sqrt{2}\lambda$

Question 286 View solution online

The kinetic energy of an electron, α-particle and a proton are given as $4\ \mathrm{K}, 2\ \mathrm{K}$ and K respectively. The de-Broglie wavelength associated with electron (λ e) α-particle ($\lambda\alpha$) and the proton (λ p) are as follows :

A. $\lambda\alpha = \lambda\mathrm{p} < \lambda\mathrm{e}$

B. $\lambda\alpha > \lambda p > \lambda e$

C. $\lambda\alpha < \lambda\mathrm{p} < \lambda\mathrm{e}$

D. $\lambda\alpha = \lambda p > \lambda e$

Question 287 View solution online

When UV light of wavelength 300 nm is incident on the metal surface having work function 2.13 eV , electron emission takes place. The stopping potential is : (Given hc $= 1240\mathrm{eVnm}$)

A. 4 V

B. 4.1 V

C. 2 V

D. 1.5 V

Question 288 View solution online

In photoelectric effect an em-wave is incident on a metal surface and electrons are ejected from the surface. If the work function of the metal is 2.14 eV and stopping potential is 2 V , what is the wavelength of the em-wave?(Given hc $= 1242\mathrm{eVnm}$ where h is the Planck's constant and c is the speed of light in vaccum.)

A. 400 nm

B. 600 nm

C. 200 nm

D. 300 nm

Question 289 View solution online

UV light of 4.13 eV is incident on a photosensitive metal surface having work function 3.13 eV . The maximum kinetic energy of ejected photoelectrons will be :

A. 4.13 eV

B. 1 eV

C. 3.13 eV

D. 7.26 eV

Question 290 View solution online

The stopping potential for electrons emitted from a photosensitive surface illuminated by light of wavelength 491 nm is 0.710 V . When the incident wavelength is changed to a new value, the stopping potential is 1.43 V . The new wavelength is:

A. 400 NM

B. 382 nm

C. 309 nm

D. 329 nm

Atoms

Questions 291-291 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Excitation and ionisation energy: 1 question / 100.0% of this chapter

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Question 291 View solution online

Find the ratio of energies of photons produced due to transition of an election of hydrogen atom from its(i) second permitted energy level to the first level, and (ii) the highest permitted energy level to the first permitted level.

A. $3:4$

B. $4:3$

C. $1:4$

D. $4:1$

Nuclei

Questions 292-293 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

- Nuclear fission: 1 question / 50.0% of this chapter
- Radioactive decay law: 1 question / 50.0% of this chapter

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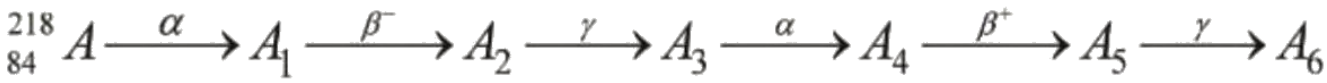
Question 292 View solution online

Consider the following radioactive decay processThe mass number and the atomic number of $\mathbf{A_6}$ are given by:



A. 210 and 84

B. 210 and 82

C. 211 and 80

D. 210 and 80

Question 293 View solution online

The energy released in the fusion of 2 kg of hydrogen deep in the sun is $\mathbf{E_H}$ and the energy released in the fission of 2 kg of $^{235}\mathbf{U}$ is $\mathbf{E_U}$. The ratio $\frac{\mathbf{E_H}}{\mathbf{E_U}}$ is approximately :(Consider the fusion reaction as $\mathbf{4^1_1H + 2e^- \rightarrow {}^4_2He + 2v + 6\gamma + 26.7MeV}$, energy released in the fission reaction of $^{235}\mathbf{U}$ is 200 MeV per fission nucleus and $\mathbf{N_A = 6.023 \times 10^{23}}$)

A. 9.13

B. 15.04

C. 7.62

D. 25.6

Semiconductor Electronics: Materials, Devices and Simple Circuits

Questions 294-297 / 4 selected / 1.3% practice weight / Consolidate

Topics to prioritise in this collection

- Logic gates: 2 questions / 50.0% of this chapter
- Electronic circuits and logic gates: 1 question / 25.0% of this chapter
- Semiconductor devices: 1 question / 25.0% of this chapter

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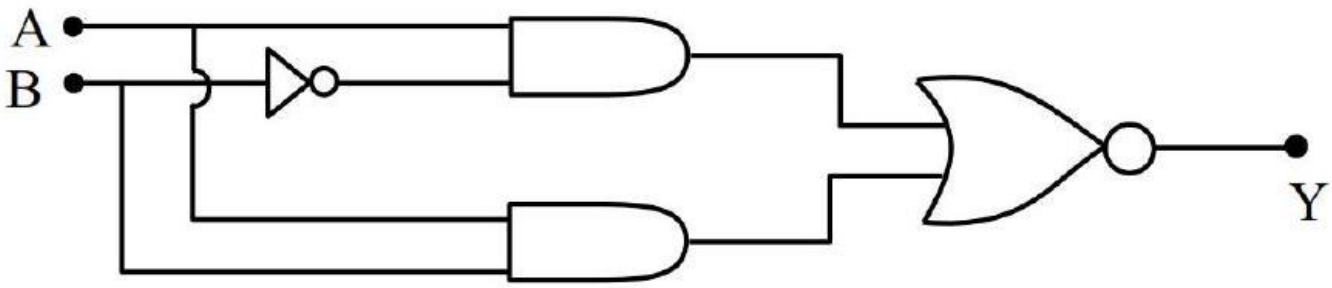
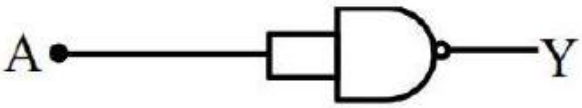
Question 294

View solution online

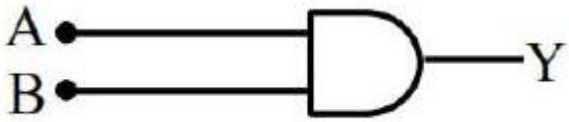
Which of the following circuits has the same output as that of the given circuit?



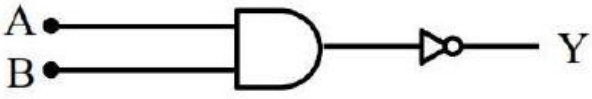
A.



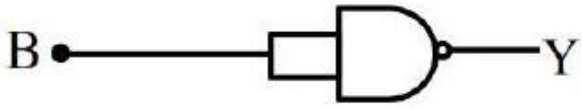
B.



C.



D.



(3)

Question 295 View solution online

The radii of two planets ' A ' and ' B ' are ' R ' and ' 4 R ' and their densities are ρ and $\rho/3$ respectively. The ratio of acceleration due to gravity at their surfaces $(g_A : g_B)$ will be :

A. $1 : 16$

B. $3 : 16$

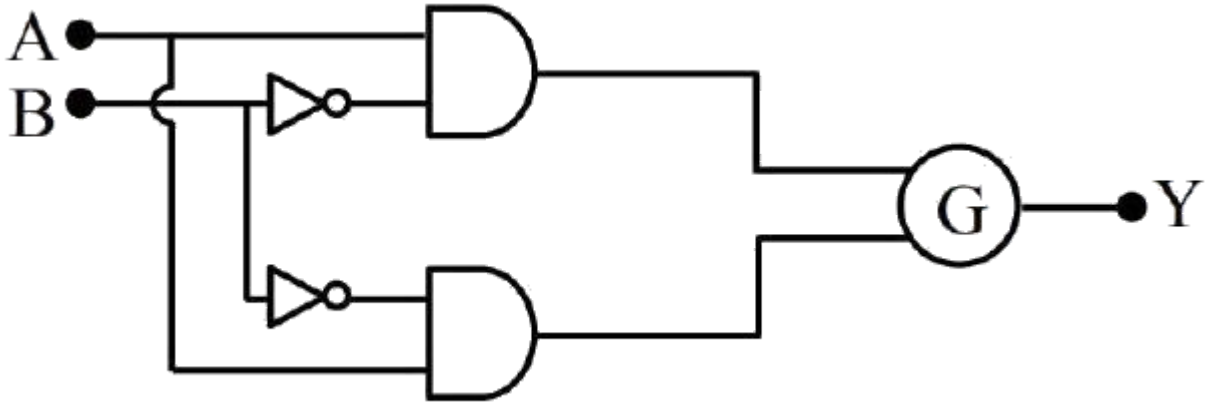
C. $3 : 4$

D. $4 : 3$

Question 296 View solution online

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

To obtain the given truth table, the following logic gate should be placed at G:



A. NOR Gate

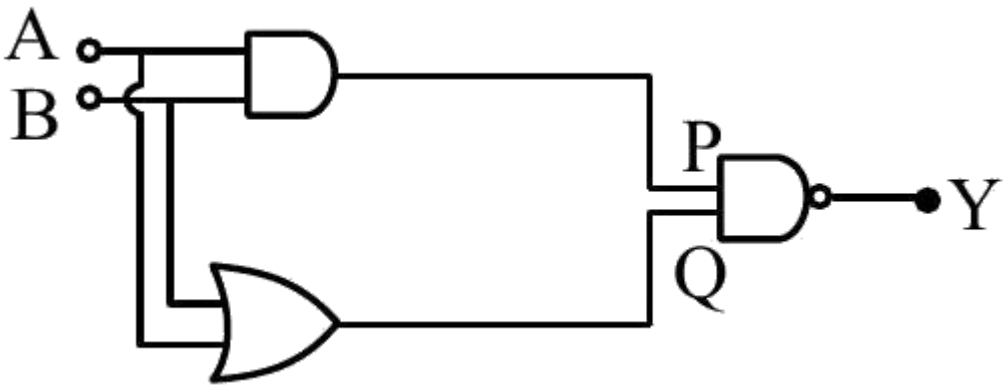
B. AND Gate

C. NAND Gate

D. OR Gate

Question 297 View solution online

In the following logic circuit the sequence of the inputs A, B are $(0,0),(0,1),(1,0)$ and $(1,1)$. The output Y for this sequence will be :



A. $1,0,1,0$

B. $0,1,0,1$

C. $1,1,1,0$

D. $0,0,1,1$

Communication Systems

Questions 298-300 / 3 selected / 1.0% practice weight / Historical appendix

Topics to prioritise in this collection

- Communication systems: 2 questions / 66.7% of this chapter
- Amplitude modulation: 1 question / 33.3% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 298 View solution online

A carrier wave with amplitude of 250 V is amplitude modulated by a sinusoidal base band signal of amplitude 150 V. The ratio of minimum amplitude to maximum amplitude for the amplitude modulated wave is 50 : x, then value of x is ___

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 299 View solution online

The maximum and minimum amplitude of an amplitude modulated wave is 16 V and 8 V respectively. The modulation index for this amplitude modulated wave is $x \times 10^{-2}$. The value of x is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 300 View solution online

The maximum and minimum voltage of an amplitude modulated signal are 60 V and 20 V respectively. The percentage modulation index will be :

A. 0.5%

B. 50%

C. 2%

D. 30%

QUICK CHECK

Answer key

For numerical questions the stored answer value is shown. Follow the question's precision and units.

1. C	**2.** C	**3.** C	**4.** B	**5.** 400
6. 5	**7.** A	**8.** B	**9.** 20	**10.** D
11. 5	**12.** C	**13.** B	**14.** 100	**15.** 700
16. B	**17.** A	**18.** 4	**19.** 120	**20.** C
21. C	**22.** C	**23.** A	**24.** B	**25.** C
26. 150	**27.** 90	**28.** 12	**29.** 346	**30.** D
31. 3	**32.** 20	**33.** B	**34.** 50	**35.** 10
36. 11	**37.** 2	**38.** A	**39.** A	**40.** 24
41. 18	**42.** 6	**43.** D	**44.** D	**45.** C
46. C	**47.** A	**48.** B	**49.** D	**50.** 40
51. D	**52.** C	**53.** 5	**54.** 4	**55.** B
56. A	**57.** 6	**58.** 30	**59.** A	**60.** B
61. 50	**62.** 5	**63.** A	**64.** D	**65.** 25
66. 3	**67.** 15	**68.** A	**69.** 5	**70.** 200
71. B	**72.** 10	**73.** A	**74.** 12	**75.** 540
76. B	**77.** D	**78.** C	**79.** 25	**80.** 480
81. A	**82.** C	**83.** D	**84.** B	**85.** A
86. B	**87.** 1400	**88.** B	**89.** B	**90.** B
91. A	**92.** 500	**93.** C	**94.** C	**95.** B
96. B	**97.** C	**98.** D	**99.** B	**100.** A
101. D	**102.** B	**103.** 16	**104.** 10	**105.** 11
106. 5	**107.** 3	**108.** 600	**109.** 4	**110.** 750
111. 4	**112.** 3	**113.** 9	**114.** 630	**115.** 10
116. 600	**117.** 30	**118.** 462	**119.** 2	**120.** 125
121. 450	**122.** 4	**123.** 0.2	**124.** 2	**125.** 300
126. 144	**127.** 275	**128.** 20	**129.** B	**130.** 2
131. B	**132.** 6	**133.** 45	**134.** 2	**135.** C
136. D	**137.** 1320	**138.** 50	**139.** 22	**140.** D
141. 2500	**142.** 12	**143.** 30	**144.** 3	**145.** 70
146. 2	**147.** A	**148.** C	**149.** 1	**150.** 10

151. D **152.** 30 **153.** C **154.** 20 **155.** 1

156. 3 **157.** 6 **158.** D **159.** 9 **160.** 1.5

161. 60 **162.** 18 **163.** 32 **164.** 975 **165.** B

166. B **167.** 10 **168.** A **169.** A **170.** A

171. 2 **172.** B **173.** C **174.** 88 **175.** 100

176. 2 **177.** 60 **178.** C **179.** 50 **180.** A

181. 628 **182.** 40 **183.** 8 **184.** C **185.** B

186. 10 **187.** B **188.** 2 **189.** C **190.** D

191. D **192.** 10 **193.** A **194.** 50 **195.** 44

196. 250 **197.** 10 **198.** 10 **199.** 4 **200.** A

201. D **202.** A **203.** A **204.** 128 **205.** 2

206. C **207.** C **208.** D **209.** A **210.** B

211. 750 **212.** C **213.** B **214.** C **215.** 8

216. B **217.** 2 **218.** B **219.** B **220.** 32

221. 60 **222.** A **223.** B **224.** B **225.** D

226. B **227.** C **228.** B **229.** C **230.** A

231. D **232.** B **233.** D **234.** C **235.** B

236. B **237.** D **238.** 54 **239.** B **240.** B

241. B **242.** C **243.** C **244.** D **245.** D

246. A **247.** B **248.** B **249.** A **250.** A

251. D **252.** A **253.** D **254.** B **255.** C

256. D **257.** D **258.** D **259.** A **260.** B

261. C **262.** B **263.** D **264.** B **265.** A

266. B **267.** 1 **268.** C **269.** C **270.** A

271. D **272.** B **273.** A **274.** D **275.** A

276. B **277.** 125 **278.** D **279.** B **280.** D

281. 1 **282.** 2 **283.** B **284.** 4125 **285.** C

286. C **287.** C **288.** D **289.** B **290.** B

291. A **292.** D **293.** C **294.** A **295.** C

296. A **297.** C **298.** 200 **299.** 33 **300.** B

LEARNE2I / PRIORITY PRACTICE

JEE Main 2025 Session 2

Chemistry
Chapter-wise practice collection

300 questions / NCERT chapter navigation
Chapter and topic priority guide, followed by questions and an answer key.

Start with the priority guide, then practise chapter by chapter. Enter a numerical value where no options are given; follow the units and precision specified in the question.

Solutions on your phone

Scan to choose a chapter or question. You can also download all three solutions PDFs together.

learne2i.com/jee-main/revision-archive/2025-session-2/

Open the PDF bookmarks panel on the left to jump between chapters. The chapter links in the guide are clickable too.

YOUR PRACTICE ROADMAP

Chapter & topic priorities

For this Session 2 collection, begin with **Hydrocarbons; Equilibrium; Alcohols, Phenols and Ethers**. These chapters have the largest share of the selected questions.

Practice weight = questions selected from a chapter / 300. Topic percentages use that chapter's question count. These are practice priorities from the prediction output, not guaranteed exam marks or probabilities.

NCERT chapter / leading topics	Priority	Questions	Weight
Some Basic Concepts of Chemistry Mole concept and stoichiometry: 10 (76.9%) / Empirical and molecular formula: 1 (7.7%) / Mole calculations and concentrations: 1 (7.7%) / More topics in chapter guide	Focus first	1-13 (13)	4.3%
Classification of Elements and Periodicity in Properties Classification of Elements and Periodicity in Properties: 2 (100.0%)	Consolidate	14-15 (2)	0.7%
Chemical Bonding and Molecular Structure Chemical bonding: 5 (55.6%) / Ionic and covalent bonding: 2 (22.2%) / Molecular orbital theory: 2 (22.2%)	Next	16-24 (9)	3.0%
Thermodynamics Thermodynamics: 2 (100.0%)	Consolidate	25-26 (2)	0.7%
Equilibrium Chemical and ionic equilibrium: 35 (89.7%) / Basic buffer: 1 (2.6%) / Chemical equilibrium: 1 (2.6%) / More topics in chapter guide	Focus first	27-65 (39)	13.0%
Redox Reactions Oxidation states and redox reactions: 1 (100.0%)	Consolidate	66-66 (1)	0.3%
Organic Chemistry - Some Basic Principles and Techniques Organic reaction mechanisms: 3 (50.0%) / Aromaticity: 1 (16.7%) / Organic Chemistry - Some Basic Principles and Techniques: 1 (16.7%) / More topics in chapter guide	Next	67-72 (6)	2.0%
Hydrocarbons Reactions of hydrocarbons: 116 (95.9%) / Hydrocarbons: 2 (1.7%) / Acid-catalysed alkene reaction: 1 (0.8%) / More topics in chapter guide	Focus first	73-193 (121)	40.3%
Solutions Solution properties: 2 (33.3%) / Colligative properties: 1 (16.7%) / Electrolyte colligative properties: 1 (16.7%) / More topics in chapter guide	Consolidate	194-199 (6)	2.0%
Electrochemistry Electrochemical cells: 1 (50.0%) / Molar conductivity: 1 (50.0%)	Consolidate	200-201 (2)	0.7%
Chemical Kinetics Initial-rate method: 1 (100.0%)	Consolidate	202-202 (1)	0.3%

NCERT chapter / leading topics	Priority	Questions	Weight
The p-Block Elements Main group element chemistry: 3 (60.0%) / Gas-evolution reactions: 1 (20.0%) / Group 16 properties: 1 (20.0%)	Consolidate	203-207 (5)	1.7%
The d- and f-Block Elements Properties of transition elements: 3 (100.0%)	Consolidate	208-210 (3)	1.0%
Coordination Compounds Coordination chemistry: 5 (55.6%) / Crystal field splitting: 2 (22.2%) / Coordination and crystal field theory: 1 (11.1%) / More topics in chapter guide	Next	211-219 (9)	3.0%
Haloalkanes and Haloarenes Nucleophilic substitution: 8 (72.7%) / Reactivity of aryl halides: 1 (9.1%) / Silver nitrate test: 1 (9.1%) / More topics in chapter guide	Focus first	220-230 (11)	3.7%
Alcohols, Phenols and Ethers Reactions of alcohols, phenols and ethers: 17 (60.7%) / Acid-catalysed dehydration: 2 (7.1%) / Phenol acidity: 2 (7.1%) / More topics in chapter guide	Focus first	231-258 (28)	9.3%
Aldehydes, Ketones and Carboxylic Acids Aldehydes, Ketones and Carboxylic Acids: 4 (44.4%) / Acetal and ester formation: 1 (11.1%) / Cannizzaro reaction: 1 (11.1%) / More topics in chapter guide	Next	259-267 (9)	3.0%
Amines Amines: 5 (50.0%) / Reactions of amines: 2 (20.0%) / Diazotisation and azo coupling: 1 (10.0%) / More topics in chapter guide	Next	268-277 (10)	3.3%
Biomolecules Carbohydrates: 8 (72.7%) / Biomolecules: 1 (9.1%) / Structure and function of biomolecules: 1 (9.1%) / More topics in chapter guide	Next	278-288 (11)	3.7%
Practical Chemistry (NCERT Laboratory Manual) Qualitative chemical analysis: 1 (100.0%)	Consolidate	289-289 (1)	0.3%
States of Matter Historical appendix / omitted source chapter Gaseous and liquid states: 1 (100.0%)	Historical appendix	290-290 (1)	0.3%
Hydrogen Historical appendix / omitted source chapter Hydrogen and water chemistry: 1 (100.0%)	Historical appendix	291-291 (1)	0.3%
The s-Block Elements Historical appendix / omitted source chapter s-Block Elements: 1 (50.0%) / Uses of alkali metals: 1 (50.0%)	Historical appendix	292-293 (2)	0.7%
The Solid State Historical appendix / omitted source chapter Crystal structures and defects: 2 (100.0%)	Historical appendix	294-295 (2)	0.7%

NCERT chapter / leading topics	Priority	Questions	Weight
Polymers Historical appendix / omitted source chapter Polymer structure and preparation: 1 (50.0%) / Polymers: 1 (50.0%)	Historical appendix	296-297 (2)	0.7%
Environmental Chemistry Historical appendix / omitted source chapter Water and atmospheric pollution: 2 (66.7%) / Environmental chemistry: 1 (33.3%)	Historical appendix	298-300 (3)	1.0%

How to use the priorities

1. Rank chapters by their selected question counts. Ties follow NCERT book order.
2. Focus first: chapters starting within the first 70% of selected, non-historical questions. Next: the following 20%. Consolidate: the remainder. A chapter crossing a threshold stays together.
3. Topic counts use the question's existing core concept, falling back to topic and then chapter. Each question is counted once. Full topic lists begin each chapter.
4. Historical/omitted chapters stay in a separate appendix. Their presence is not a recommendation that they are in the target examination syllabus.

Names follow NCERT Classes XI and XII. Practical chemistry is identified as a laboratory-manual section. Percentages are rounded and may not add to exactly 100.0%. Chapters with no selected questions are not listed; this does not mean they have no exam importance.

Chapter naming references: NCERT textbooks.

Some Basic Concepts of Chemistry

Questions 1-13 / 13 selected / 4.3% practice weight / Focus first

Topics to prioritise in this collection

- Mole concept and stoichiometry: 10 questions / 76.9% of this chapter
- Empirical and molecular formula: 1 question / 7.7% of this chapter
- Mole calculations and concentrations: 1 question / 7.7% of this chapter
- Solution preparation: 1 question / 7.7% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

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Question 1 View solution online

The elemental composition of a compound is $54.2\%, C, 9.2\% H$ and $36.6\% O$. If the molar mass of the compound is $132\ g\ mol^{-1}$, the molecular formula of the compound is :
[Given : The relative atomic mass of $C : H : O = 12 : 1 : 16$]

A. $C_4H_9O_3$

B. $C_6H_{12}O_6$

C. $C_6H_{12}O_3$

D. $C_4H_8O_2$

Question 2 View solution online

Match List-I with List-II :

	List-I (Species)		List-II (Maximum allowed concentration in ppm in drinking water)
A.	F^-	I.	$< 50ppm$
B.	SO_4^{2-}	II.	$< 5ppm$
C.	NO_3^-	III.	$< 2ppm$
D.	Zn	IV.	$< 500ppm$

A. A-II, B-I, C-III, D-IV

B. A-IV, B-III, C-II, D-I

C. A-I, B-II, C-III, D-IV

D. A-III, B-II, C-I, D-IV

Question 3 View solution online

A solution containing 2 g of a non-volatile solute in 20 g of water boils at 373.52 K . The molecular mass of the solute is $gmol^{-1}$. (Nearest integer)
Given, water boils at $373\ K,\ K_b$ for water $= 0.52\ K\ kg\ mol^{-1}$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 4 View solution online

The molarity of the solution prepared by dissolving 6.3 g of oxalic acid $(H_2C_2O_4 \cdot 2H_2O)$ in 250 mL of water in $molL^{-1}$ is $x \times 10^{-2}$. The value of x is

. (Nearest integer)

[Atomic mass : $H : 1.0, C : 12.0, O : 16.0$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 5 View solution online

At 1990 K and 1 atrm pressure, there are equal number of Cl_2 molecules and Cl atoms in the reaction mixture. The value of K_p for the reaction $Cl_{2(g)} \rightleftharpoons 2Cl_{(g)}$ under the above conditions is x $\times 10^{-1}$. The value of x is . (Rounded off to the nearest integer)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 6 View solution online

Match List I with List II

LIST I (molecules/ions)		LIST II (No. of lone pairs of e^- on central atom)	
A.	IF_7	I.	Three
B.	ICl_4^-	II.	One
C.	XeF_6	III.	Two
D.	XeF_2	IV.	Zero

Choose the correct answer from the options given below:

A. A - II, B - III, C - IV, D - I

B. A - II, B - I, C - IV, D - III

C. A - IV, B - I, C - II, D - III

D. A - IV, B - III, C - II, D - I

Question 7 View solution online

Number of molecules having bond order 2 from the following molecule is .

$C_2, O_2, Be_2, Li_2, Ne_2, N_2, He_2$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 8 View solution online

Number of molecules from the following which are exceptions to octet rule is .

$CO_2, NO_2, H_2SO_4, BF_3, CH_4, SiF_4, ClO_2, PCl_5, BeF_2, C_2H_6, CHCl_3, CBr_4$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 9 View solution online

Number of molecules/species from the following having one unpaired electron is .

$O_2, O_2^{-1}, NO, CN^{-1}, O_2^{2-}$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 10 View solution online

The number of molecules/ions that show linear geometry among the following is .

$$SO_2, BeCl_2, CO_2, N_3^-, NO_2, F_2O, XeF_2, NO_2^+, I_3^-, O_3$$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 11 View solution online

The number of molecules or ions from the following, which do not have odd number of electrons are

(A) NO_2

(B) ICl_4^-

(C) BrF_3

(D) ClO_2

(E) NO_2^+

(F) NO

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 12 View solution online

Total number of molecules/species from following which will be paramagnetic is .

$$O_2, O_2^+, O_2^-, NO, NO_2, CO, K_2[NiCl_4]$$
$$[Co(NH_3)_6]Cl_3, K_2[Ni(CN)_4]$$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 13 View solution online

The number of molecules from the following which contain only two lone pair of electrons is

$$H_2O, N_2, CO, XeF_4, NH_3, NO, CO_2, F_2$$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Classification of Elements and Periodicity in Properties

Questions 14-15 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

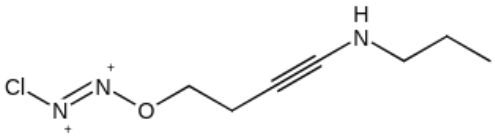
- Classification of Elements and Periodicity in Properties: 2 questions / 100.0% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

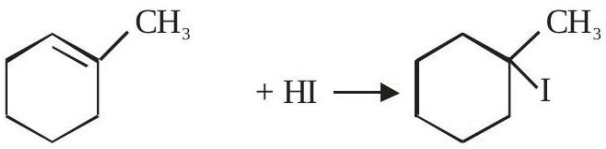
Question 14 View solution online

Which of the following reaction is correct ?

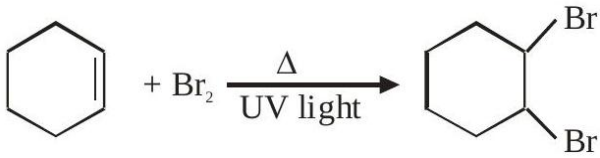
A.



B.



C.



D. $C_2H_5CONH_2 + Br_2 + NaOH \rightarrow C_2H_5CH_2NH_2 + Na_2CO_3 + NaBr + H_2O$

Question 15 View solution online

Which of the following reaction is correct?

A. $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 2\,N_2O_4 + O_2$

B. $2LiNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

C. $2LiNO_3 \rightarrow 2Li + 2NO_2 + O_2$

D. $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

Chemical Bonding and Molecular Structure

Questions 16-24 / 9 selected / 3.0% practice weight / Next

Topics to prioritise in this collection

- Chemical bonding: 5 questions / 55.6% of this chapter
- Ionic and covalent bonding: 2 questions / 22.2% of this chapter
- Molecular orbital theory: 2 questions / 22.2% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 16 View solution online

Which of the following is least ionic ?

A. $BaCl_2$

B. AgCl

C. KCl

D. $CoCl_2$

Question 17 View solution online

An element ' E ' has the ionisation enthalpy value of $374\ kJ\ mol^{-1}$. 'E' reacts with elements A, B, C and D with electron gain enthalpy values of $-328, -349$, -325 and $-295\ kJ\ mol^{-1}$, respectively.

The correct order of the products EA, EB, EC and ED in terms of ionic character is :

A. $EB > EA > EC > ED$

B. $ED > EC > EA > EB$

C. $EA > EB > EC > ED$

D. $ED > EC > EB > EA$

Question 18 View solution online

Total number of species from the following with central atom utilising $2p^2$ hybrid orbitals for bonding is

.

$NH_3, SO_2, SiO_2, BeCl_2, C_2H_2, C_2H_4, BCl_3, HCHO, C_6H_6, BF_3, C_2H_4Cl_2$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 19 View solution online

Number of compounds/species from the following with non-zero dipole moment is

$BeCl_2, BCl_3, NF_3, XeF_4, CCl_4, H_2OH_2\ S, HBr, CO_2, H_2, HCl$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 20 View solution online

Number of compounds from the following with zero dipole moment is .

$HF, H_2, H_2\ S, CO_2, NH_3, BF_3, CH_4, CHCl_3, SiF_4, H_2O, BeF_2$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 21 View solution online

Match List-I with List-II

List-I

(A) $\Psi_{MO} = \Psi_A - \Psi_B$
(B) $\mu = Q \times r$
(C) $\frac{N_b - N_a}{2}$
(D) $\Psi_{MO} = \Psi_A + \Psi_B$

List-II

(I) Dipole moment
(II) Bonding molecular orbital
(III) Anti-bonding molecualr orbital
(IV) Bond order

A. -(II), (B)-(I), (C)-(IV), (D)-(III)

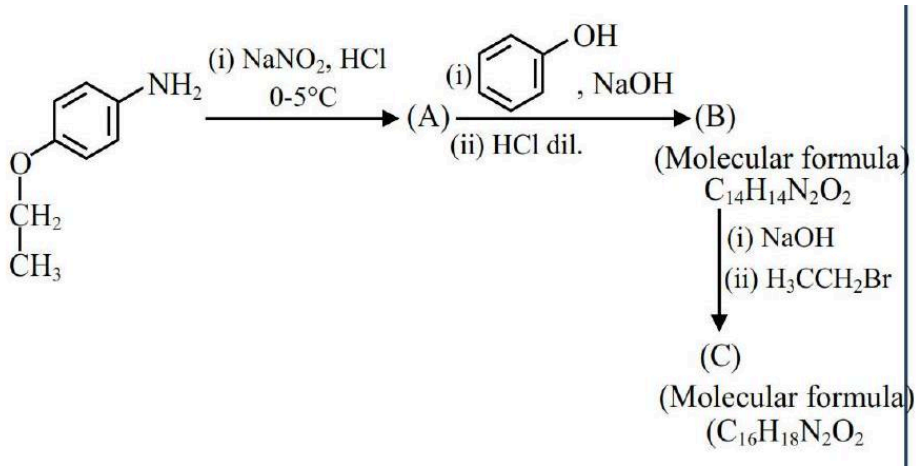
B. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

C. (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

D. (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Question 22 View solution online

Consider the following sequence of reactions.



Total number of $\mathbf{sp^3}$ hybridised carbon atoms in the major product C formed is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 23 View solution online

Match List - I with List - II

List - I	List - II
(A) $\Psi_{MO} = \Psi_A - \Psi_B$	(I) Dipole moment
(B) $\mu = Q \times r$	(II) Bonding molecular orbital
(C) $\frac{N_b - N_a}{2}$	(III) Anti-bonding molecular orbital
(D) $\Psi_{MO} = \Psi_A + \Psi_B$	(IV) Bond order

A. (A)-(II), (B-(I), (C)-(IV), (D)-(III)

B. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

C. (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

D. (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Question 24 View solution online

Match List-I with List-II

List-I (Molecule)	**List-II** (Bond order)
(a) Ne_2	(i) 1
(b) N_2	(ii) 2
(c) F_2	(iii) 0
(d) O_2	(iv) 3

Choose the correct answer from the options given below.

A. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

B. (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

C. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

D. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Thermodynamics

Questions 25-26 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

- Thermodynamics: 2 questions / 100.0% of this chapter

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Question 25

View solution online

Match List - I with List - II.

List -I

(Processes/Reactions)
(A) $\mathbf{2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)}$
(B) $\mathbf{4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)}$
(C) $\mathbf{N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)}$
(D) Vegetable oil $\mathbf{(l) + H_2}$ $\rightarrow$ Vegetable ghee(s)

List - II
(Catalyst)
(I) $\mathbf{Fe(s)}$
(II) $\mathbf{Pt(s) - Rh(s)}$
(III) $\mathbf{V_2O_5}$
(IV) $\mathbf{Ni(s)}$

Choose the correct answer from the options given below:

A. - (III), (B) - (I), (C) - (II), (D) - (IV)

B. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

C. (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

D. (A) - (IV), (B) - (II), (C) - (III), (D) - (I)

Question 26 View solution online

For the reaction $2NO_2(g) \rightleftharpoons N_2O_4(g)$, when $\Delta S = -176.0 JK^{-1}$ and $\Delta H = -57.8\ kJ\ mol^{-1}$, the magnitude of ΔG at 298 K for the reaction is ___ $kJmol^{-1}$. (Nearest integer)

Numerical answer: _____

Enter the requested integer (0 decimal places).

Equilibrium

Questions 27-65 / 39 selected / 13.0% practice weight / Focus first

Topics to prioritise in this collection

- Chemical and ionic equilibrium: 35 questions / 89.7% of this chapter
- Basic buffer: 1 question / 2.6% of this chapter
- Chemical equilibrium: 1 question / 2.6% of this chapter
- Equilibrium: 1 question / 2.6% of this chapter
- Heterogeneous equilibrium: 1 question / 2.6% of this chapter

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Question 27 View solution online

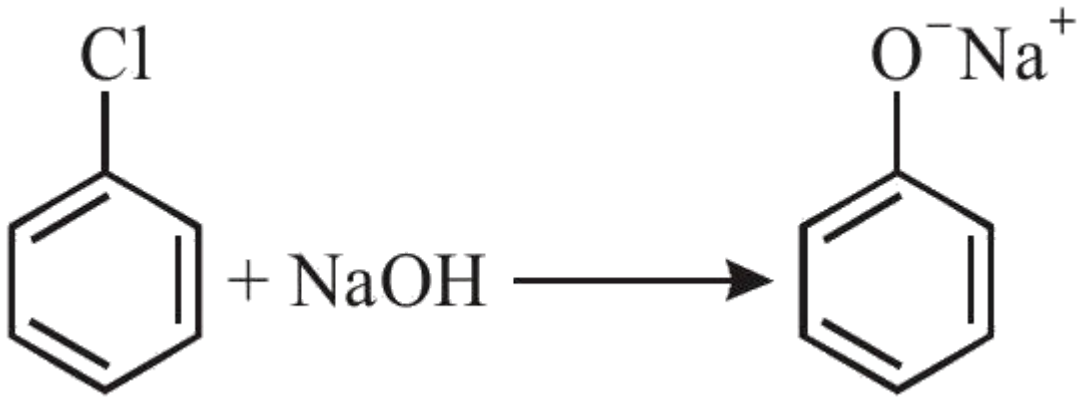
When 5.1 g of solid $\mathbf{NH_4HS}$ is introduced into a two litre evacuated flask at $\mathbf{27^\circ C, 20\%}$ of the solid decomposes into gaseous ammonia and hydrogen sulphide. The $\mathbf{K_p}$ for the reaction at $\mathbf{27^\circ C}$ is $\mathbf{x \times 10^{-2}}$. The value of $\boldsymbol{x}$ is . (Integer answer)
[Given $\mathbf{R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 28 View solution online

The above reaction requires which of the following reaction conditions?



A. 573 K, Cu, 300 atm

B. 623 K, Cu, 300 atm

C. 573 K, 300 atm

D. 623 K, 300 atm

Question 29 View solution online

Match List-I with List-II.

List-I (Oxide)		List-II (Nature)	
(A)	Cl_2O_7	(I)	Amphoteric
(B)	Na_2O	(II)	Basic
(C)	Al_2O_3	(III)	Neutral
(D)	N_2O	(IV)	Acidic

Choose the correct answer from the options given below:

A. - (IV), (B) - (III), (C) - (I), (D) - (II)

B. (A) - (IV), (B) - (II), (C) - (I), (D) - (III)

C. (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

D. (A) - (I), (B) - (II), (C) - (IIII), (D) - (IV)

Question 30 View solution online

$37.8\ g\ N_2O_5$ was taken in a 1 L reaction vessel and allowed to undergo the following reaction at 500 K

$2\ N_2O_{5(g)} \rightarrow 2\ N_2O_{4(g)} + O_{2(g)}$

The total pressure at equilibrium was found to be 18.65 bar.

Then, $Kp =$ $\times 10^{-2}$ [nearest integer]

Assume N_2O_5 to behave ideally under these conditions

Given : $R = 0.082$ bar $Lmol^{-1}\ K^{-1}$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 31 View solution online

For the reaction $A(g) \rightleftharpoons B(g)$ at 495 K , $\Delta_r G^\circ = -9.478\ kJ\ mol^{-1}$.
If we start the reaction in a closed container at 495 K with 22 millimoles of A , the amount of B is the equilibrium mixture is millimoles. (Round off to the Nearest Integer).
$[R = 8.314\ J\ mol^{-1}\ K^{-1}; \ell n 10 = 2.303]$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 32 View solution online

The OH^- concentration in a mixture of 5.0 mL of $0.0504 M NH_4Cl$ and 2 mL of $0.0210 M NH_3$ solution is $x \times 10^{-6} M$. The value of x is .
(Nearest integer)
[Given $K_w = 1 \times 10^{-14}$ and $K_b = 1.8 \times 10^{-5}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 33 View solution online

Assuming that $Ba(OH)_2$ is completely ionised in aqueous solution under the given conditions the concentration of H_3O^+ ions in 0.005 M aqueous solution of $Ba(OH)_2$ at 298 K is ___ $\times 10^{-12}\ mol\ L^{-1}$.
(Nearest integer)

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 34 View solution online

A mixture of 1 mole of $\mathbf{H_2O}$ and 1 mole of CO is taken in a 10 litre container and heated to 725 K . At equilibrium $\mathbf{40\%}$ of water by mass reacts with carbon monoxide according to the equation :

$\mathbf{CO(g) + H_2O(g) \rightleftharpoons CO_2(\ g) + H_2(\ g)}$.

The equilibrium constant $\mathbf{K_C \times 10^2}$ for the reaction is . (Nearest integer)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 35 View solution online

For the reaction $\mathbf{A_{(g)} \rightarrow B_{(g)}}$, the value of the equilibrium constant at 300 K and 1 atm is equal to 100.0. The value of $\mathbf{\Delta_r G}$ for the reaction at 300 K and 1 atm in $\mathbf{Jmol^{-1}}$ is $\mathbf{-xR}$, where $\boldsymbol{x}$ is .

(Rounded off to the nearest integer)

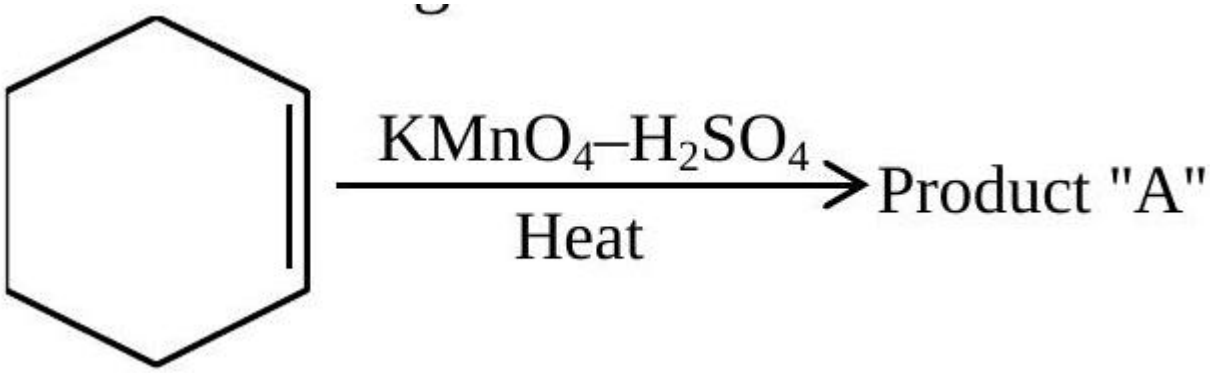
$\left[\mathbf{R = 8.31\ J\ mol^{-1}\ K^{-1}} \text{ and } \mathbf{\ln 10 = 2.3}\right]$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 36 View solution online

Consider the given chemical reaction :



Product " A " is :

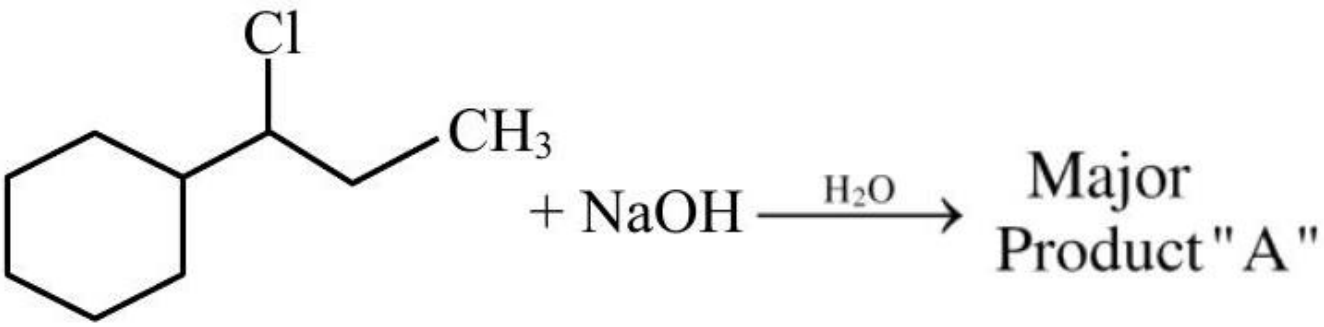
A. picric acid

B. oxalic acid

C. acetic acid

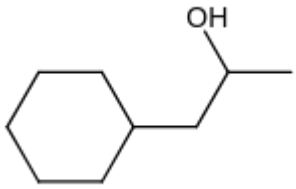
D. adipic acid

Question 37 View solution online

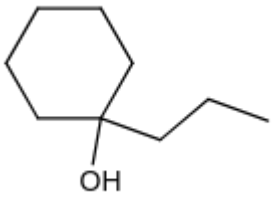


Consider the above chemical reaction. Product " A " is:

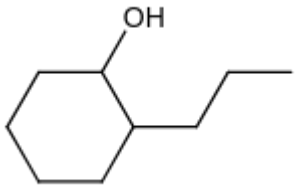
A.



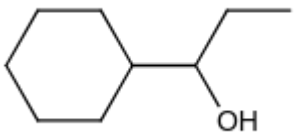
B.



C.

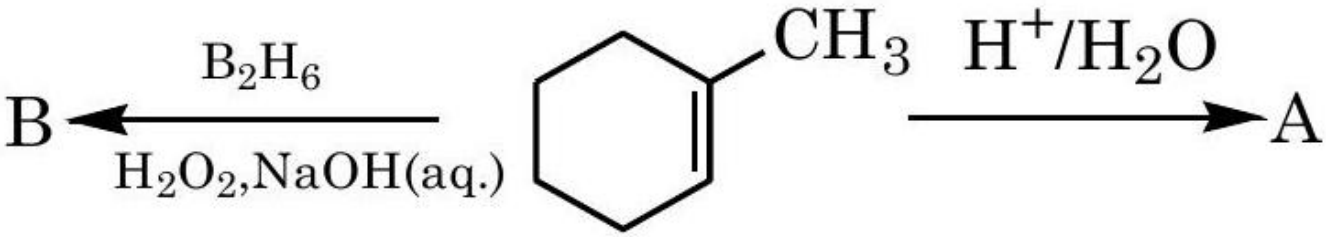


D.

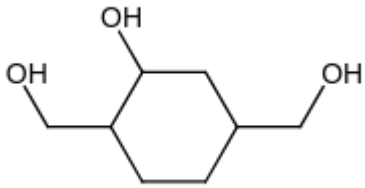


Question 38 View solution online

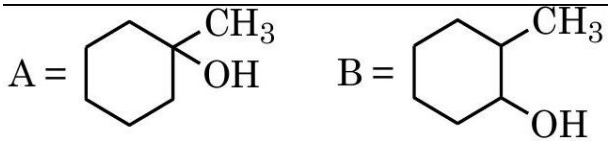
Product A and B formed in the following set of reactions are:



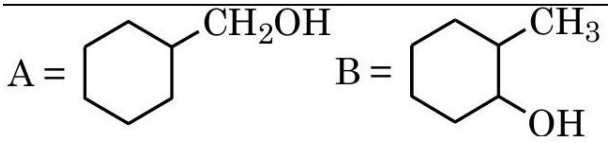
A. A =



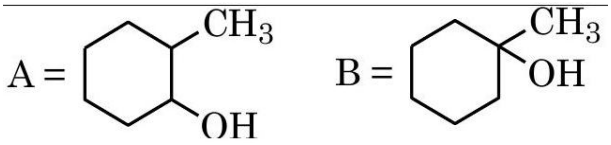
B.



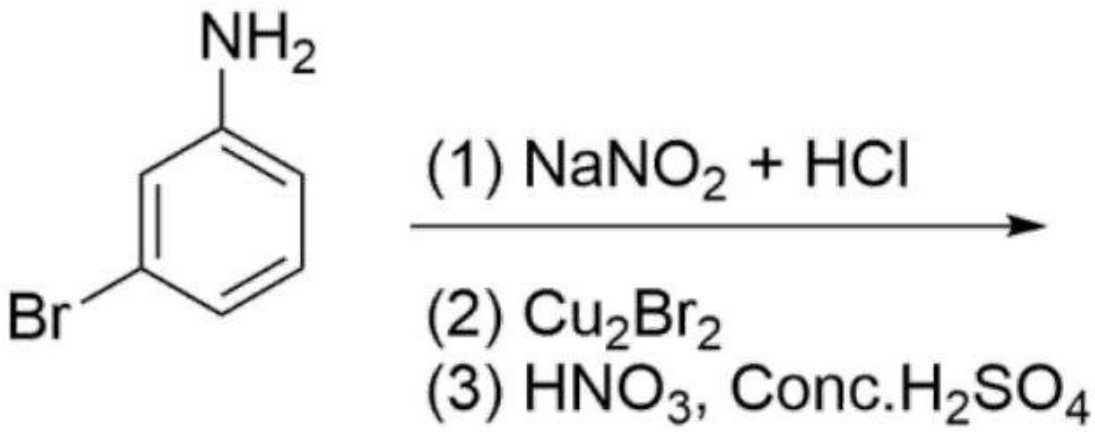
C.



D.

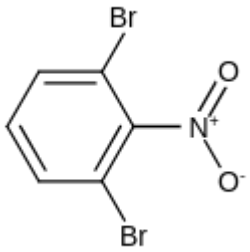


Question 39 View solution online

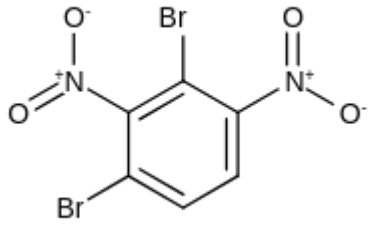


The major product for above sequence of reaction is:

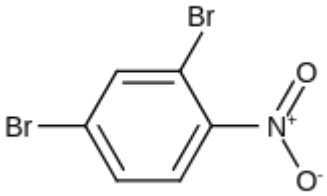
A.



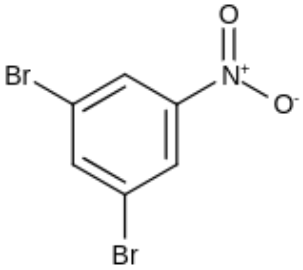
B.



C.

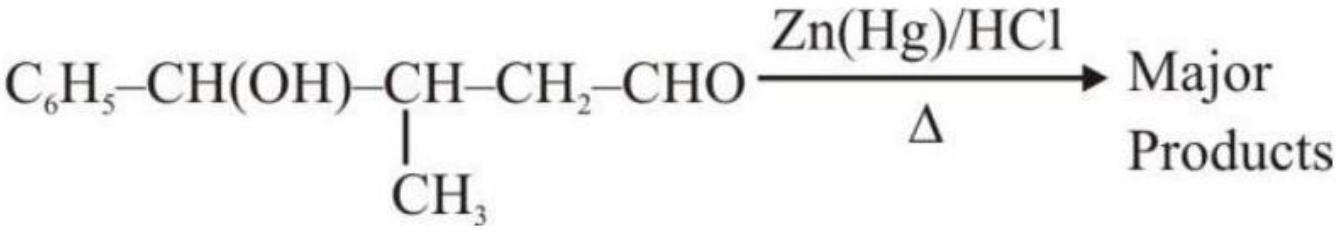


D.

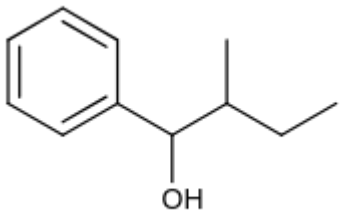


Question 40 View solution online

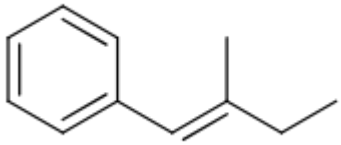
The major product formed in the following reaction is:



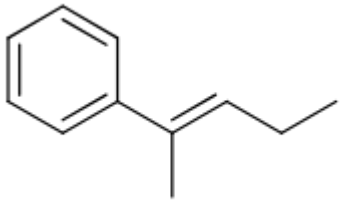
(A)



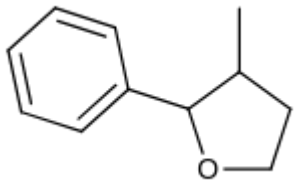
(B)



(C)



(D)



Choose the correct answer from the options given below:

A. A only

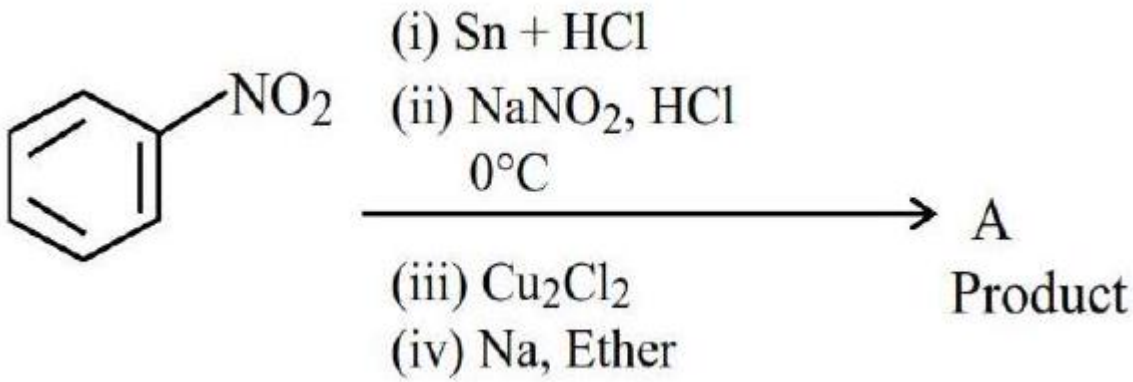
B. B only

C. C only

D. D only

Question 41 View solution online

Consider the following sequence of reactions :



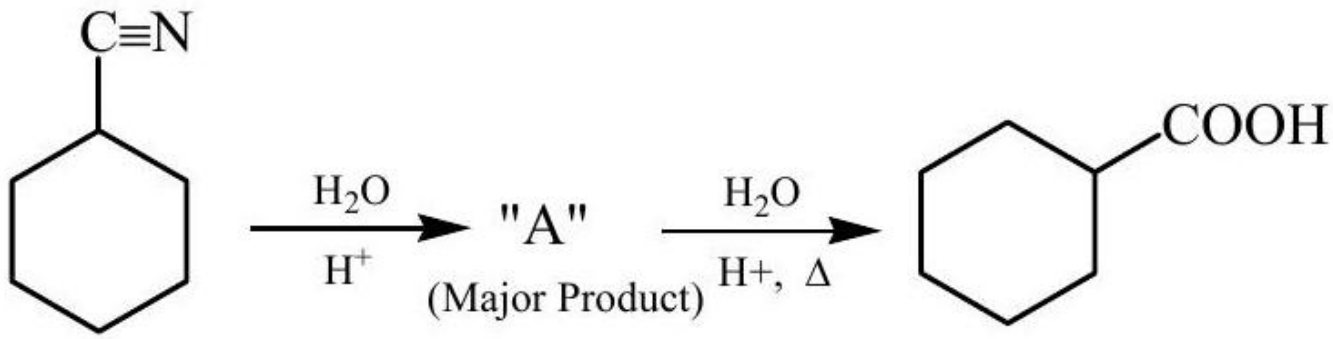
Molar mass of the product formed (A) is

gmol^{-1}.

Numerical answer: _____

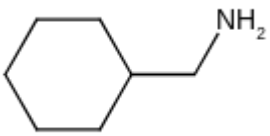
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 42 View solution online

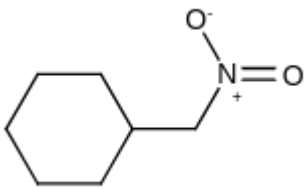


Consider the above chemical reaction and identify product " A "

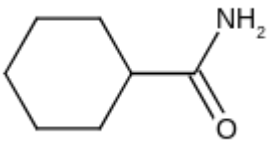
A.



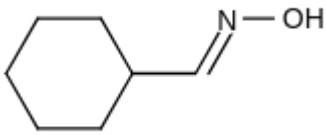
B.



C.

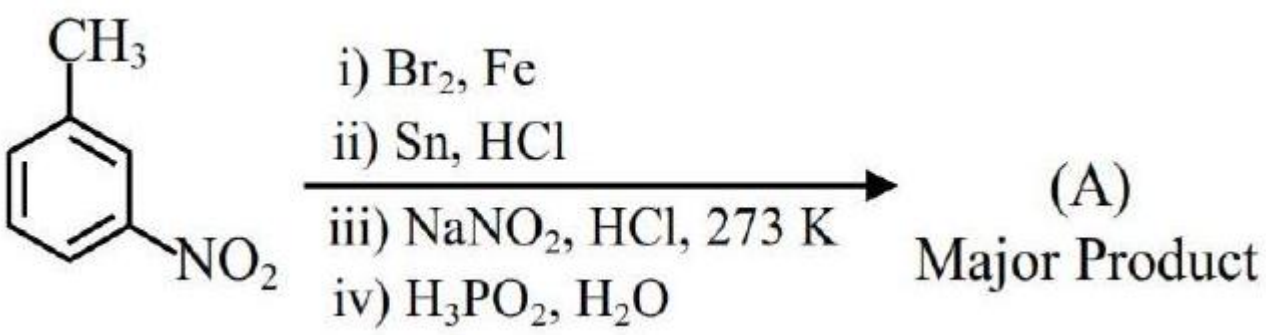


D.



Question 43 View solution online

Consider the following sequence of reactions to produce major product (A)



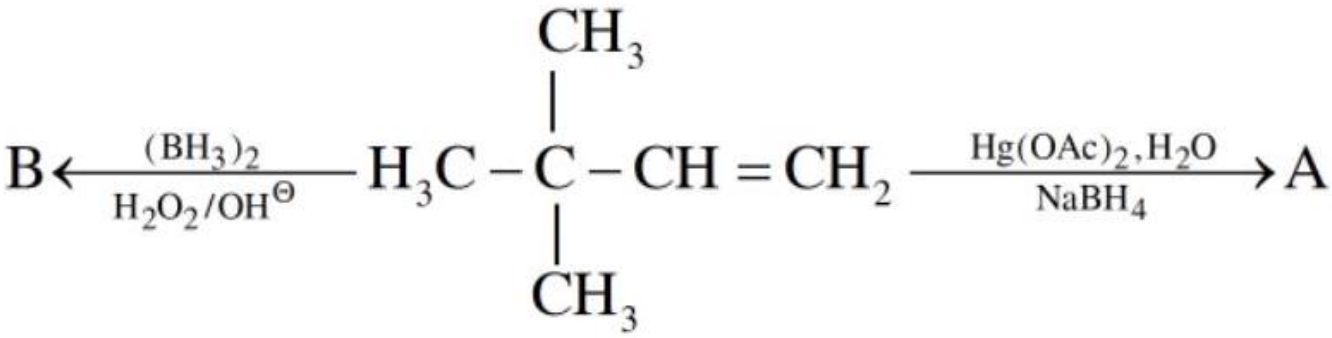
Molar mass of product (A) is gmol^{-1}. (Given molar mass in gmol^{-1} of $\text{C}:12, \text{H}:1$, $\text{O}:16, \text{Br}:80, \text{N}:14, \text{P}:31$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 44 View solution online

Choose the correct option for the following reactions.



A. 'A' and 'B' are both Markovnikov addition products.

B. ' A ' is Markovnikov product and ' B ' is antiMarkovnikov product.

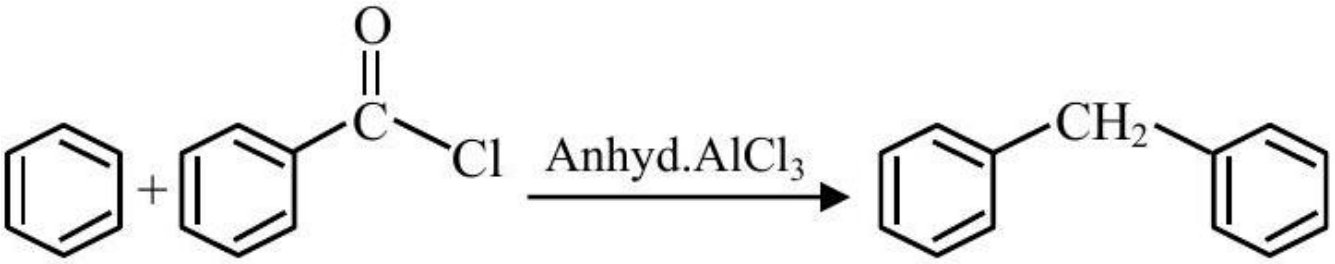
C. 'A' and 'B' are both anti-Markovnikov products.

D. ' B ' is Markovnikov and ' A ' is antiMarkovnikov product.

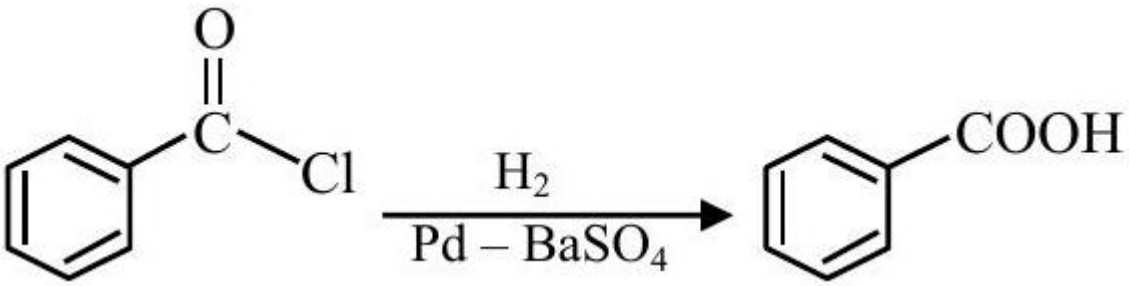
Question 45 View solution online

The number of correct reaction(s) among the following is .

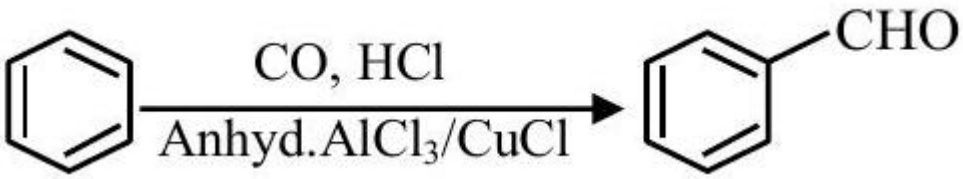
(A)



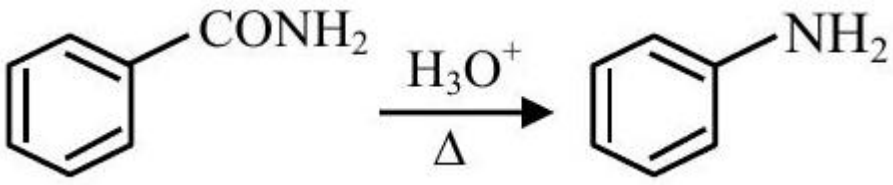
(B)



(C)



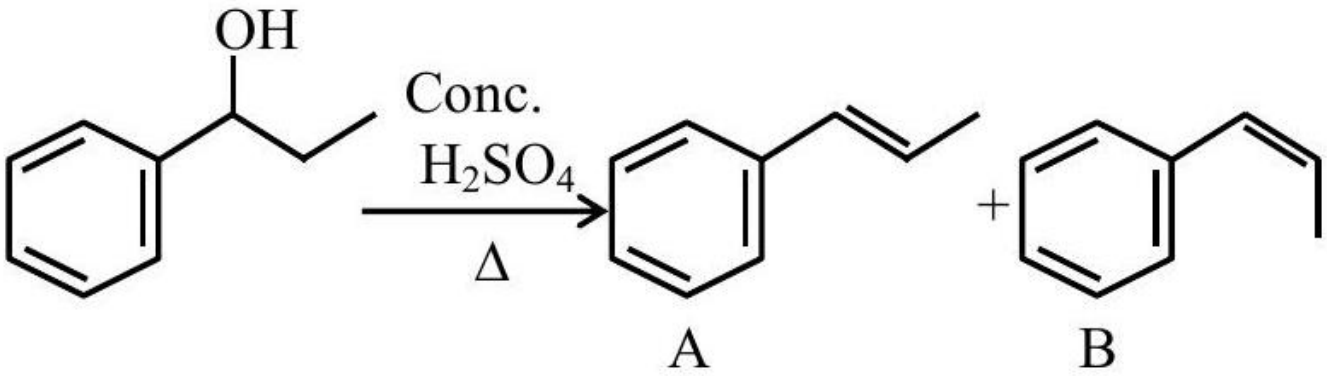
(D)



Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 46 View solution online



consider the above reaction, and choose the correct statement :

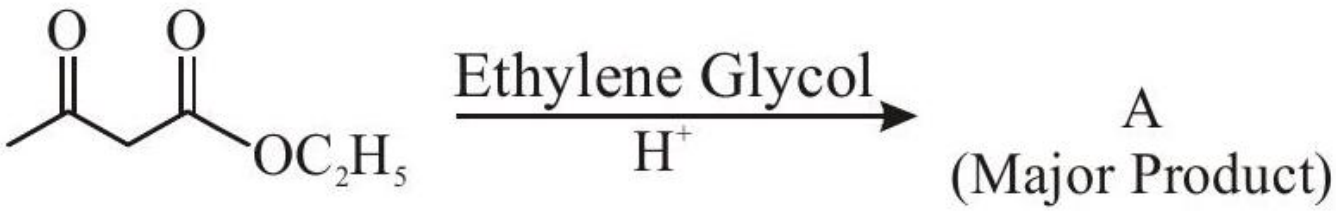
A. The reaction is not possible in acidic medium

B. Both compounds **A** and **B** are formed equally

C. Compound **A** will be the major product

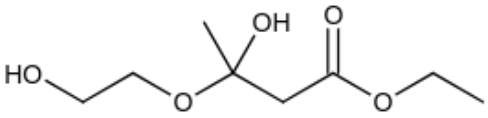
D. Compound **B** will be the major product

Question 47 View solution online

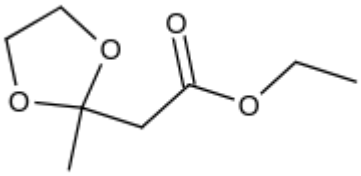


The product " A " in the above reaction is:

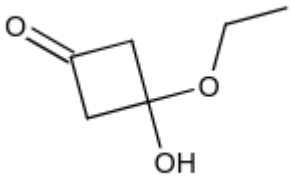
A.



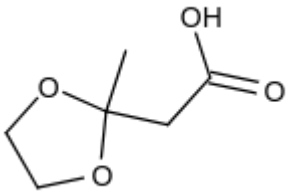
B.



C.

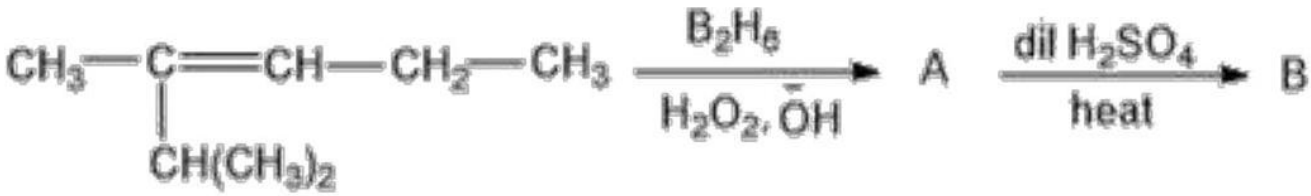


D.



Question 48 View solution online

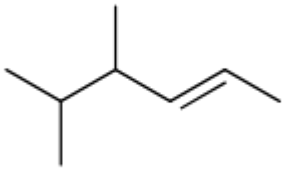
Find the final major product of the following reactions?



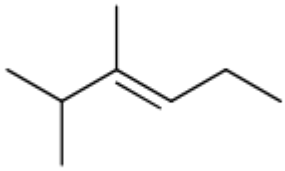
A.



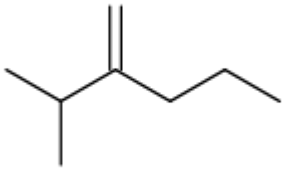
B.



C.

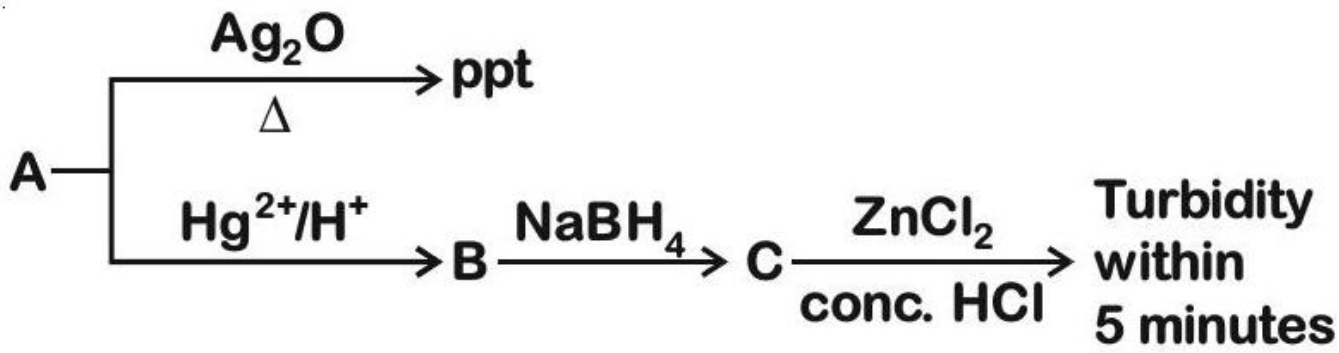


D.



Question 49 View solution online

Consider the following reactions :



'A' is

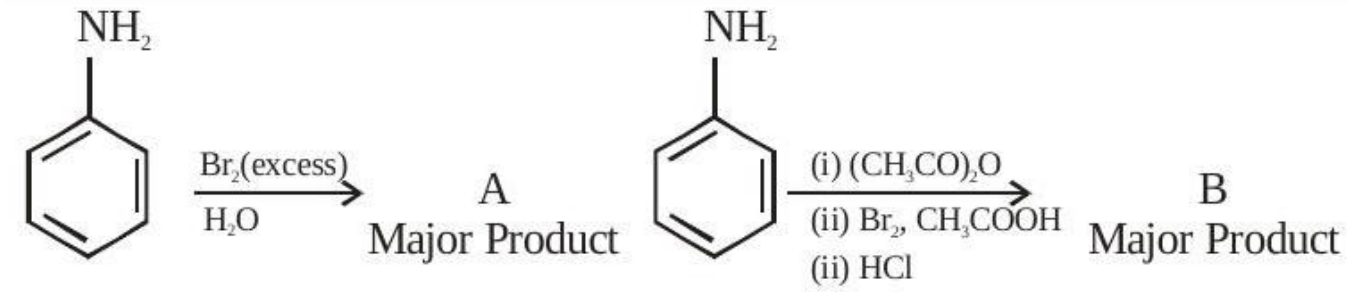
A. $CH_3 - C \equiv CH$

B. $CH_3 - C \equiv C - CH_3$

C. $CH_2 = CH_2$

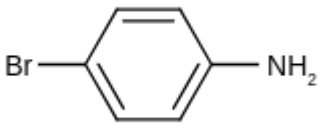
D. $CH \equiv CH$

Question 50 View solution online

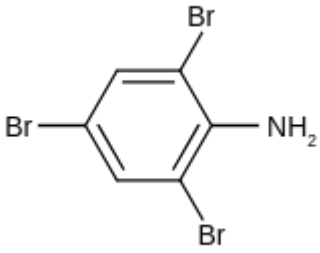


Consider the above reaction, the product A and product B respectively are

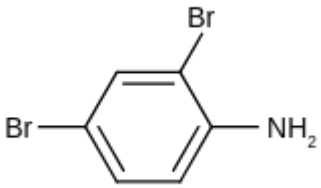
A.



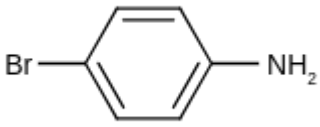
B.



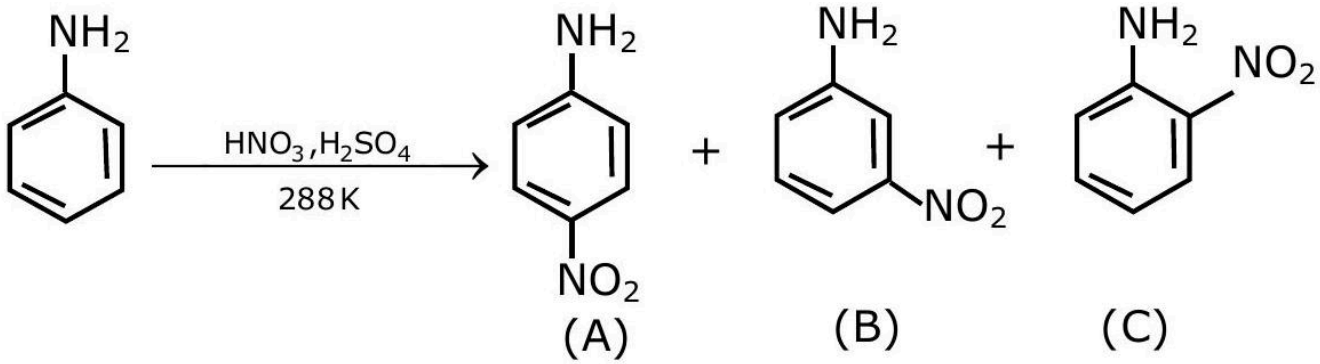
C.



D.



Question 51 View solution online



Correct statement about the given chemical reaction is :

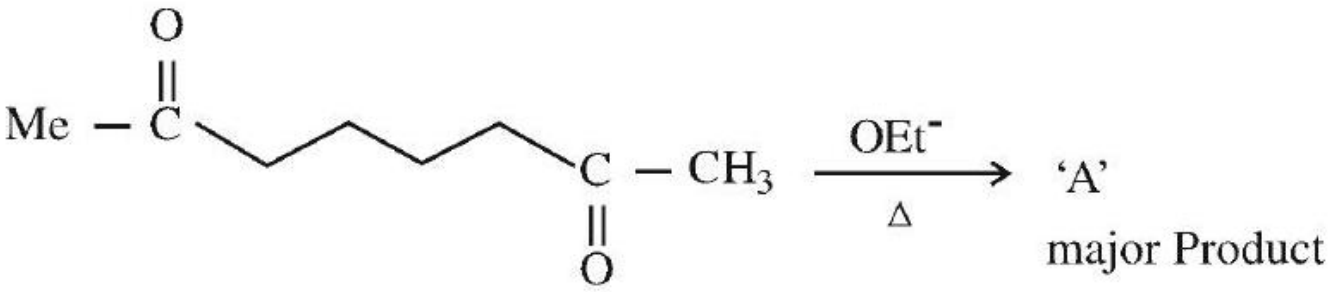
A. Reaction is possible and compound (A) will be major product.

B. The reaction will form sulphonated product instead of nitration.

C. $-\mathbf{NH_2}$ group is ortho and para directive, so product (B) is not possible.

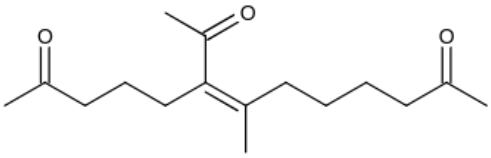
D. Reaction is possible and compound (B) will be the major product.

Question 52 View solution online

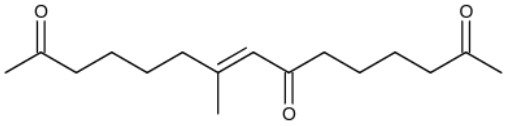


A in the above reaction is :

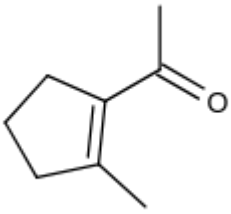
A.



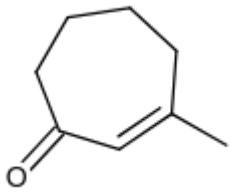
B.



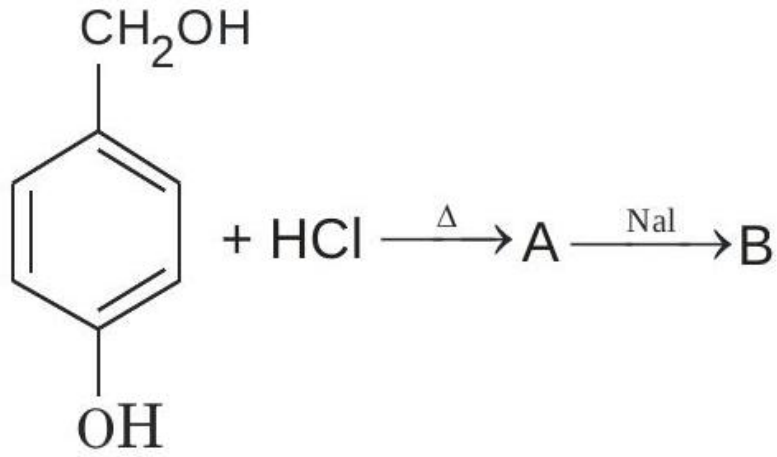
C.



D.

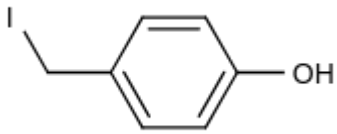


Question 53 View solution online

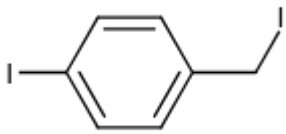


In the above reaction product B is:

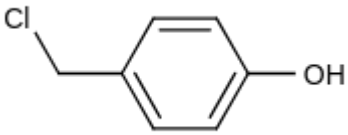
A.



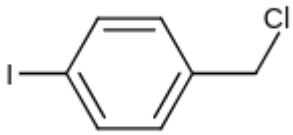
B.



C.

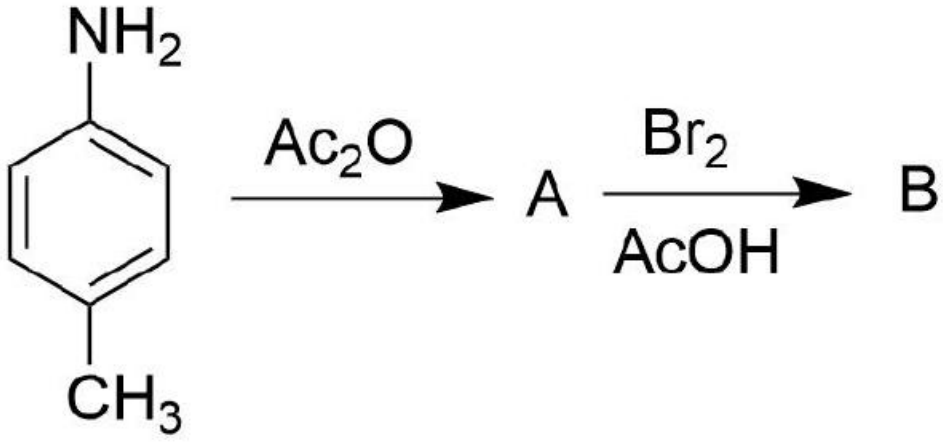


D.

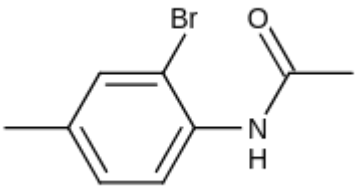


Question 54 View solution online

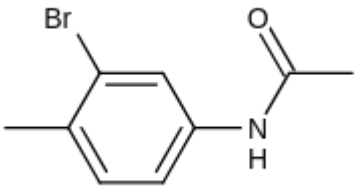
B in the given reaction is?



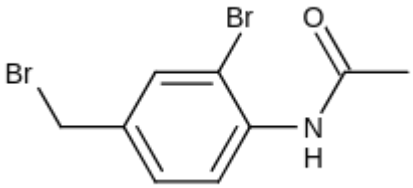
A.



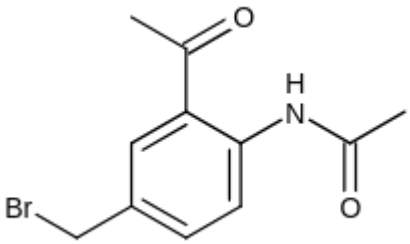
B.



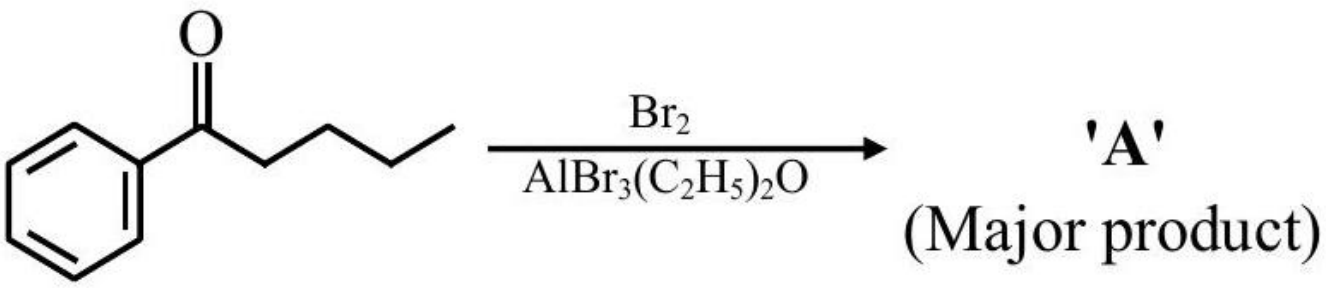
C.



D.

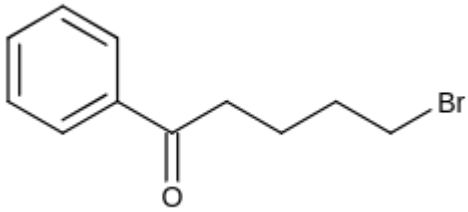


Question 55 View solution online

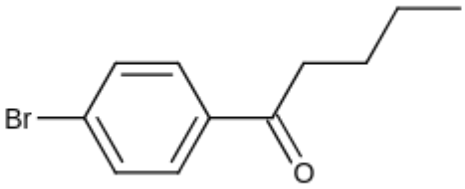


Consider the given reaction, the product **A** is :

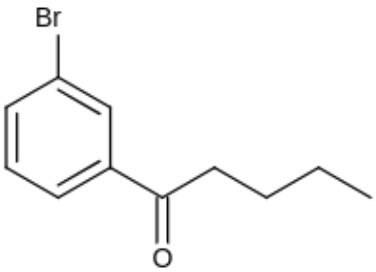
A.



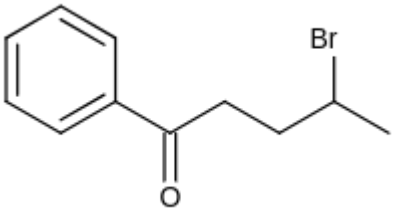
B.



C.

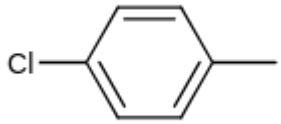


D.

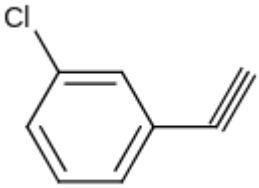


Question 56 View solution online

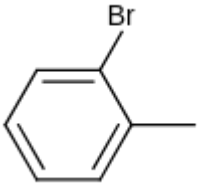
Among the following compounds I-IV, which one forms a yellow precipitate on reacting sequentially with (i) NaOH (ii) dil. HNO_3 (iii) $AgNO_3$?



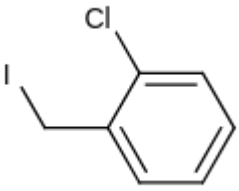
I



II



III



IV

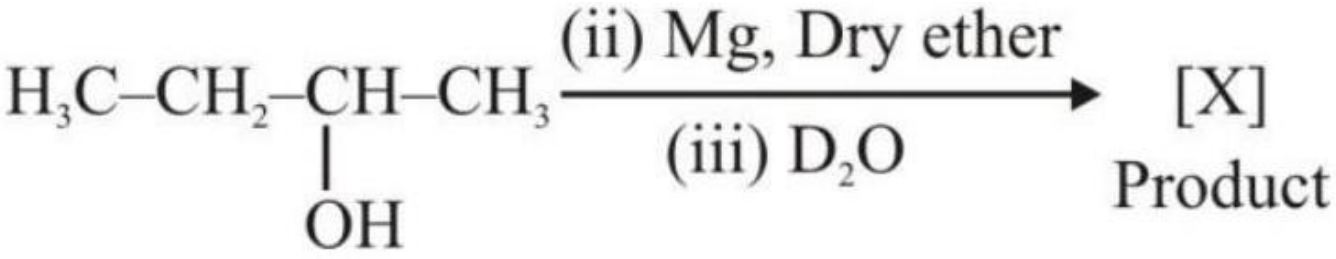
A. II

B. IV

C. I

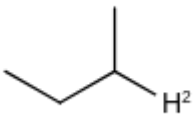
D. III

Question 57 View solution online

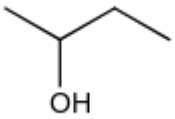


Product [X] formed in the above reaction is :

A.



B.

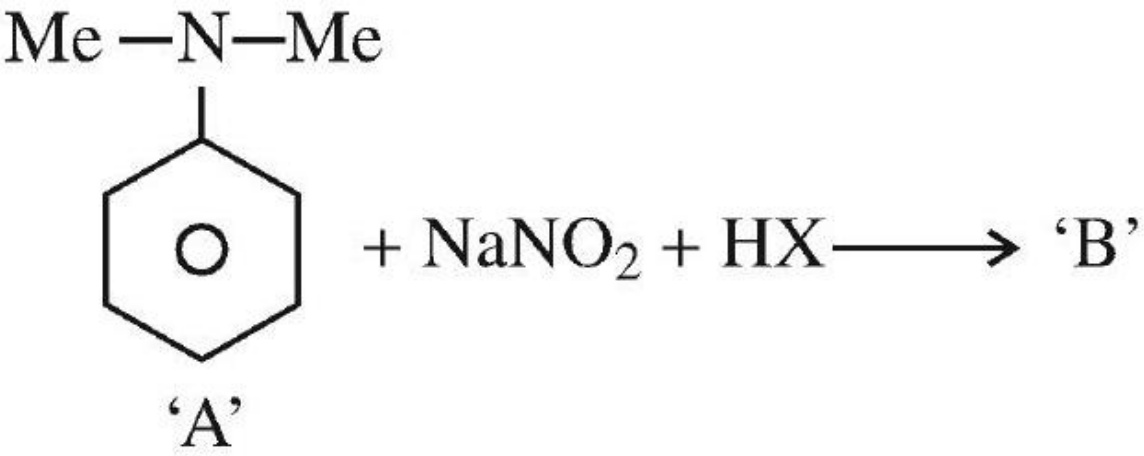


C. $H_3C - CH_2 - CH = CH_2$

D. $H_3C - CH = CH - CH_3$

Question 58 View solution online

The incorrect statement regarding the reaction given below is



A. The electrophile involved in the reaction is NO^+

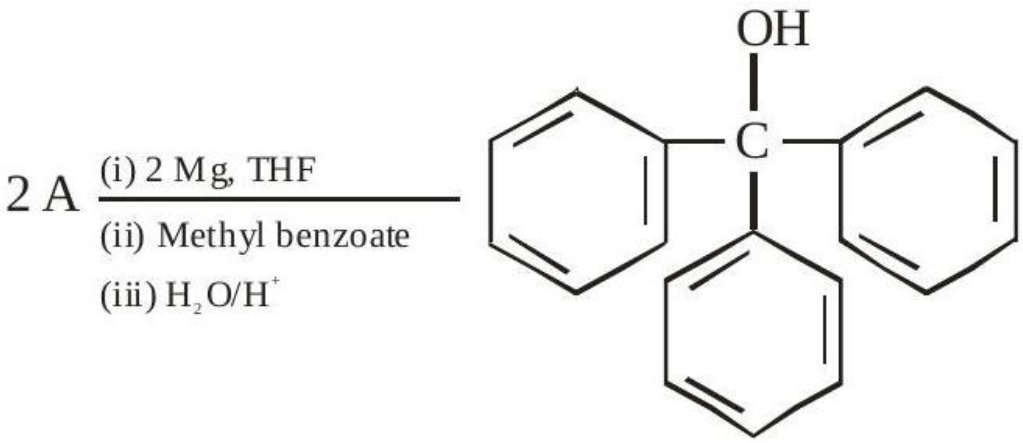
B. ' B ' is N -nitroso ammonium compound

C. The reaction occurs at low temperature

D. The product ' B ' formed in the above reaction is p-nitroso compound at low temperature

Question 59 View solution online

In the given reaction



'A' can be

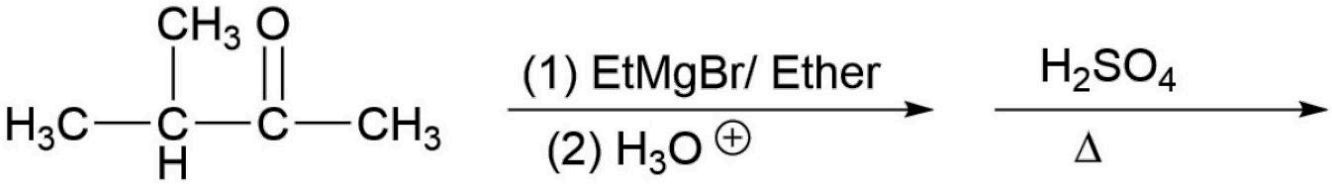
A. benzyl bromide

B. bromobenzene

C. cyclohexyl bromide

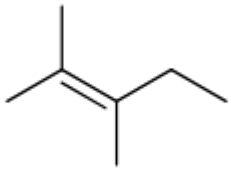
D. methyl bromide

Question 60 View solution online

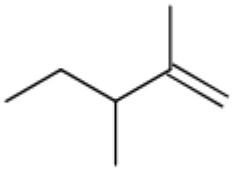


What will be the major product?

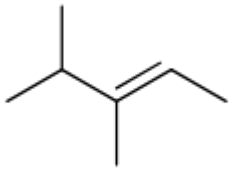
A.



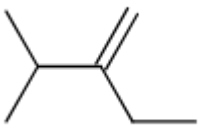
B.



C.

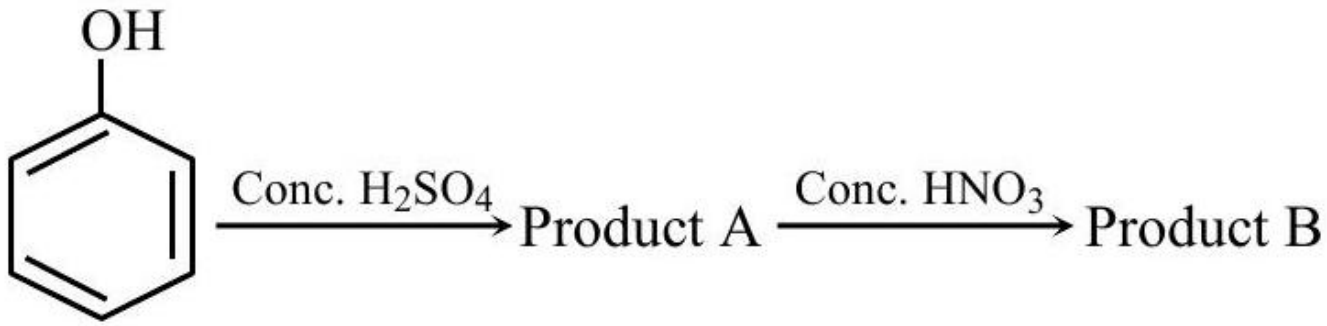


D.



Question 61 View solution online

Consider the given chemical reaction sequence :

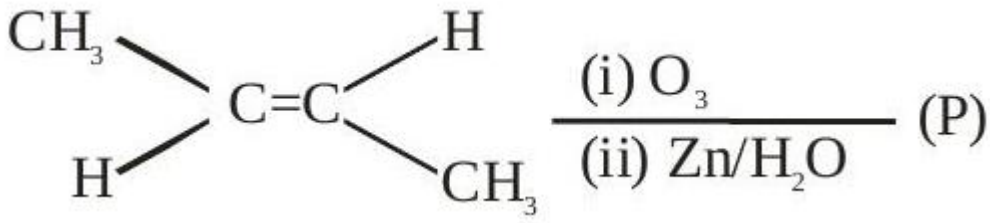


Total sum of oxygen atoms in Product A and Product B are

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 62 View solution online



Consider the given reaction. The total number of oxygen atoms present per molecule of the product (P) is

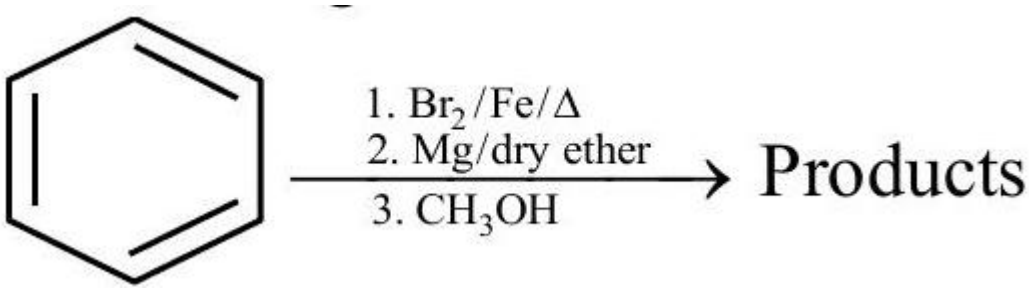
.

Numerical answer: _____

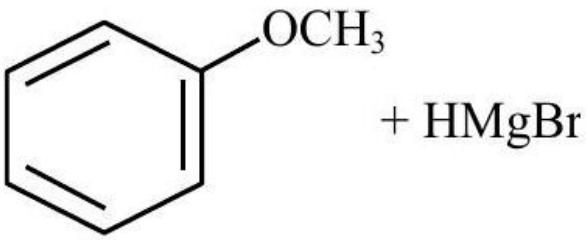
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 63 View solution online

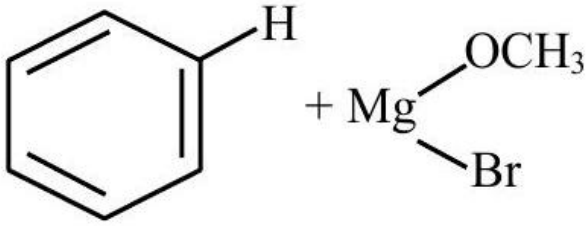
For the following:



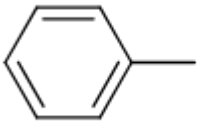
A.



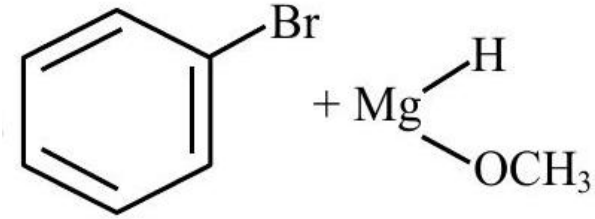
B.



C.

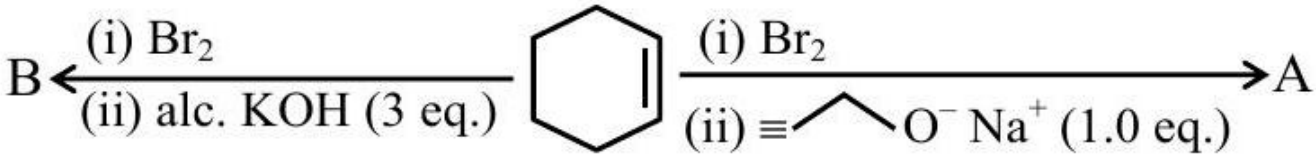


D.



Question 64 View solution online

The major products from the following reaction sequence are product A and product B .

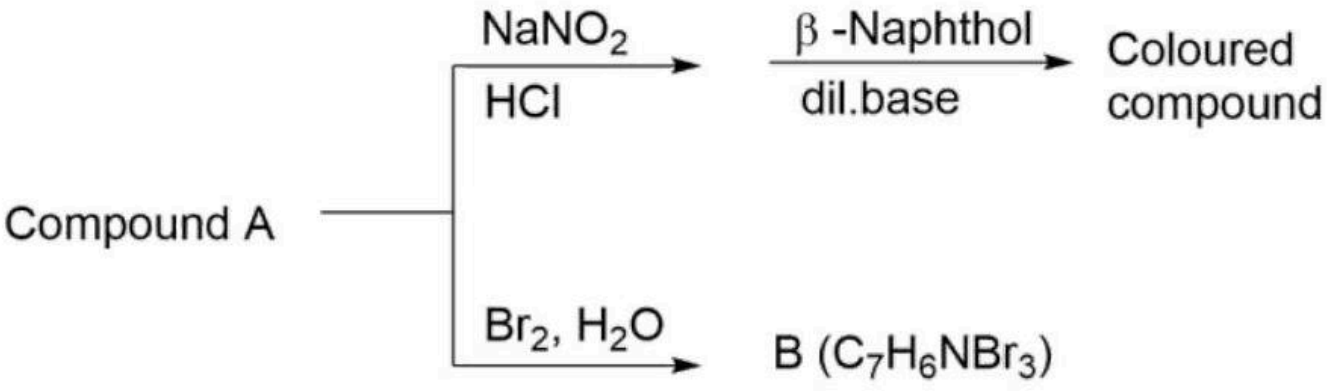


The total sum of π electrons in product A and product B are (nearest integer)

Numerical answer: _____

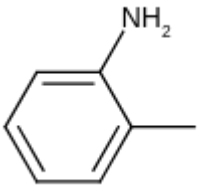
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 65 View solution online

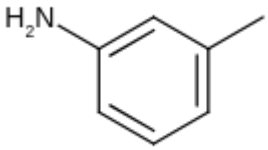


Compound A will be:

A.



B.



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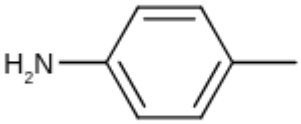

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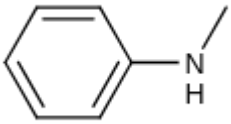

Redox Reactions

Questions 66-66 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Oxidation states and redox reactions: 1 question / 100.0% of this chapter

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Question 66

View solution online

From the given list, the number of compounds with + 4 oxidation state of Sulphur .

$SO_3, H_2SO_3, SOCl_2, SF_4, BaSO_4, H_2\ S_2O_7$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Organic Chemistry - Some Basic Principles and Techniques

Questions 67-72 / 6 selected / 2.0% practice weight / Next

Topics to prioritise in this collection

- Organic reaction mechanisms: 3 questions / 50.0% of this chapter
- Aromaticity: 1 question / 16.7% of this chapter
- Organic Chemistry - Some Basic Principles and Techniques: 1 question / 16.7% of this chapter
- Reactions of hydrocarbons: 1 question / 16.7% of this chapter

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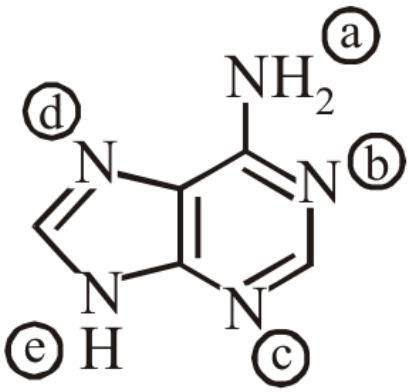
Question 67

View solution online

In the following compound,
the favourable site/s for protonation is/are :-



A. (b), (c) and (d)

B. (a)

C. (a) and (e)

D. (a) and (d)

Question 68 View solution online

Match List - I with List - II

	List - I	
(A)	$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	(I)
(B)	$CO(g) + 3H_2(g) \rightarrow CH_4(g) + H_2O(g)$	(II) $Cu/ZnO - Cr_2O_3$
(C) $CO(g) + H_2(g) \rightarrow HCHO(g)$	(III) $Fe_xO_y + K_2O + Al_2O_3$	
(D) $CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$	(IV) Ni	

Choose the correct answer from the options given below:

A. - (II), (B) - (IV), (C) - (I), (D) - (III)

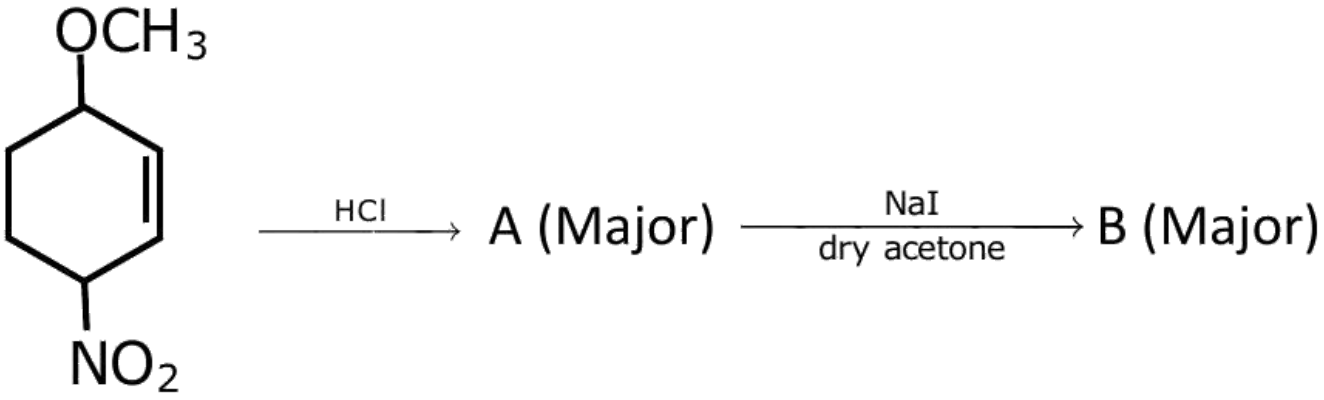
B. (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

C. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

D. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

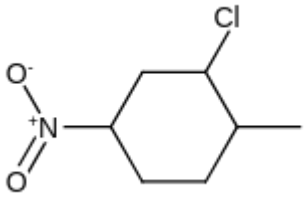
Question 69 View solution online

Identify A and B in the chemical reaction.

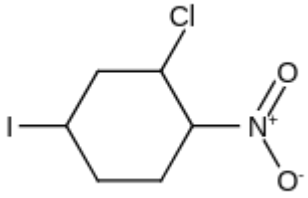


A. $A =$

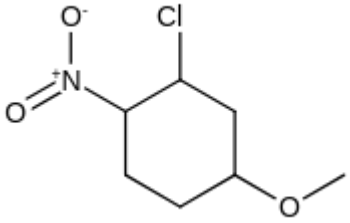
$B =$



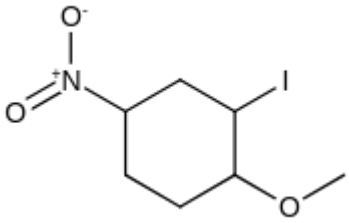
B. $B =$



C. $B =$

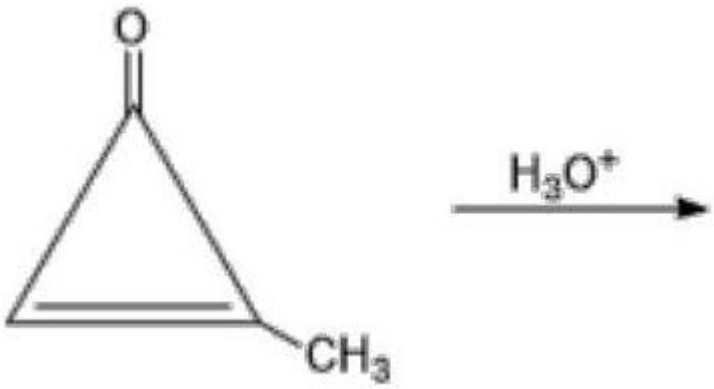


D. $B =$

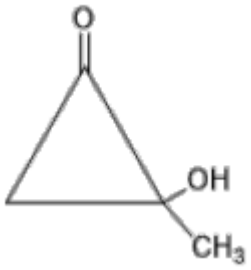


Question 70 View solution online

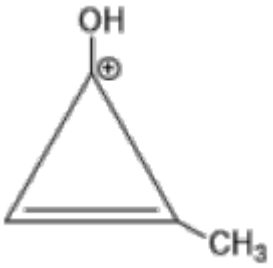
The major product of the following reactions is



A.



B.



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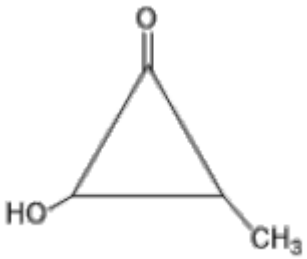
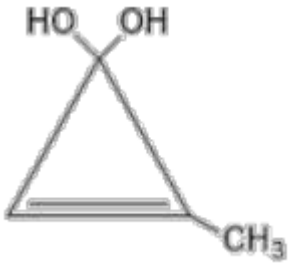
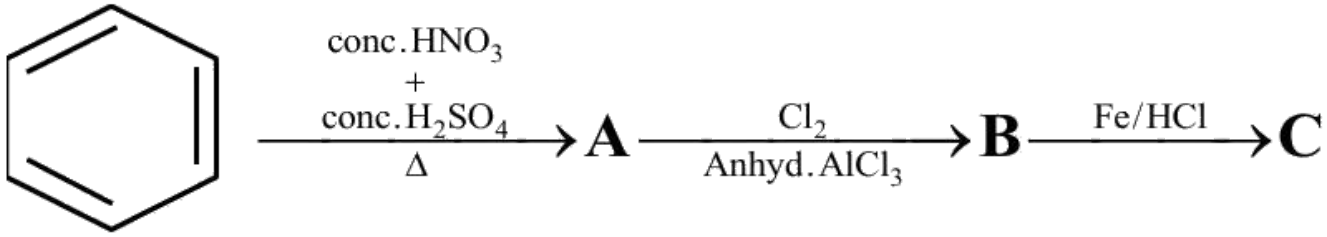


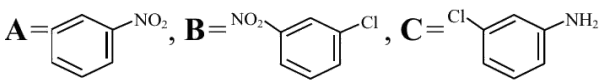
D.

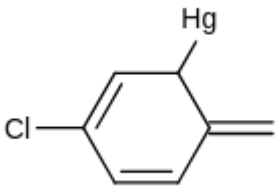


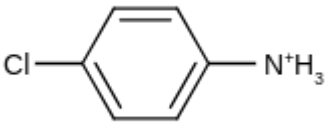
Question 71 View solution online

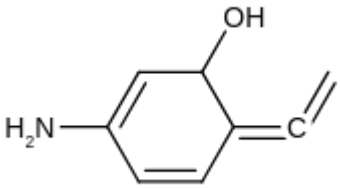
Identify correct **A**, **B** and **C** in the reaction sequence given below :



A. 

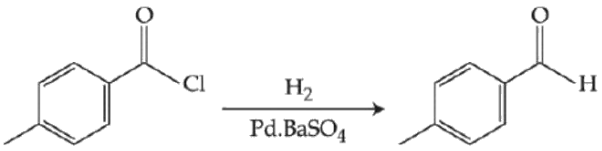
B. 

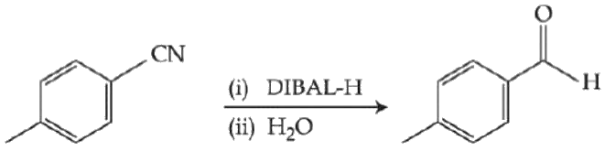
C. 

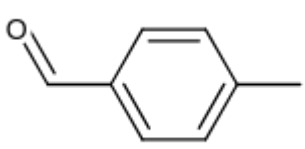
D. 

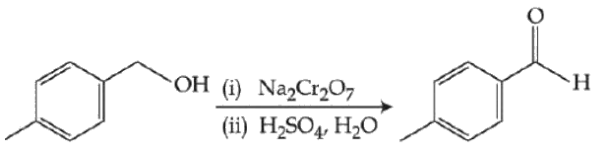
Question 72 View solution online

Which one of the following reactions does not represent correct combination of substrate and product under the given conditions ?

A. 

B. 

C. 

D. 

Hydrocarbons

Questions 73-193 / 121 selected / 40.3% practice weight / Focus first

Topics to prioritise in this collection

- Reactions of hydrocarbons: 116 questions / 95.9% of this chapter
- Hydrocarbons: 2 questions / 1.7% of this chapter
- Acid-catalysed alkene reaction: 1 question / 0.8% of this chapter
- Electrophilic addition: 1 question / 0.8% of this chapter
- Ozonolysis: 1 question / 0.8% of this chapter

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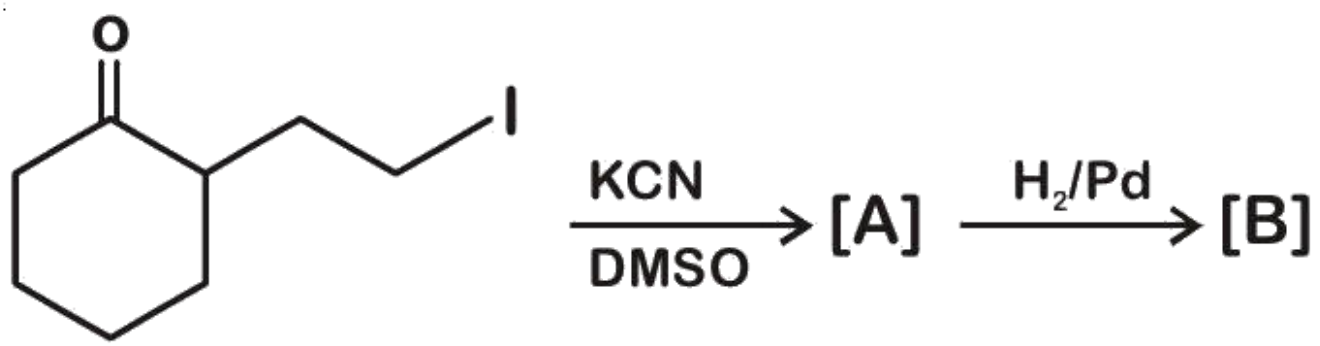
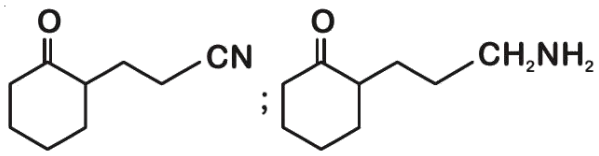
Question 73

View solution online

The major products A and B for the following reactions are, respectively



A.



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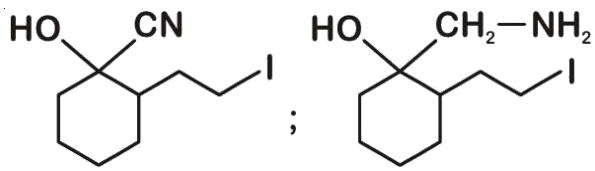
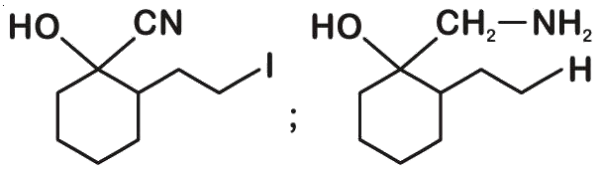
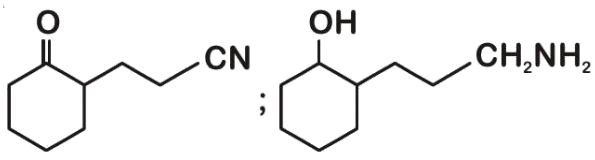


C.



D.



Question 74 View solution online

Match List I with List II.

	List I	List II
	Reaction	Reagents
	(A) Hoffmann Degradation	(I) Conc.KOH, Δ
	(B) Clemenson reduction	(II) $CHCl_3, NaOH/H_3O^{\oplus}$
	(C) Cannizaro reaction	(III) $Br_2, NaOH$
	(D) Reimer-Tiemann Reaction	(IV) $Zn - Hg/HCl$

Choose the correct answer from the options given below:

A. (A) -III , (B) -IV , (C) -I , (D) -II

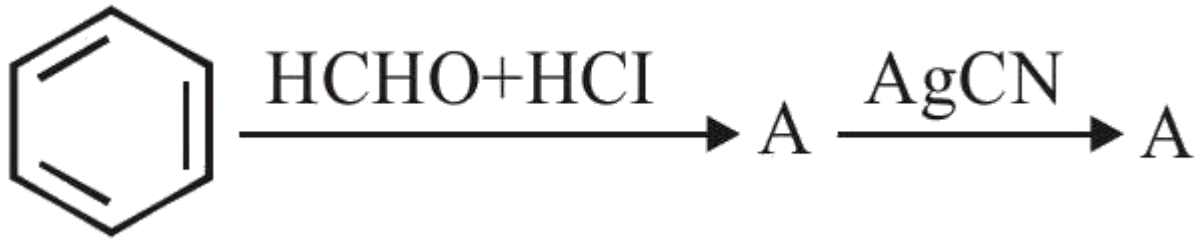
B. (A) - II, (B) -I, (C) - III, (D) - IV

C. (A) - III, (B) - IV, (C) - II, (D) - I

D. (A) -II , (B) -IV , (C) -I , (D) -III

Question 75 View solution online

The compounds A and B in the following reaction are, respectively:



A. $\mathbf{A}$ = Benzyl alcohol, $\mathbf{B}$ = Benzyl isocyanide

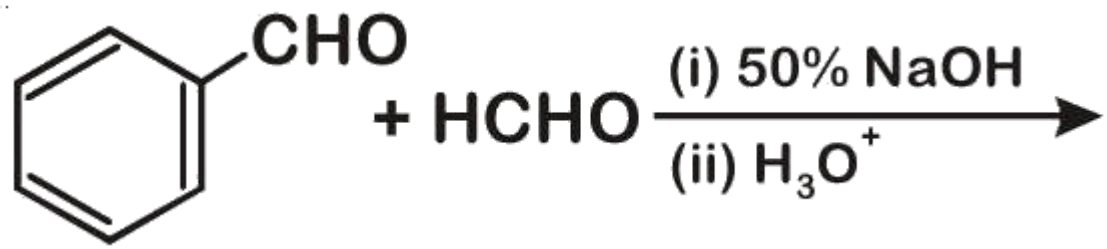
B. $\mathbf{A}$ = Benzyl alcohol, $\mathbf{B}$ = Benzyl cyanide

C. $\mathbf{A}$ = Benzyl chloride, $\mathbf{B}$ = Benzyl cyanide

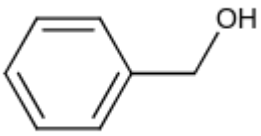
D. A = Benzyl chloride, B = Benzyl isocyanide

Question 76 View solution online

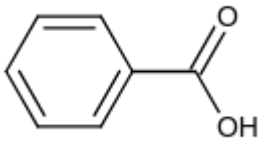
Major products of the following reaction are :



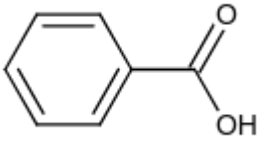
A. HCOOH and



B.



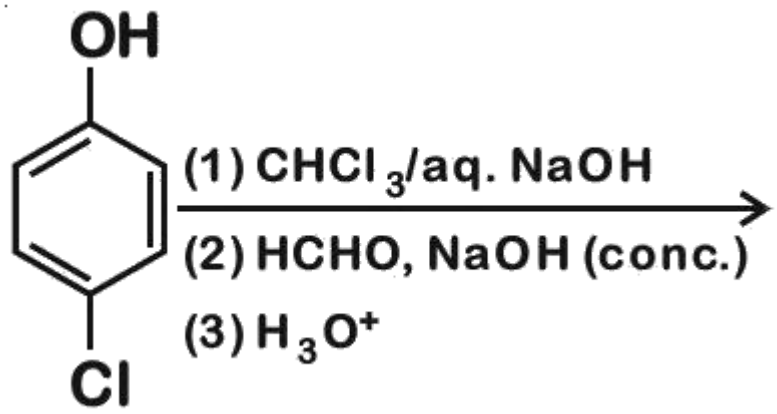
C. CH_3OH and



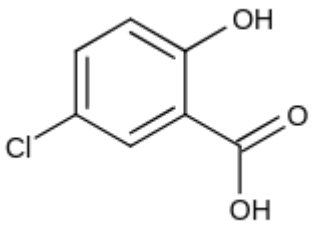
D. CH_3OH and HCO_2H

Question 77 View solution online

The major products of the following reaction are :



A.



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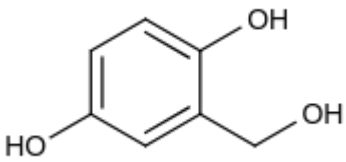

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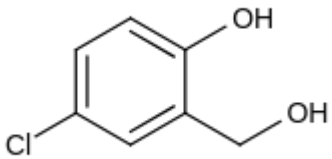
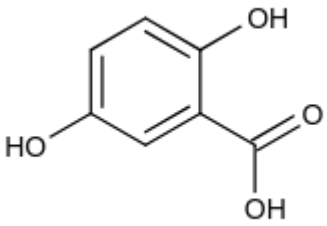
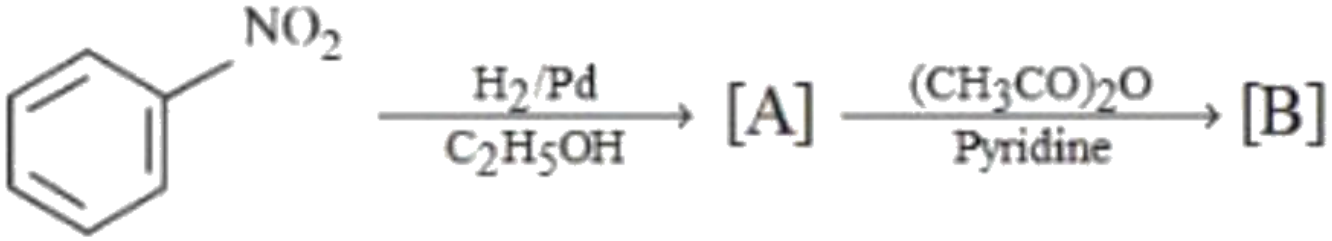


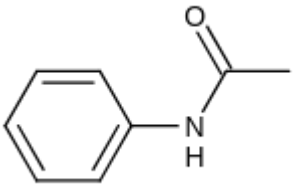
D.



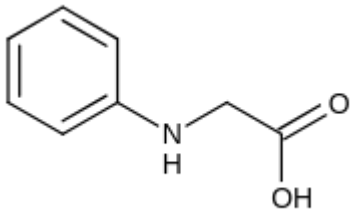
Question 78 View solution online

Consider the above reaction and identify the product B. Options





A.



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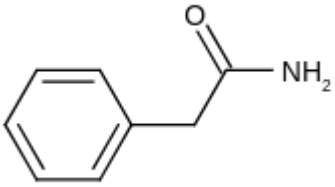

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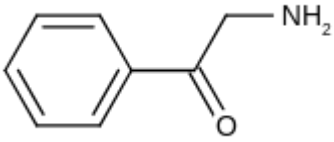
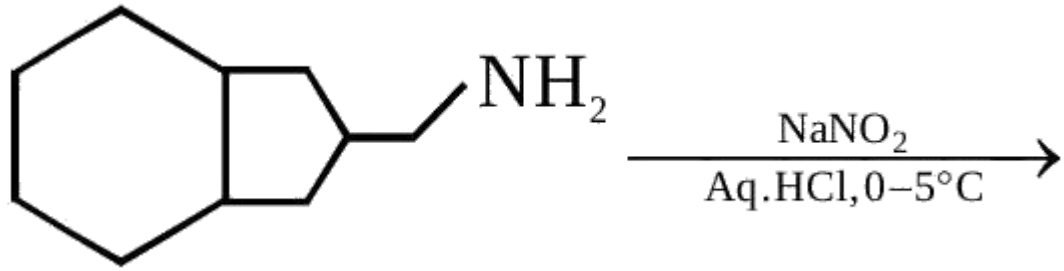


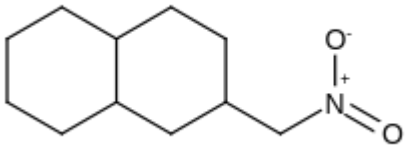
D.

Question 79 View solution online

The major product formed in the reaction given below will be :



A.



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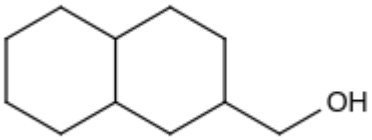

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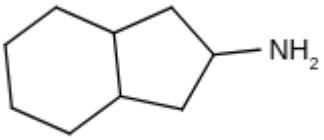
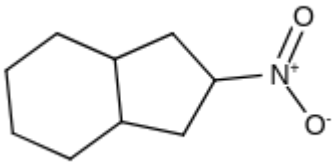
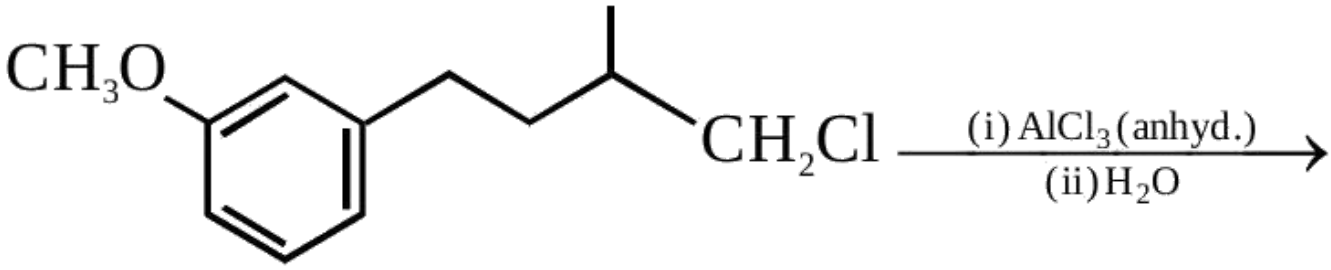


D.

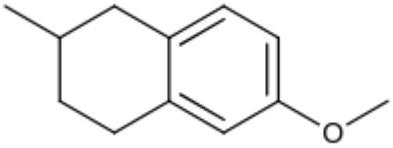


Question 80 View solution online

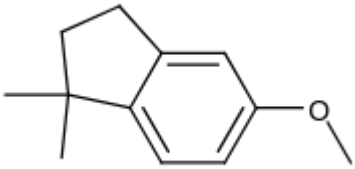
The major product of the following reaction is:



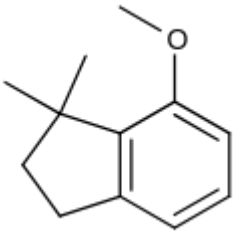
A.



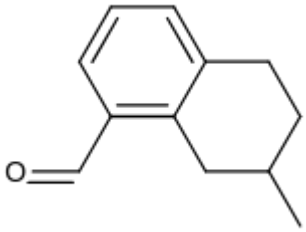
B.



C.

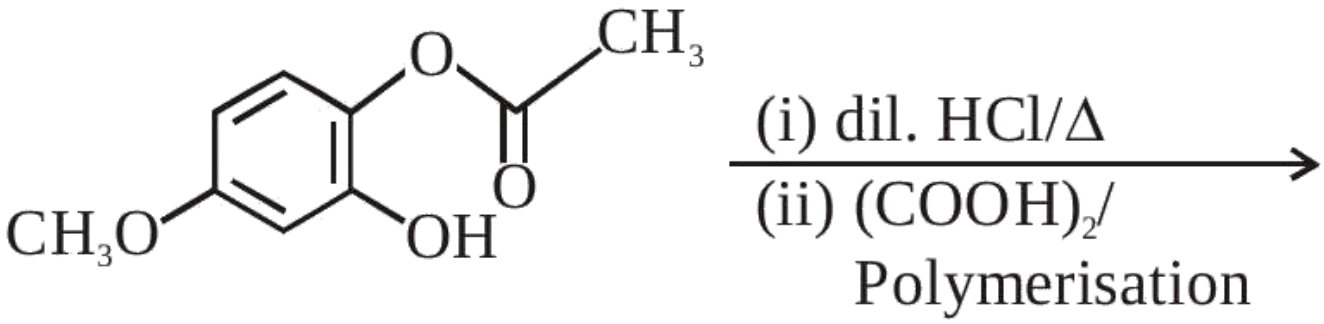


D.

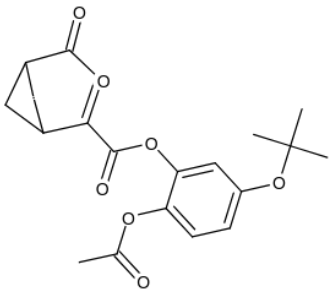


Question 81 View solution online

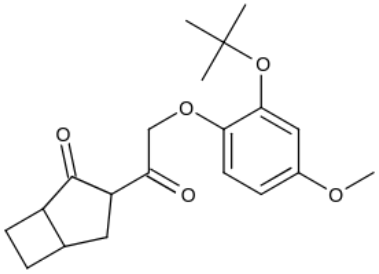
The major product of the following reaction is:



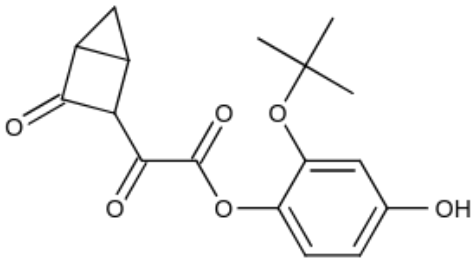
A.



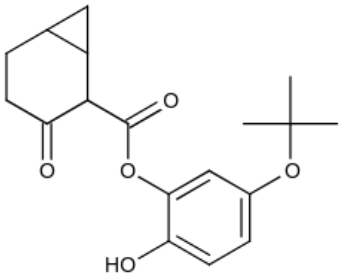
B.



C.

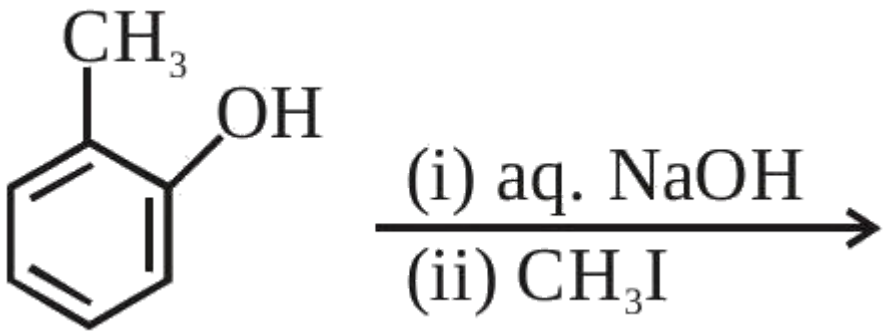


D.

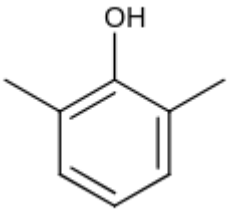


Question 82 View solution online

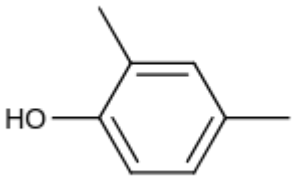
The major product of the following reaction is:



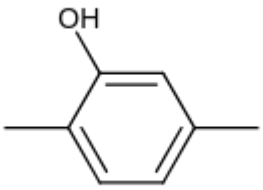
A.



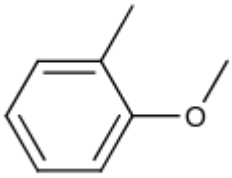
B.



C.

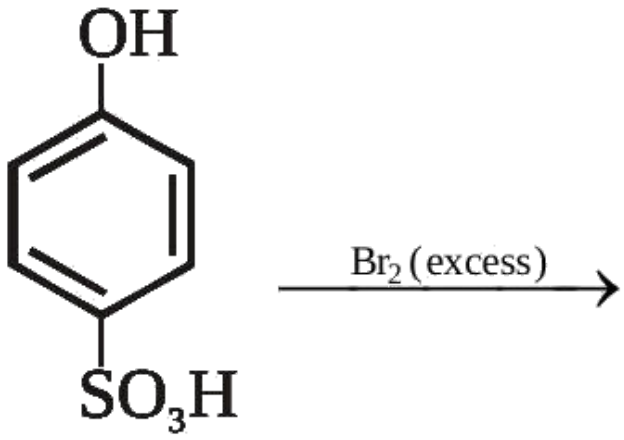


D.

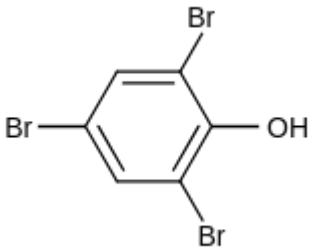


Question 83 View solution online

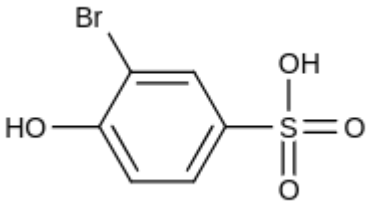
The major product of the following reaction is :



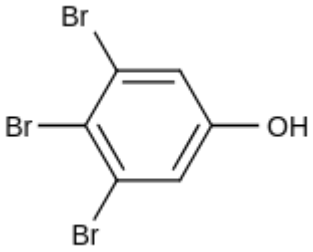
A.



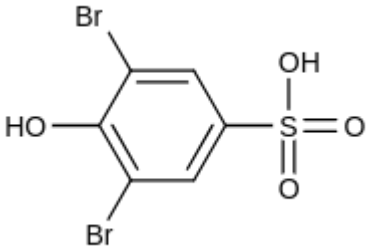
B.



C.

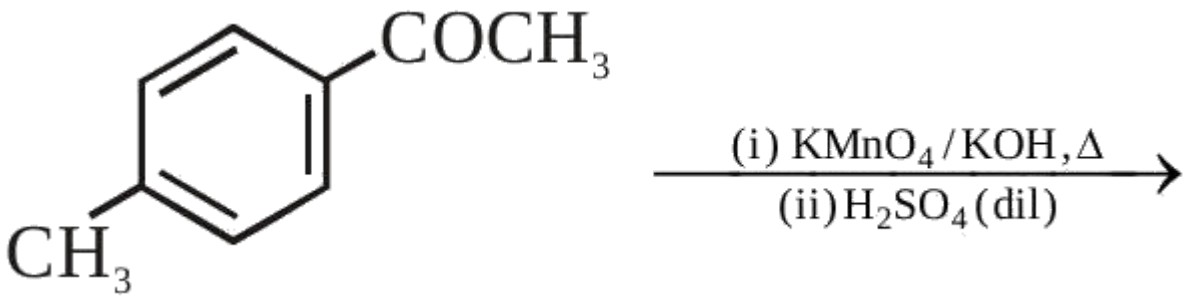


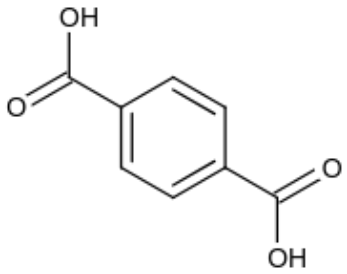
D.



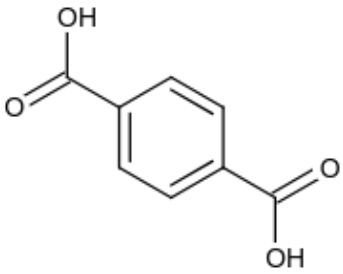
Question 84 View solution online

The major product of the following reaction is :

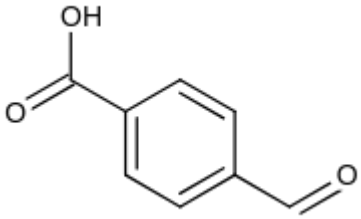




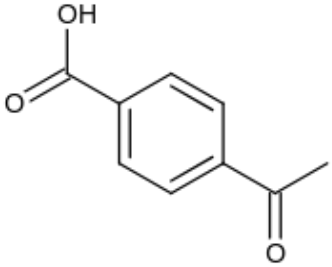
A.



B.



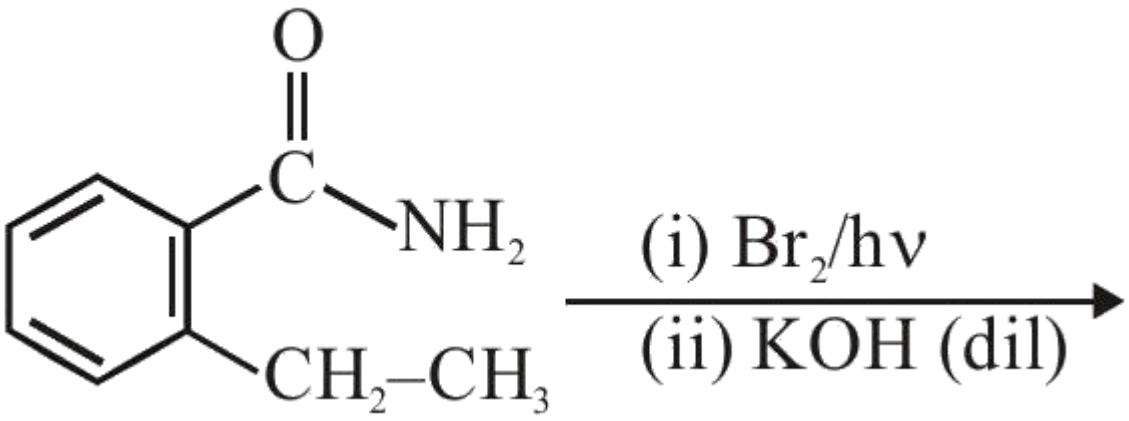
C.



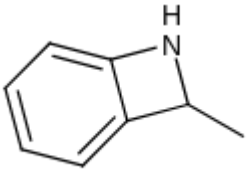
D.

Question 85 View solution online

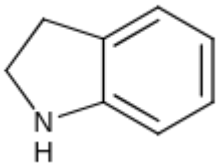
The major product of the following reaction is :



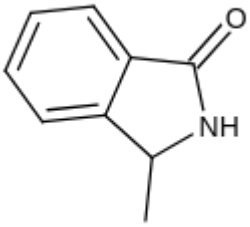
A.



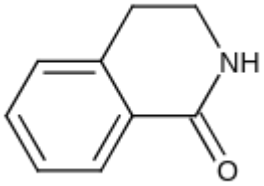
B.



C.

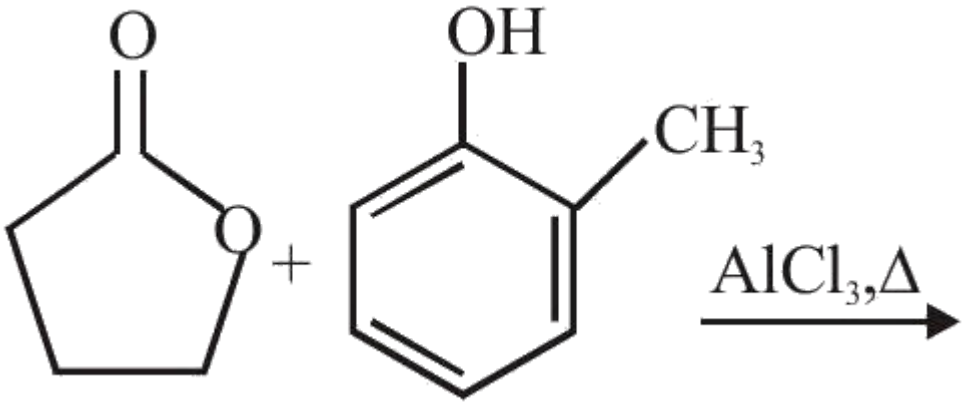


D.

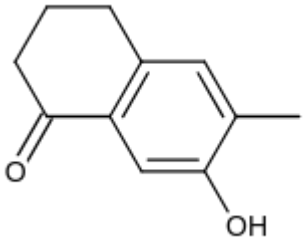


Question 86 View solution online

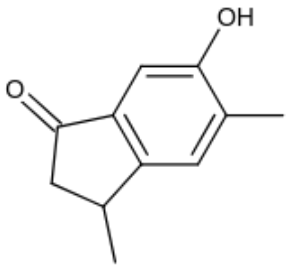
The major product of the following reaction is:



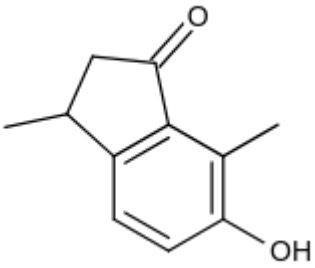
A.



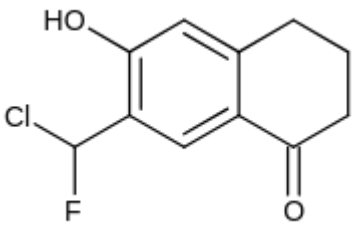
B.



C.

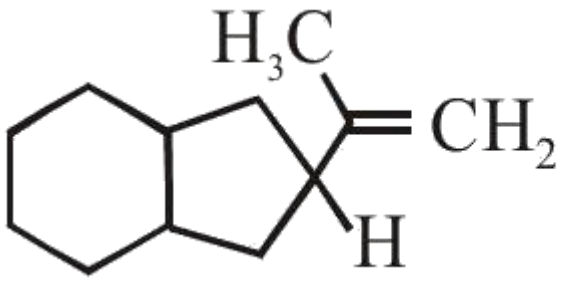


D.



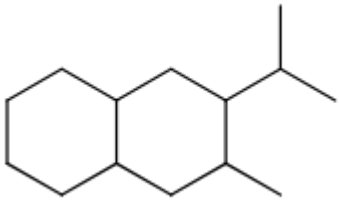
Question 87 View solution online

The major product of the following reaction is:

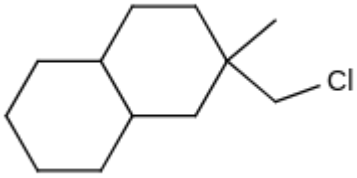


$\xrightarrow{HCl}$

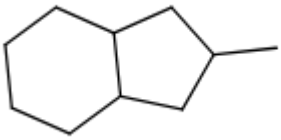
A.



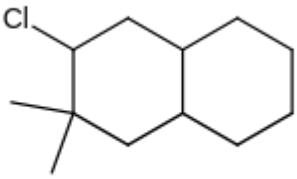
B.



C.

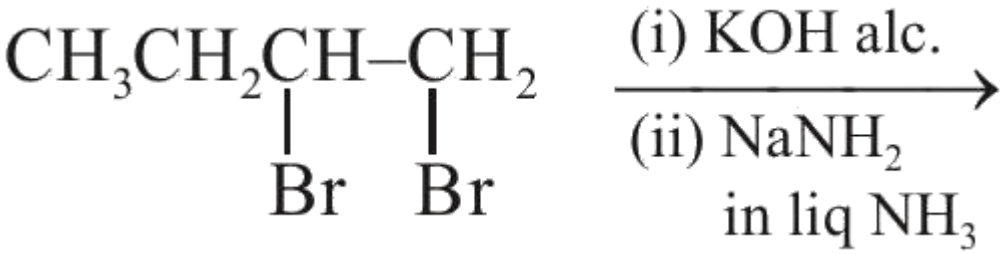


D.



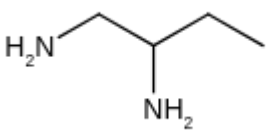
Question 88 View solution online

The major product of the following reaction is:



A. $CH_3CH_2C \equiv CH$

B.

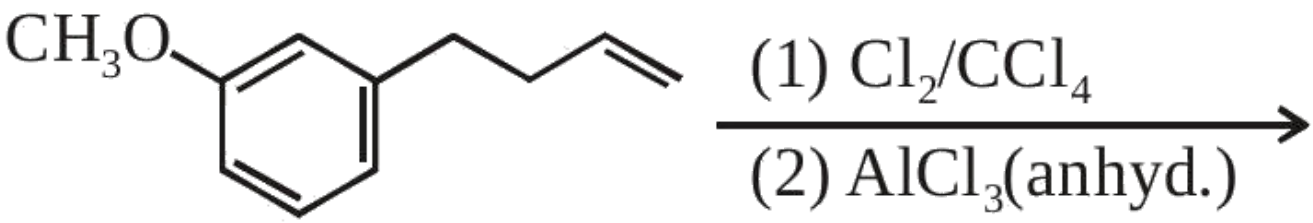


C. $CH_3CH = C = CH_2$

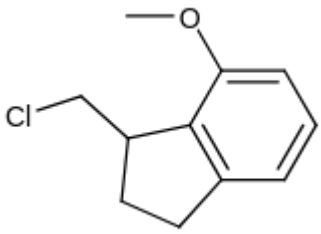
D. $CH_3CH = CHCH_2NH_2$

Question 89 View solution online

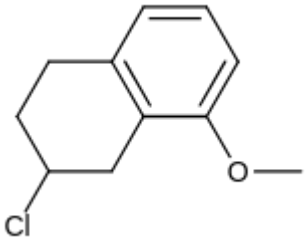
The major product of the following reaction is:



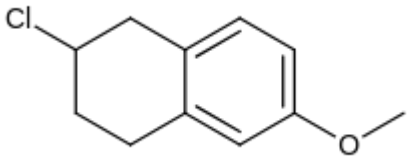
A.



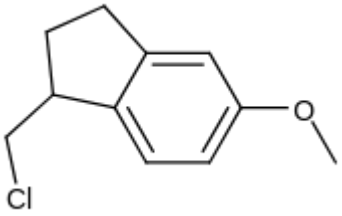
B.



C.

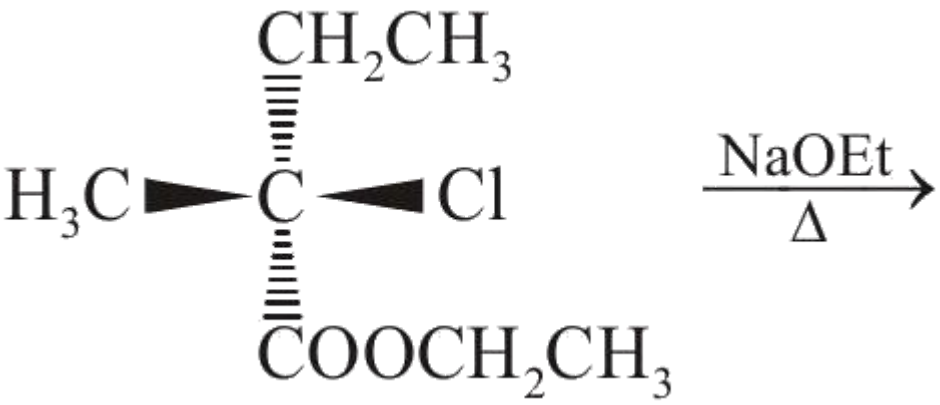


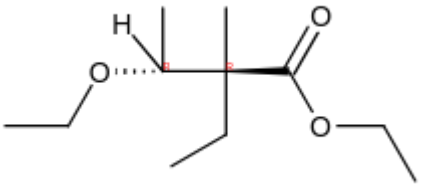
D.



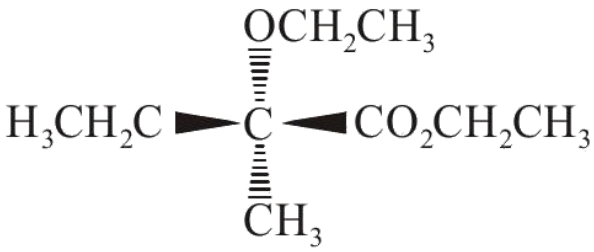
Question 90 View solution online

The major product of the following reaction is:

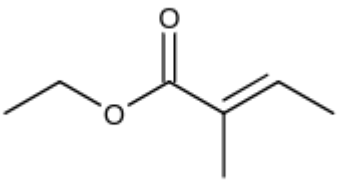




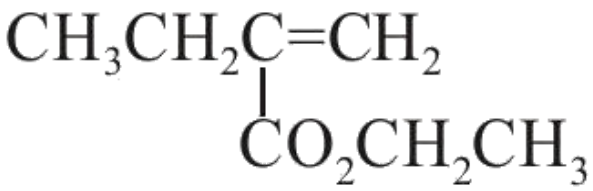
A.



B.



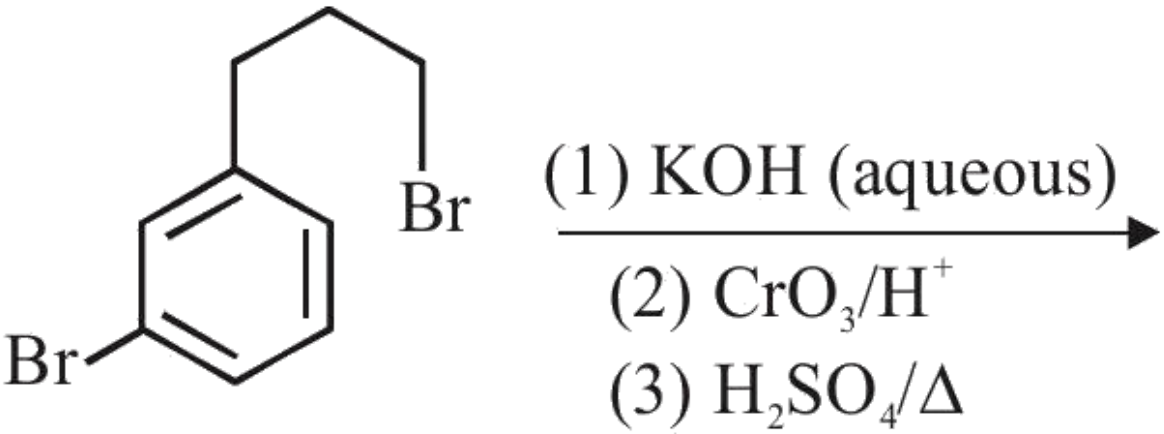
C.

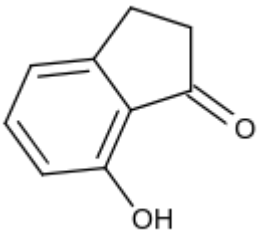


D.

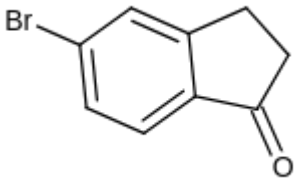
Question 91 View solution online

The major product of the following reaction is:

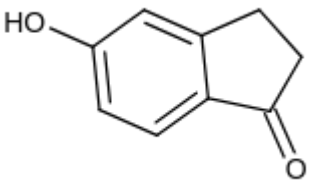




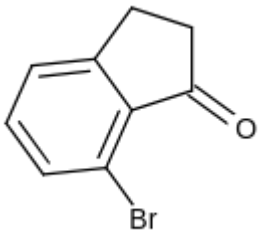
A.



B.



C.



D.

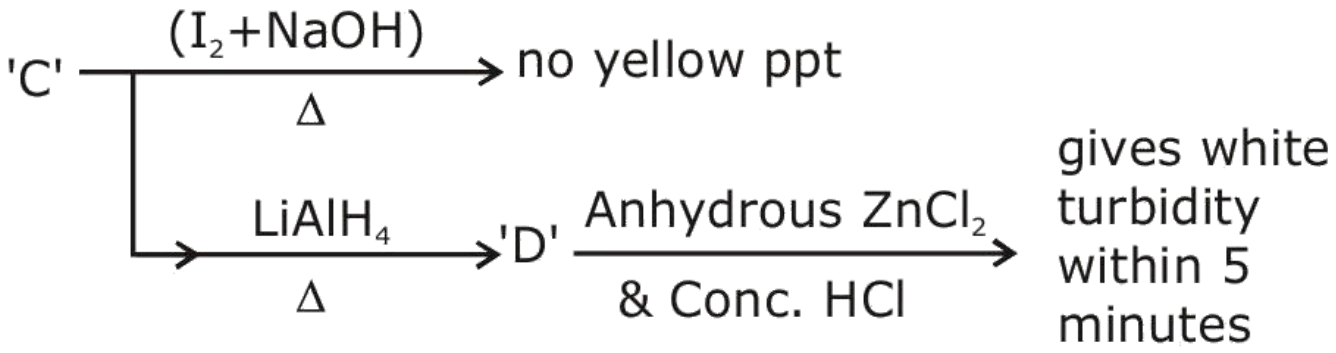
Question 92 View solution online

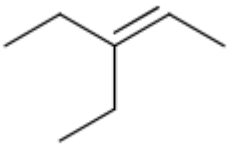
Consider the following reactions :

$\xrightarrow[(C_7H_{14})]{(A} \xrightarrow{\text{ozonolysis}} 'B' + 'C'$

$'B' \underset{\Delta}{\underbrace{\quad}} \Delta Ag_2O$ ($I_2 + NaOH$) yellow ppt

' A ' is :

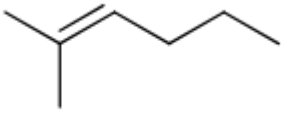




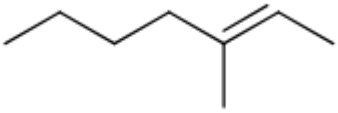
A.



B.



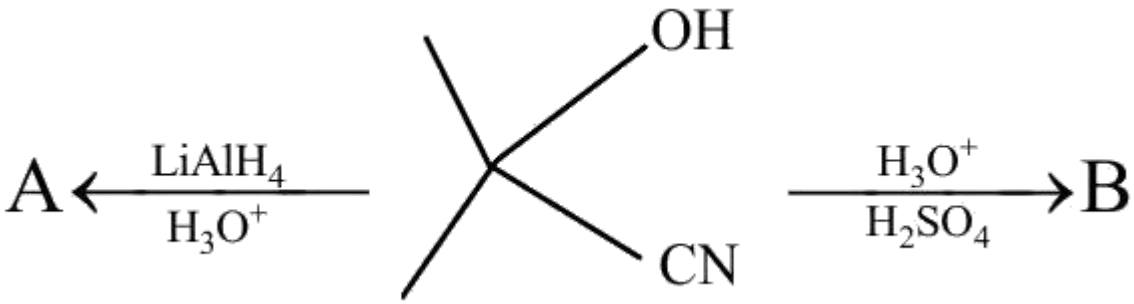
C.



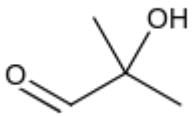
D.

Question 93 View solution online

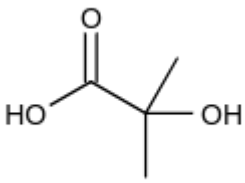
The major products A and B in the following set of reactions are :



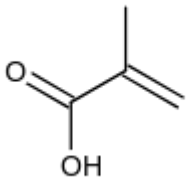
A.



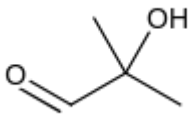
B.



C.

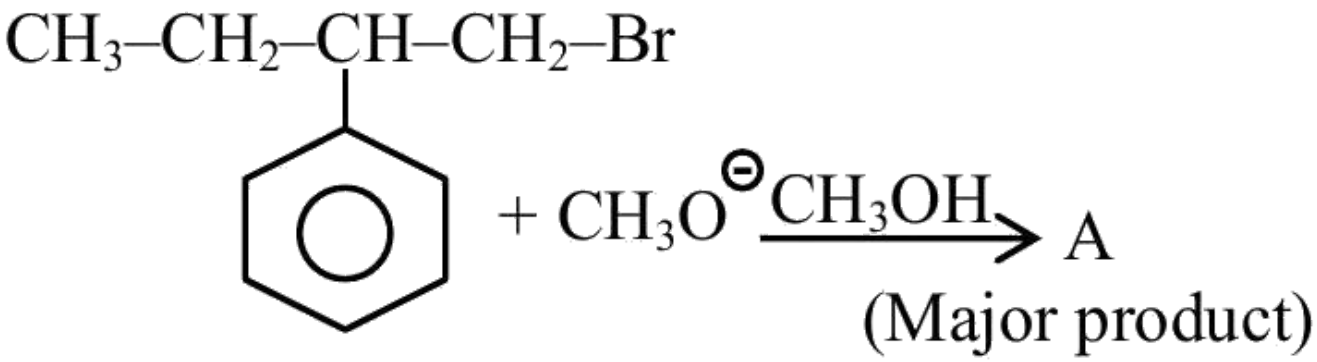


D.

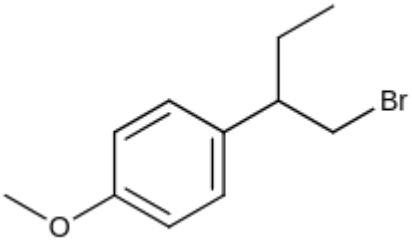


Question 94 View solution online

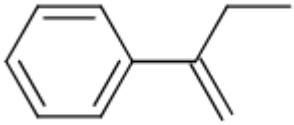
The major product (A) formed in the reaction given below is :



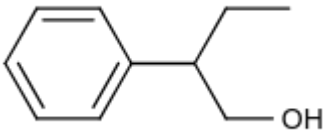
A.



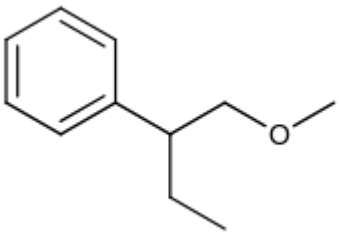
B.



C.

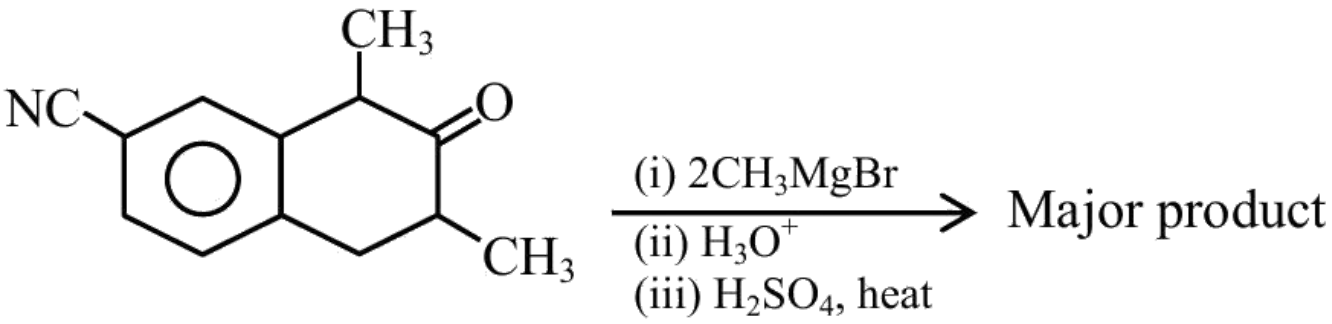


D.

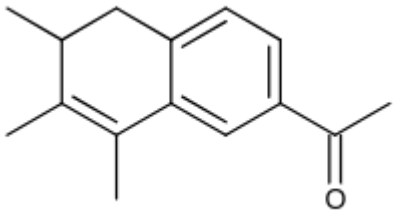


Question 95 View solution online

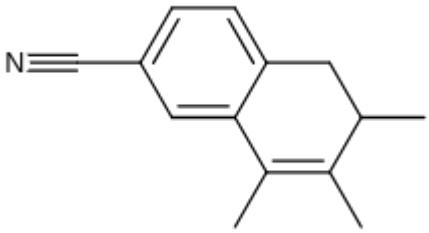
Which one of the following is the major product of the given reaction?



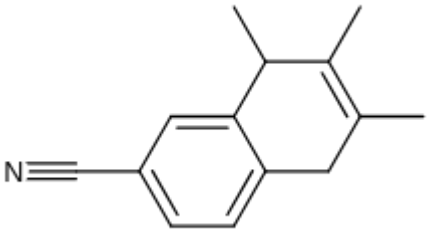
A.



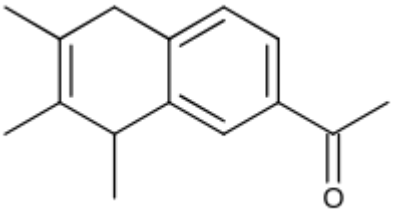
B.



C.

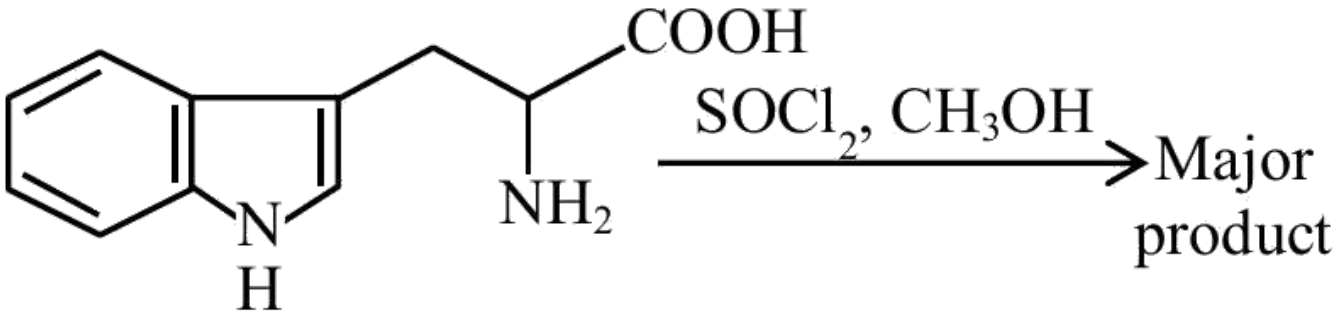


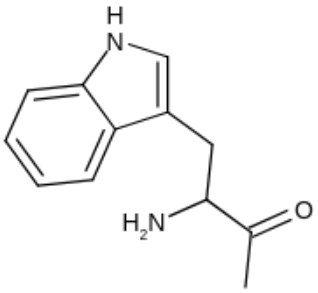
D.



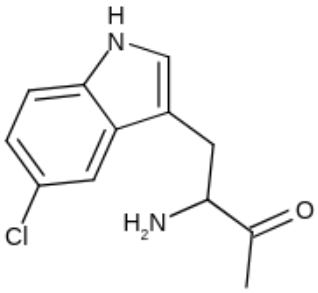
Question 96 View solution online

The major product formed in the following reaction is :

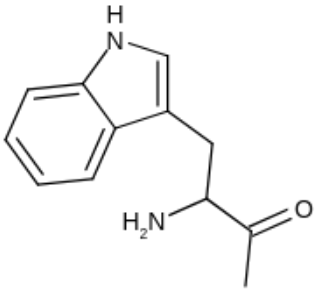




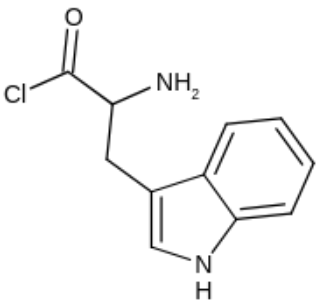
A.



B.



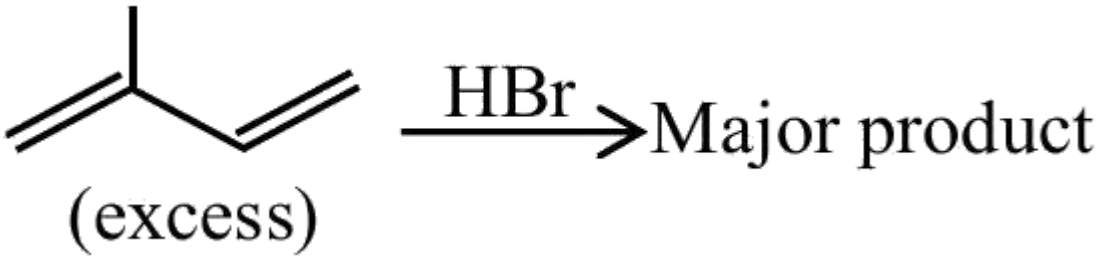
C.



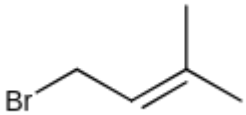
D.

Question 97 View solution online

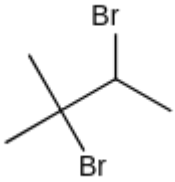
The major product formed in the following reaction is :



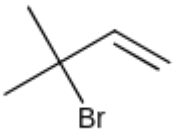
A.



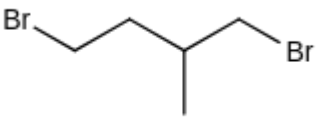
B.



C.

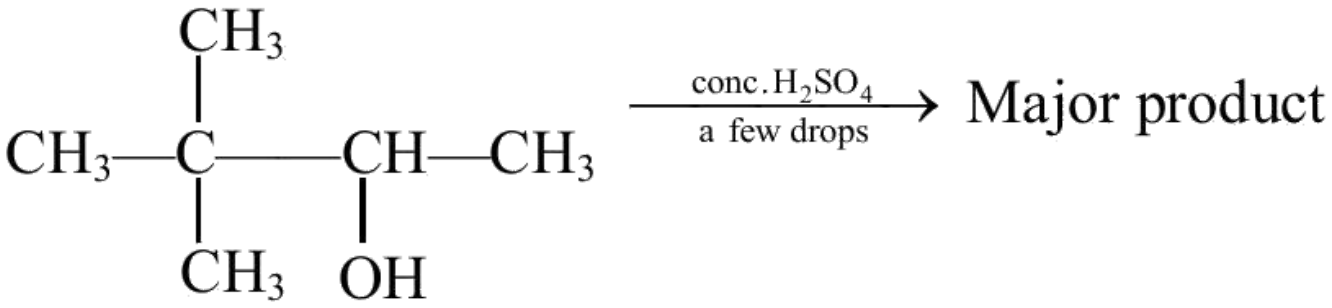


D.

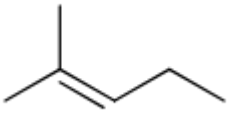


Question 98 View solution online

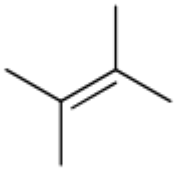
The major product formed in the following reaction is :



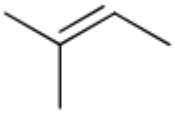
A.



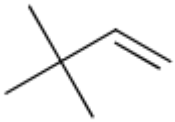
B.



C.

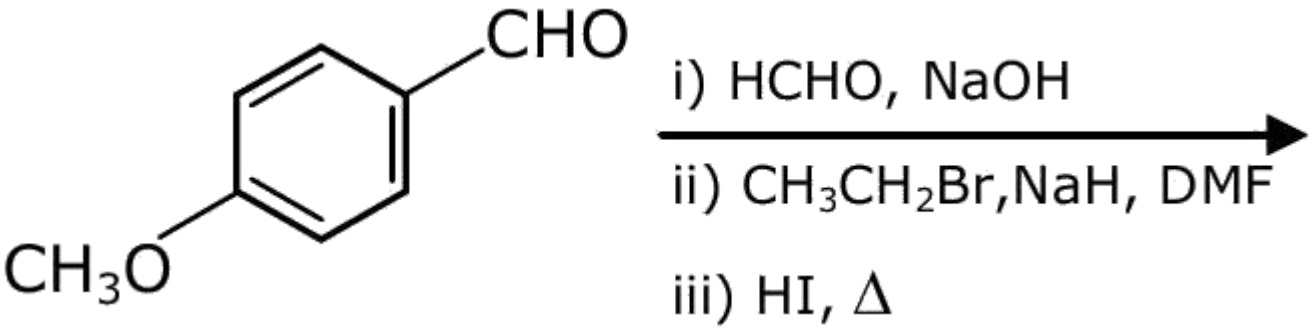


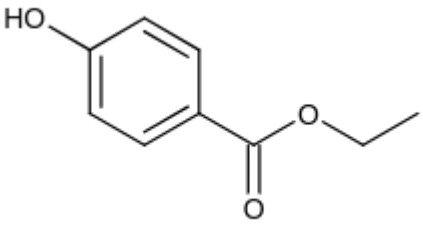
D.



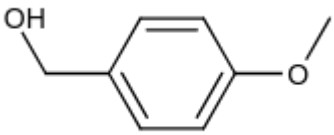
Question 99 View solution online

Identify A in the following chemical reaction.

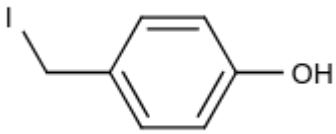




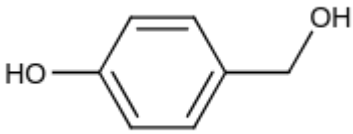
A.



B.



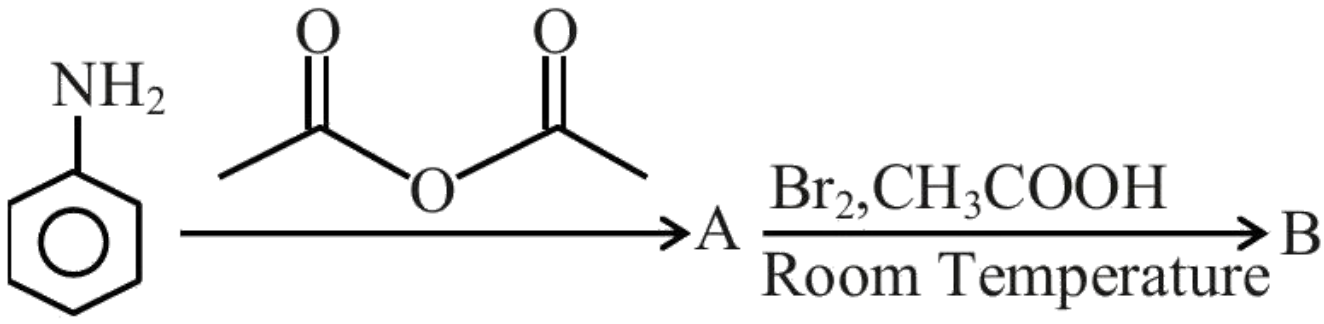
C.

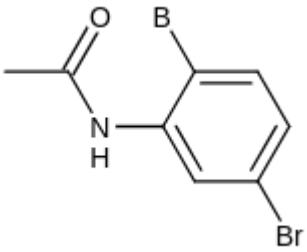


D.

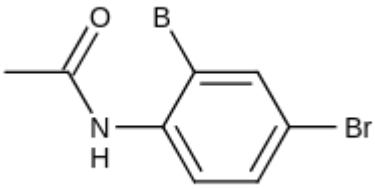
Question 100 View solution online

The major products A and B formed in the following reaction sequence are :



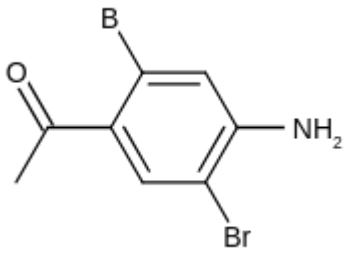


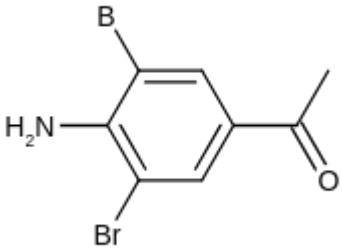
A.



B.

C. ,

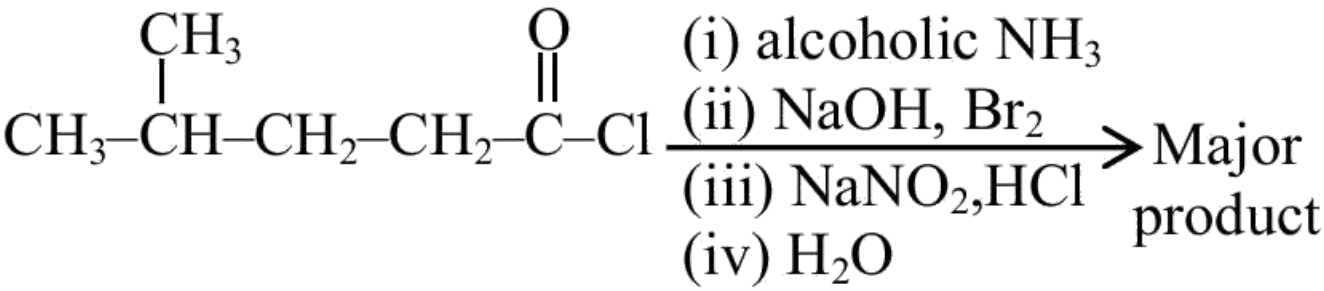




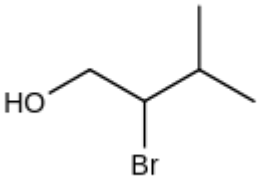
D.

Question 101 View solution online

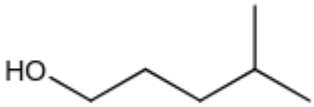
The major product of the following reaction is :



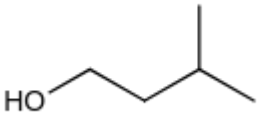
A.



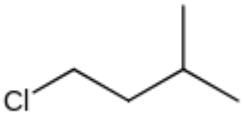
B.



C.

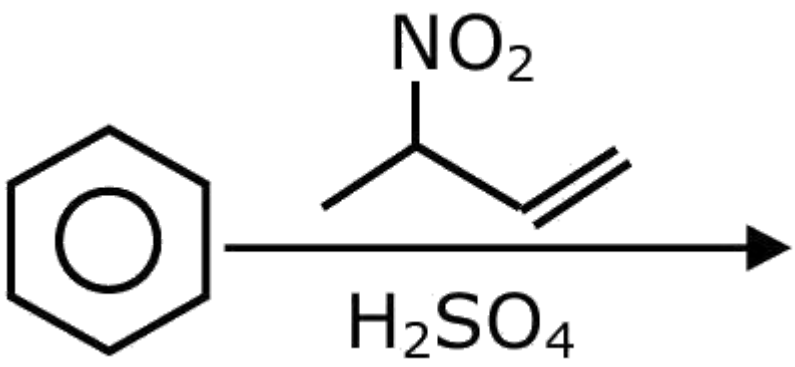


D.

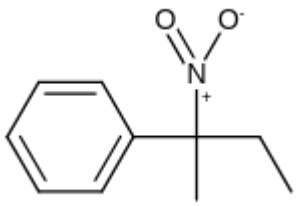


Question 102 View solution online

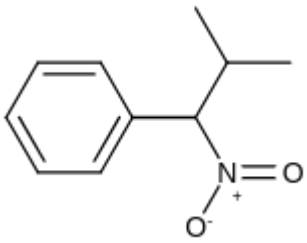
The major product of the following reaction is :



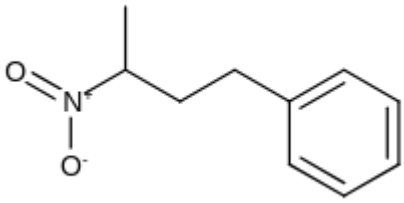
A.



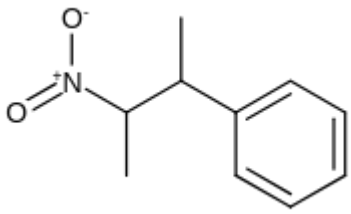
B.



C.

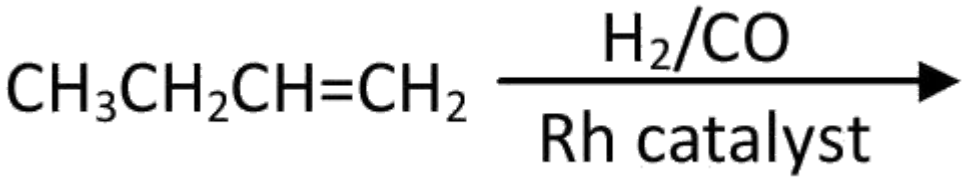


D.



Question 103 View solution online

The major product of the following reaction is :



A. $CH_3CH_2CH_2CHO$

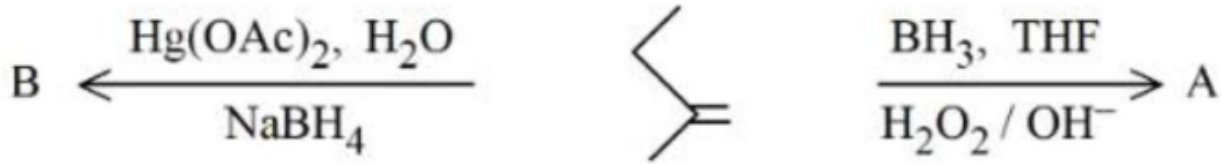
B. $CH_3CH_2CH = CH - CHO$

C. $CH_3CH_2CH_2CH_2CHO$

D. $CH_3CH_2C = CH_2$

Question 104 View solution online

Find out the major products from the following reaction



A. 

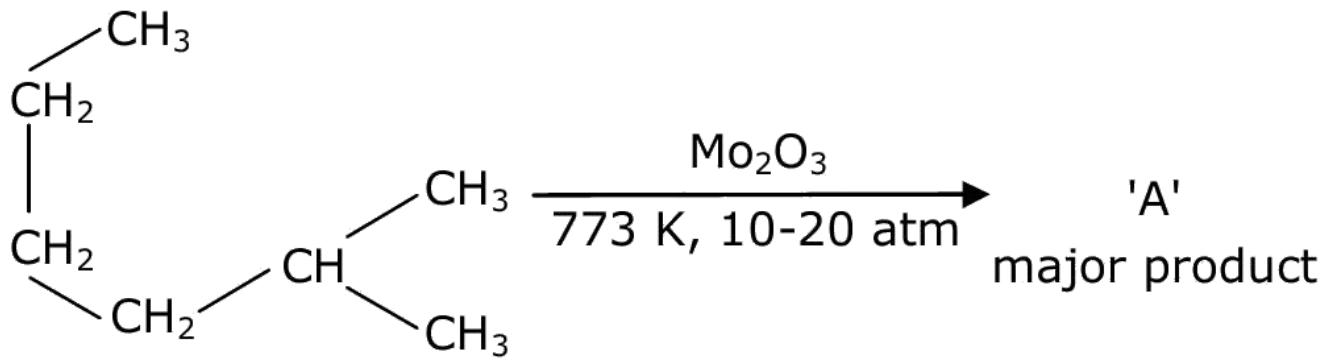
B. 

C. 

D. 

Question 105 View solution online

Identify A in the given chemical reaction.



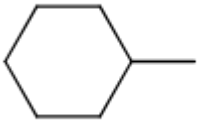
A.



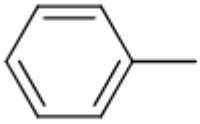
B.



C.

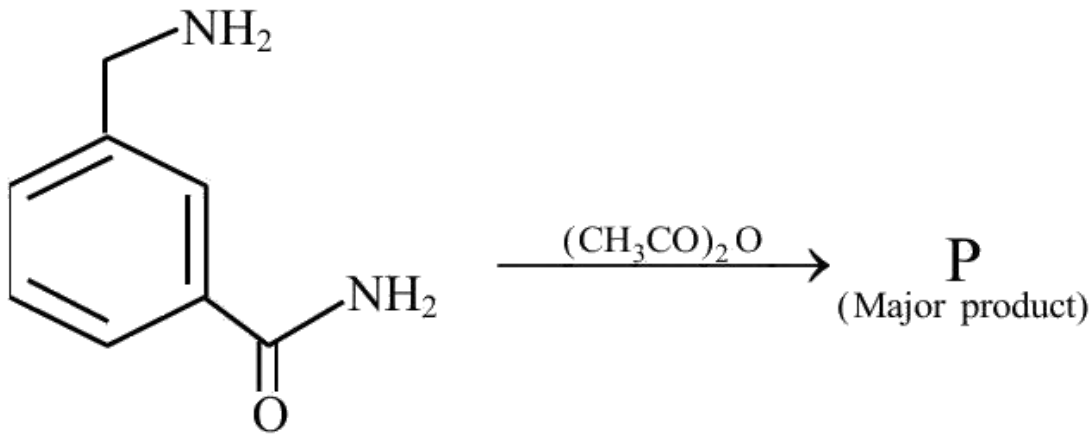


D.

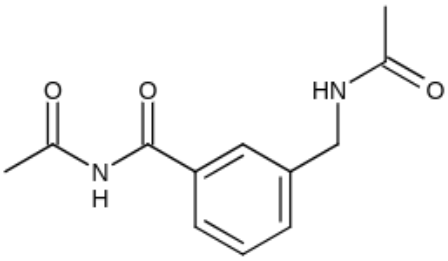


Question 106 View solution online

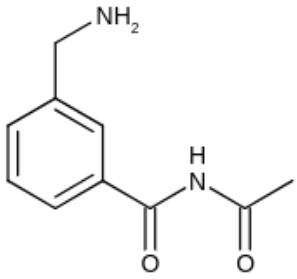
The major product in the above reaction is :



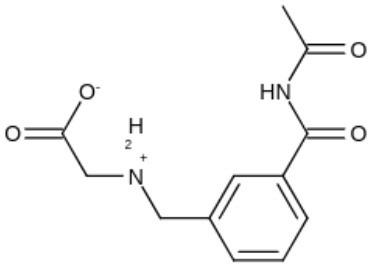
A.



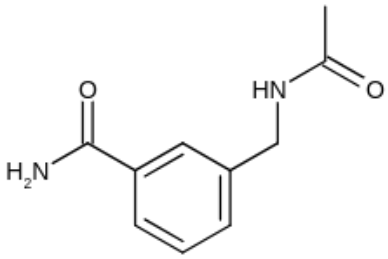
B.



C.

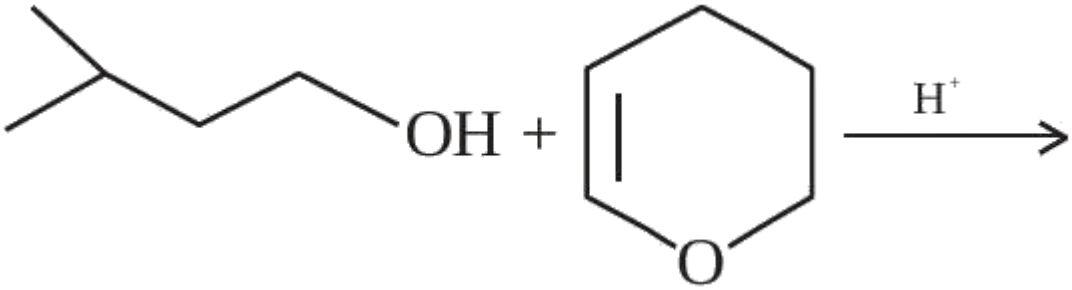


D.

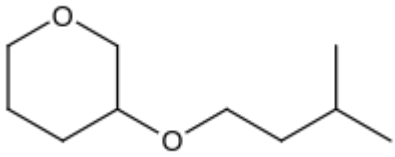


Question 107 View solution online

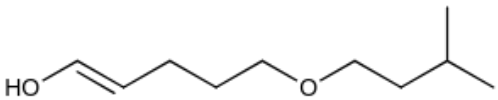
The major product formed in the following reaction, is



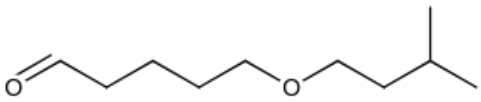
A.



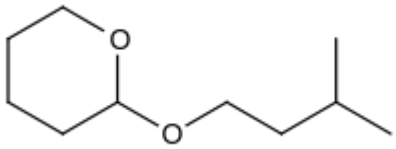
B.



C.

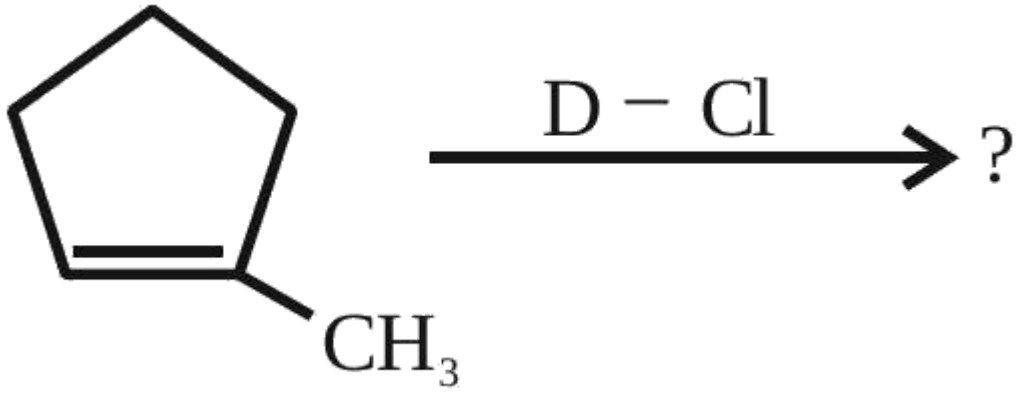


D.

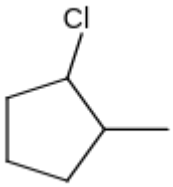


Question 108 View solution online

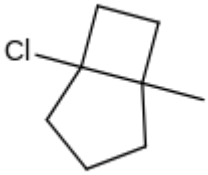
Major product of the following reaction is -



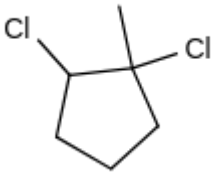
A.



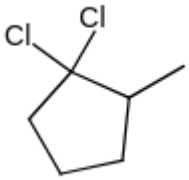
B.



C.

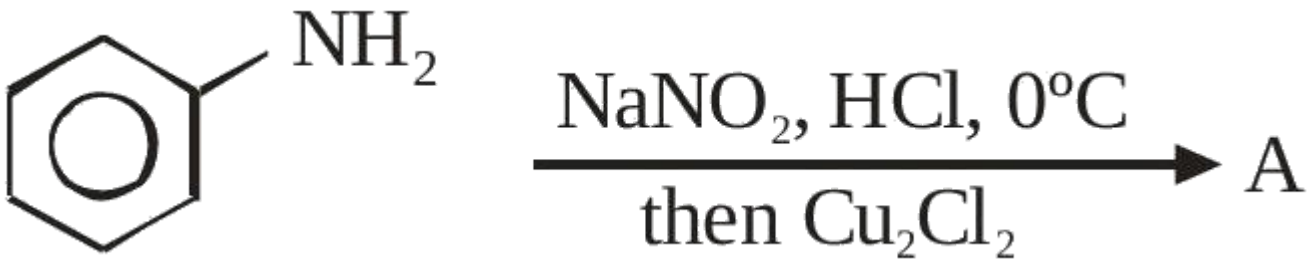


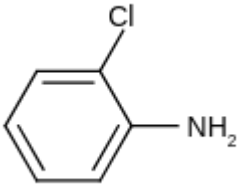
D.



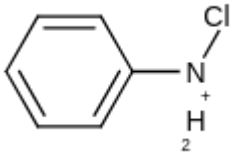
Question 109 View solution online

The product A formed in the following reaction is:

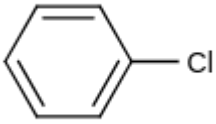




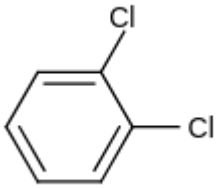
A.



B.



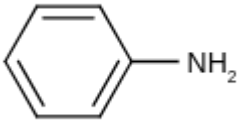
C.



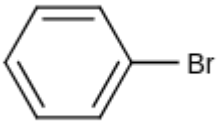
D.

Question 110 View solution online

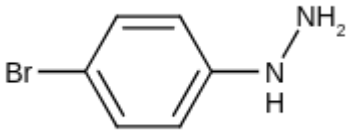
Identify the major product formed in the following sequence of reactions :



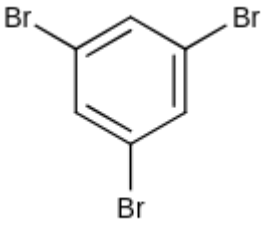
A.



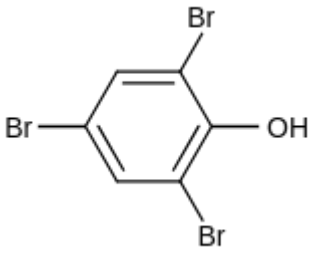
B.



C.

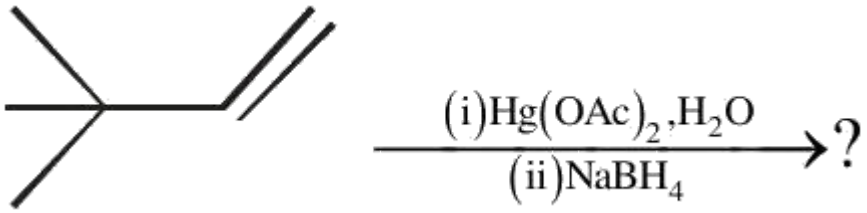


D.

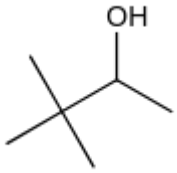


Question 111 View solution online

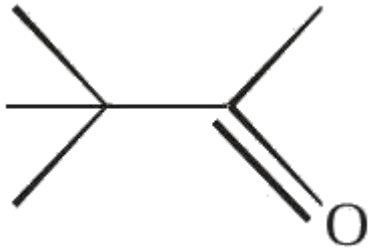
The major product in the following reaction



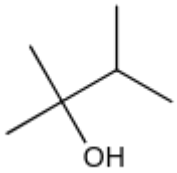
A.



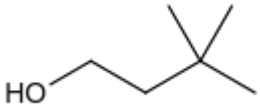
B.



C.

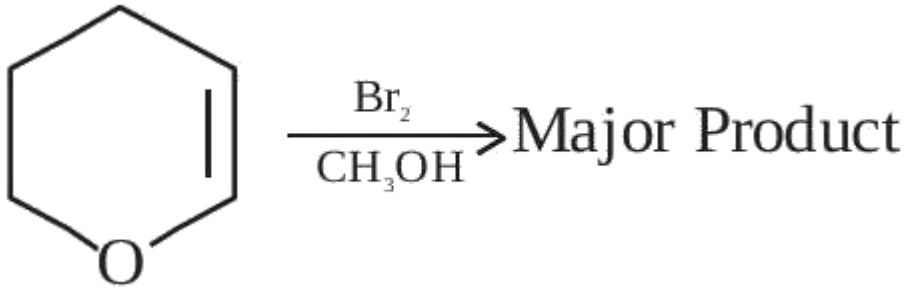


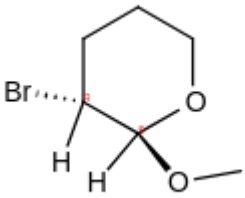
D.



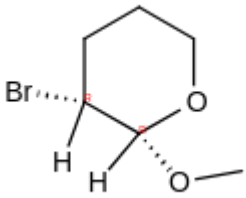
Question 112 View solution online

Amongst the following, the major product of the given chemical reaction is

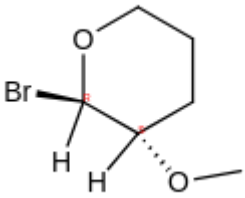




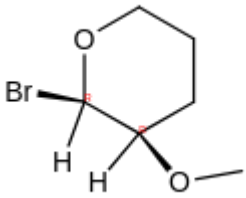
A.



B.



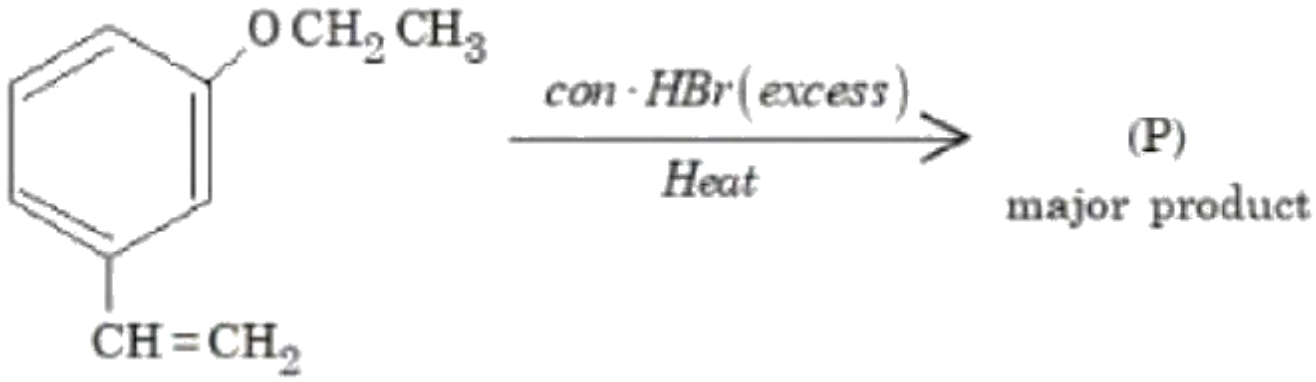
C.

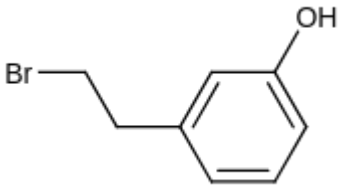


D.

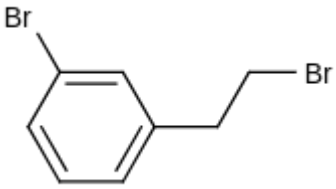
Question 113 View solution online

The major product(P) in the following reaction is

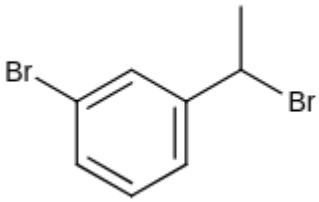




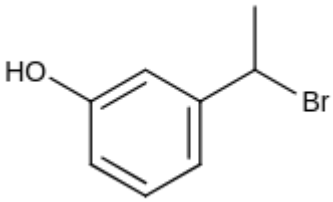
A.



B.



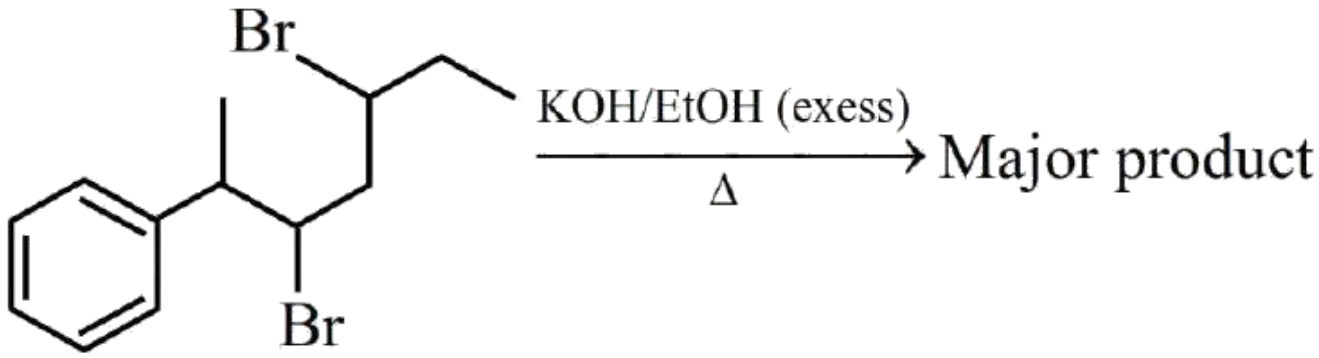
C.



D.

Question 114 View solution online

The major product of the following reaction is :



A. 6-Phenylhepta-2,4-diene

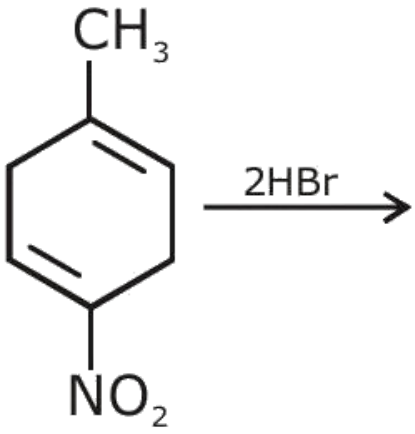
B. 2-Phenylhepta-2,5-diene

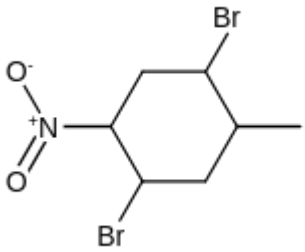
C. 6-Phenylhepta-3,5-diene

D. 2-Phenylhepta-2,4-diene

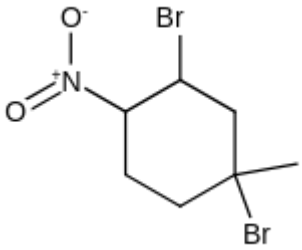
Question 115 View solution online

The major product of the following reaction is:

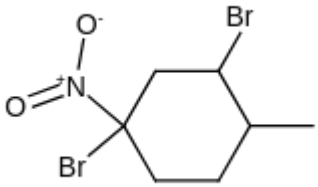




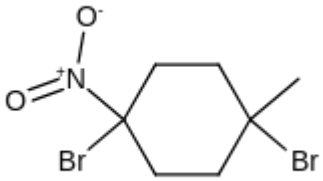
A.



B.



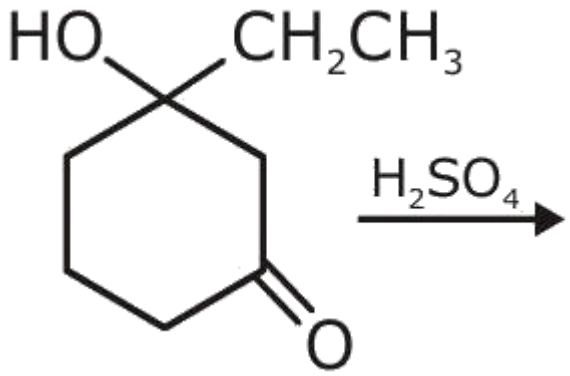
C.



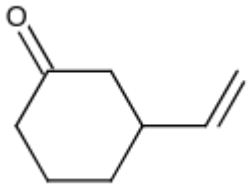
D.

Question 116 View solution online

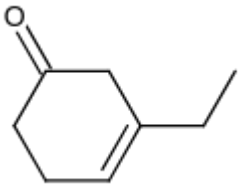
The major product of the following reaction is:



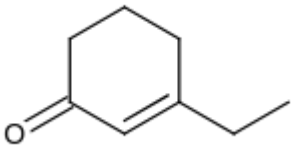
A.



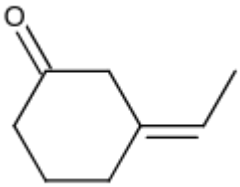
B.



C.

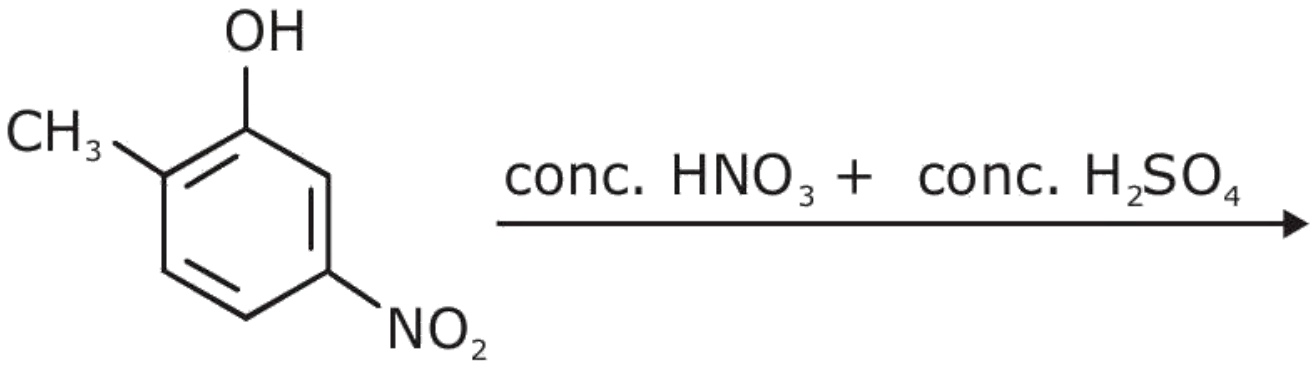


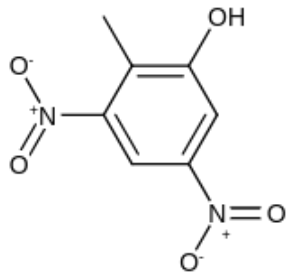
D.



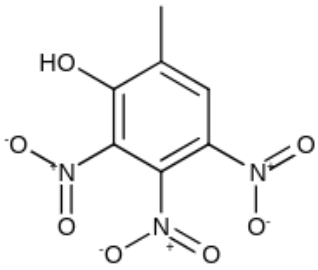
Question 117 View solution online

The major product of the following reaction is :

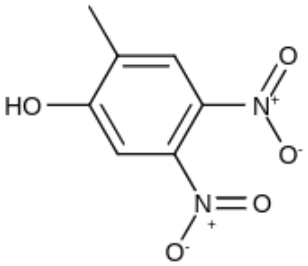




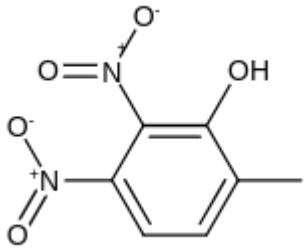
A.



B.



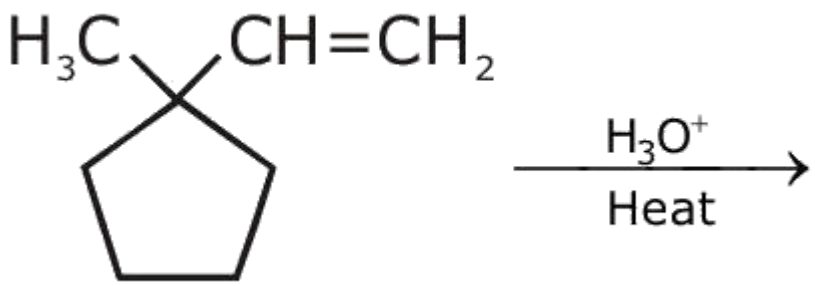
C.



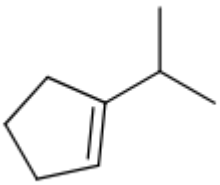
D.

Question 118 View solution online

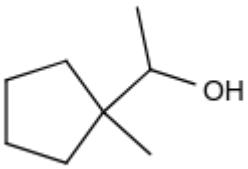
The major product in the following reaction is:



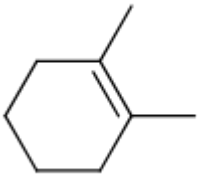
A.



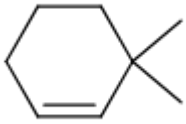
B.



C.

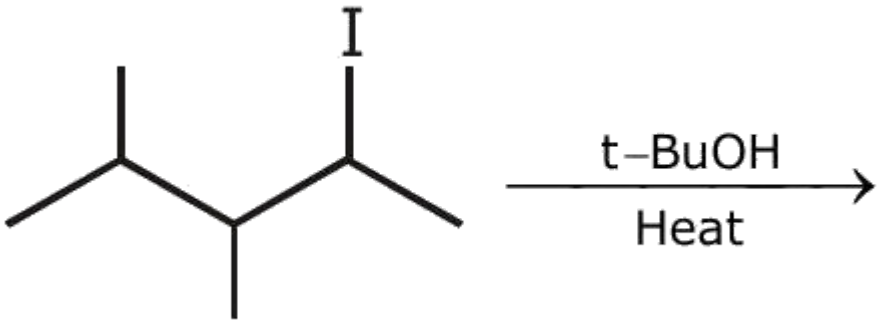


D.

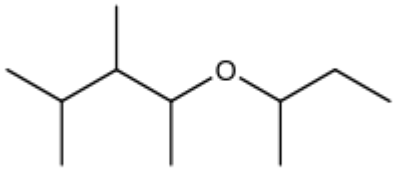


Question 119 View solution online

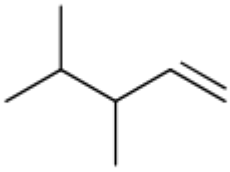
The major product in the following reaction is:



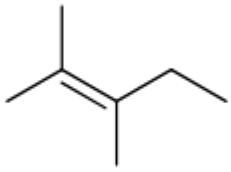
A.



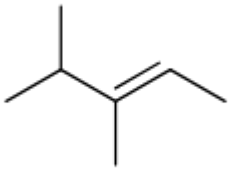
B.



C.



D.



Question 120 View solution online

The major product formed in the following reaction is :

$$CH_3CH=CHCH(CH_3)_2 \xrightarrow{HBr}$$

A. $CH_3CH(Br)CH_2CH(CH_3)_2$

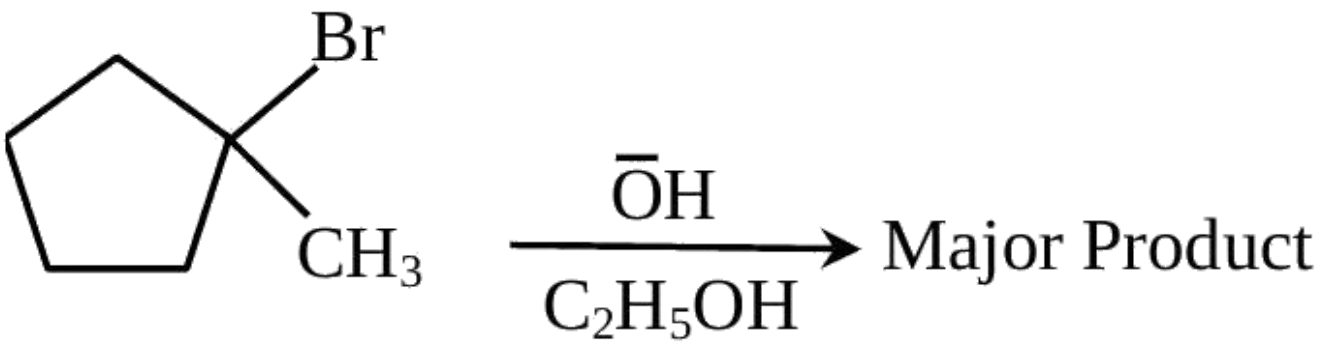
B. $CH_3CH_2CH_2C(Br)(CH_3)_2$

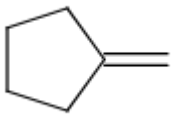
C. $CH_3CH_2CH(Br)CH(CH_3)_2$

D. $Br(CH_2)_3CH(CH_3)_2$

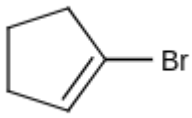
Question 121 View solution online

Identify the major product in the following reaction.

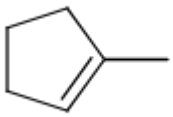




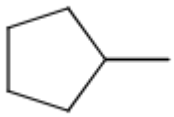
A.



B.



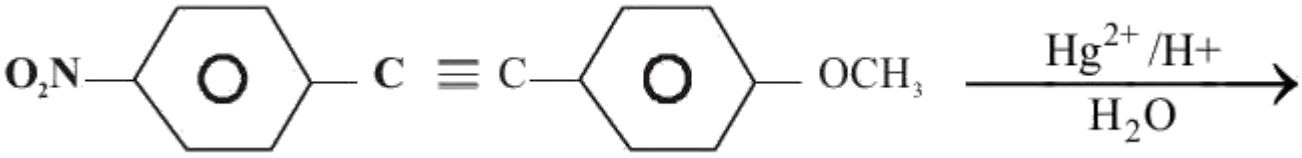
C.



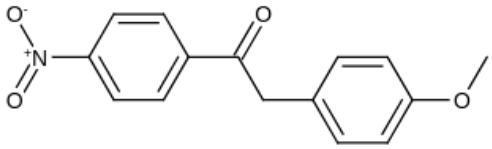
D.

Question 122 View solution online

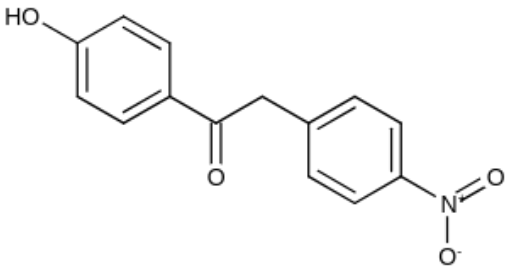
The major product obtained from the following reactions is :



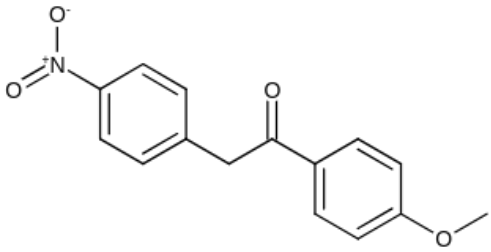
A.



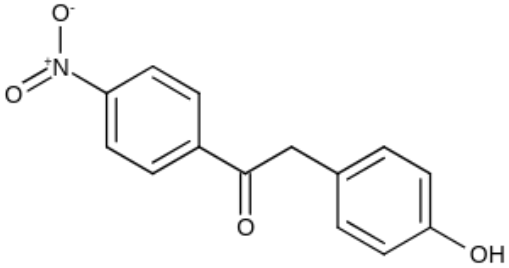
B.



C.

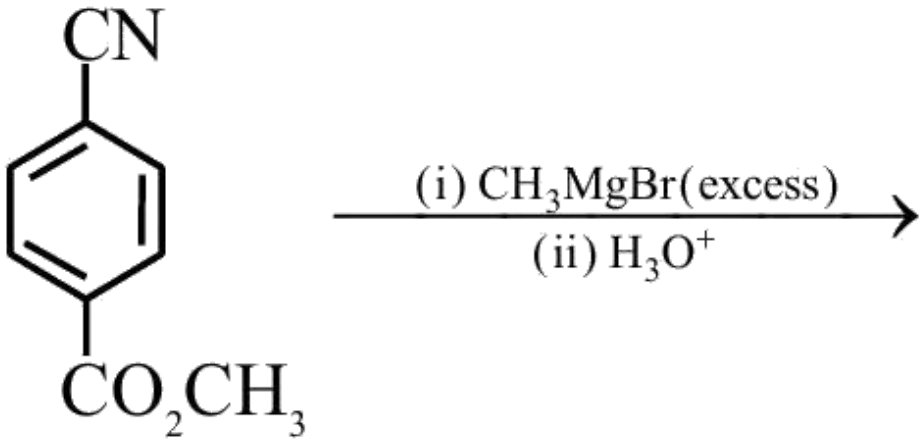


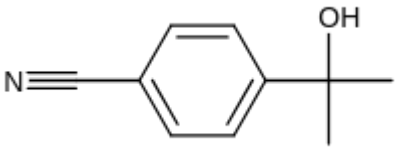
D.



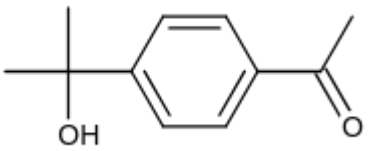
Question 123 View solution online

Major product of the following reaction is

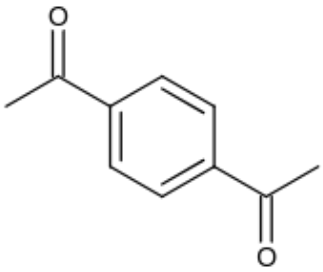




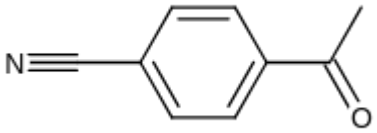
A.



B.



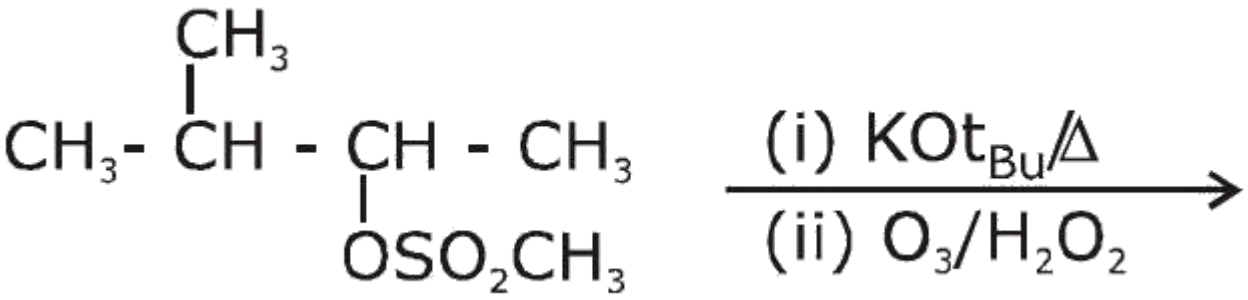
C.



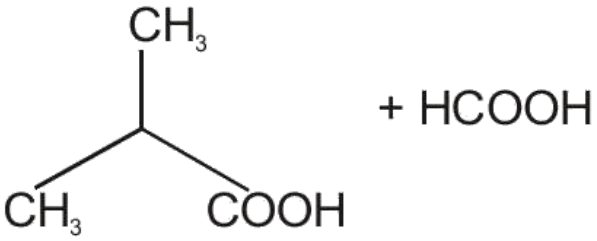
D.

Question 124 View solution online

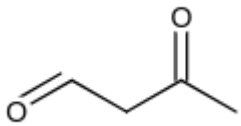
The major products of the following reactions are :



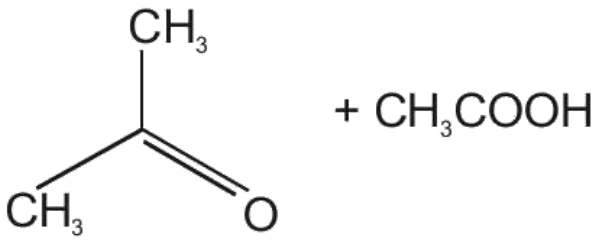
A.



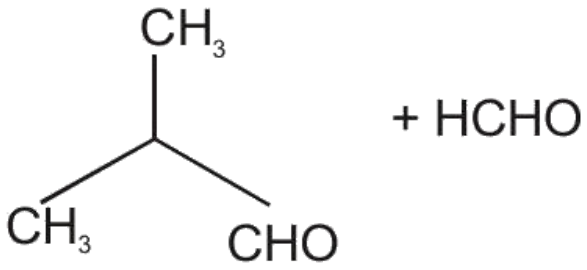
B.



C.

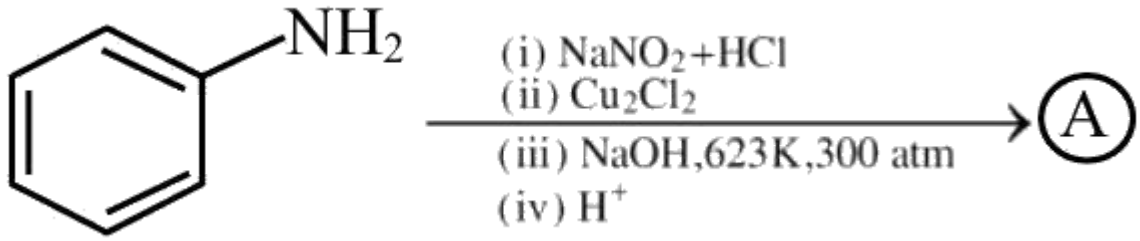


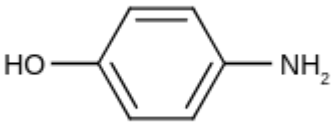
D.



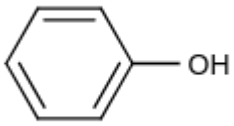
Question 125 View solution online

Identify the product (A) in the following reaction.

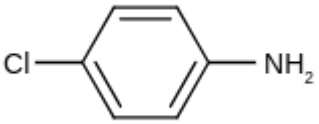




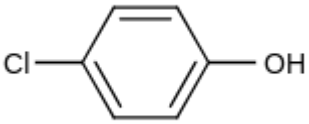
A.



B.



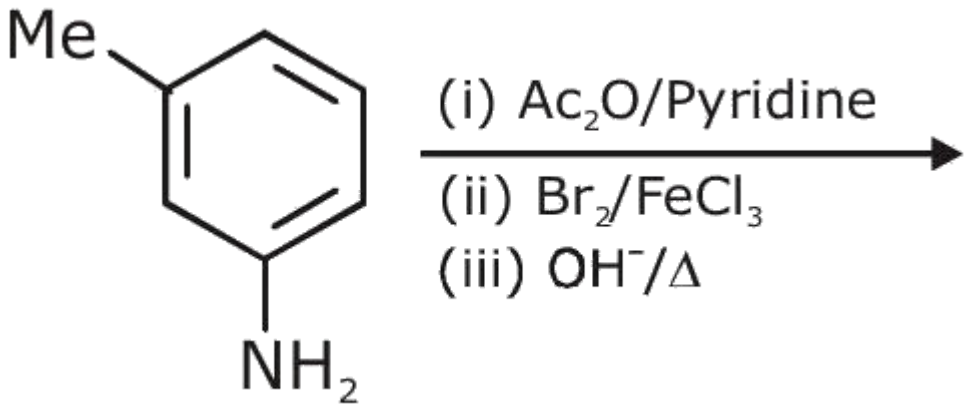
C.

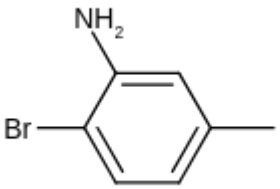


D.

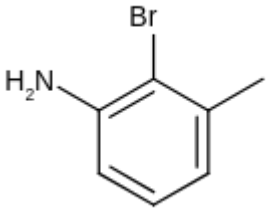
Question 126 View solution online

The final major product of the following reaction is :

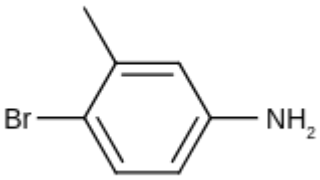




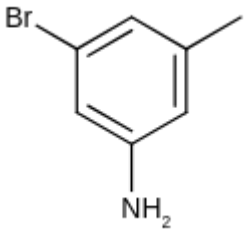
A.



B.



C.



D.

Question 127 View solution online

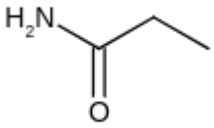
Consider the given reaction, identify the major product P .

$$CH_3-COOH \xrightarrow[(iv)\ H_2O/\bar{O}H,\Delta]{(i)\ LiAlH_4 \quad (ii)\ PCC \quad (iii)\ HCN/\bar{O}H} \text{"P"}$$

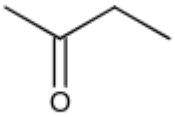
A.



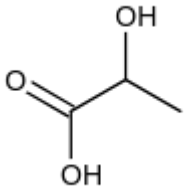
B.



C.

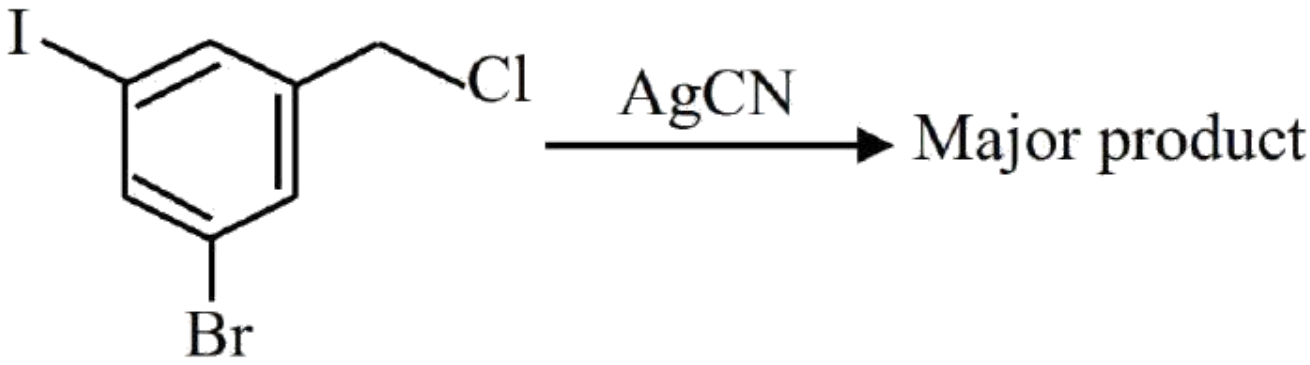


D.

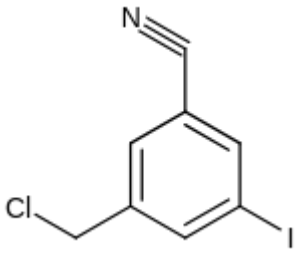


Question 128 View solution online

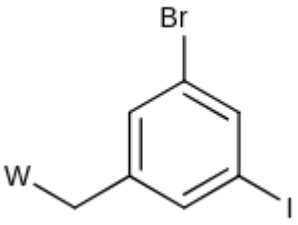
The structure of the major product formed in the following reaction is:



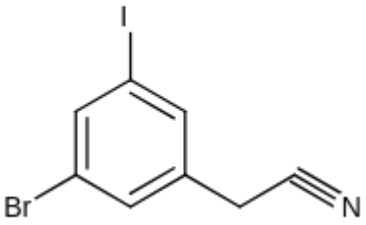
A.



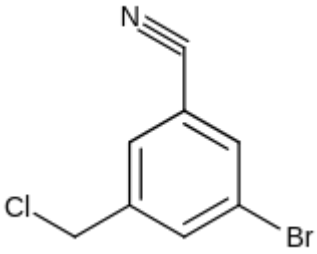
B.



C.

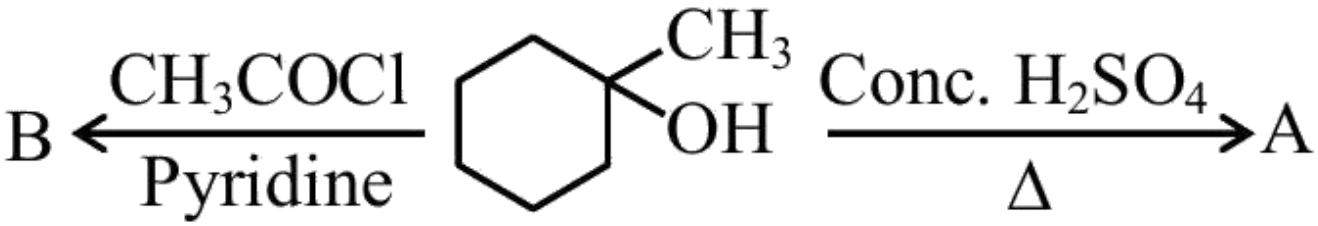


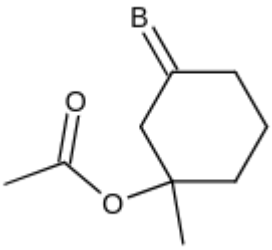
D.



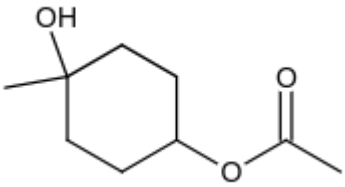
Question 129 View solution online

Identify the major products A and B respectively in the following set of reactions.

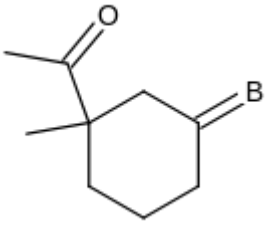




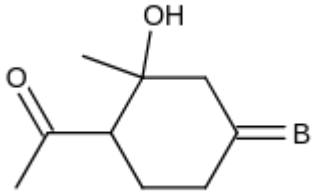
A.



B.



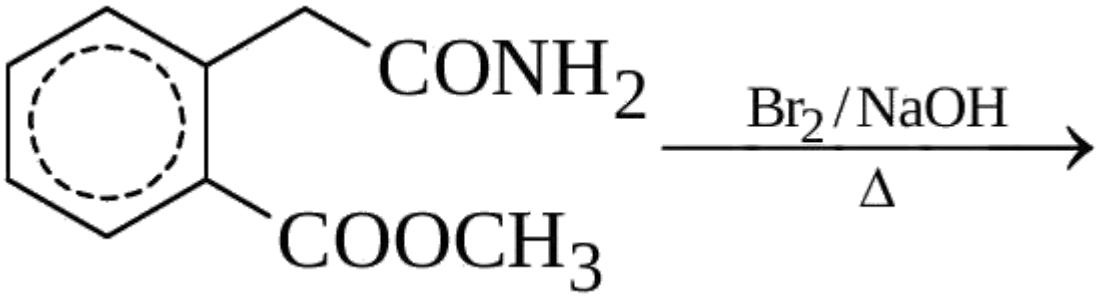
C.



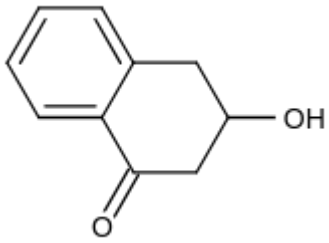
D.

Question 130 View solution online

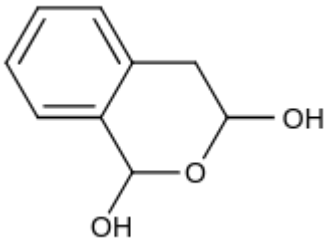
The major product formed in the following reaction is



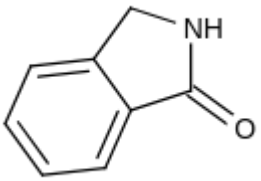
A.



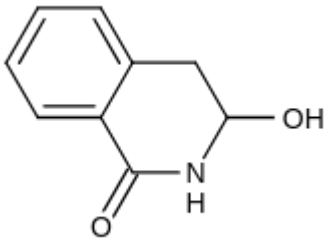
B.



C.

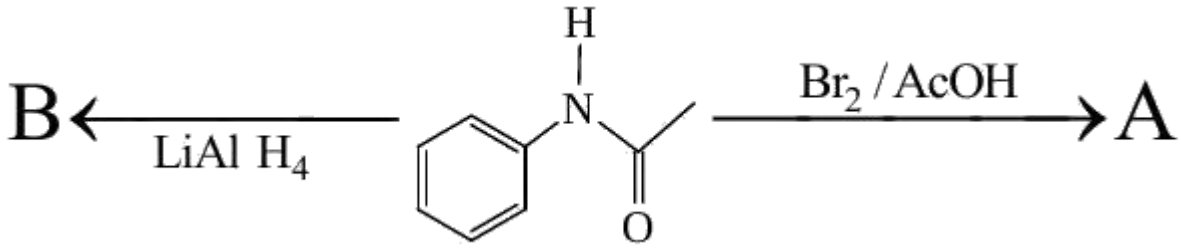


D.

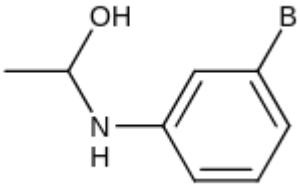


Question 131 View solution online

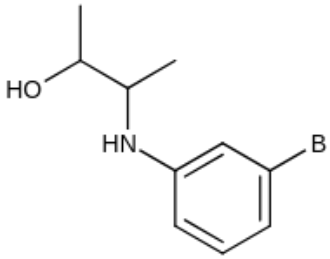
The major products A and B from the following reactions are:



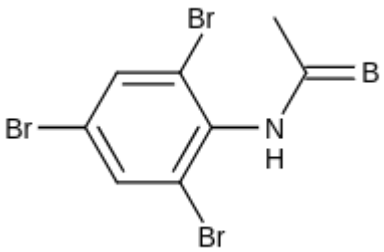
A.



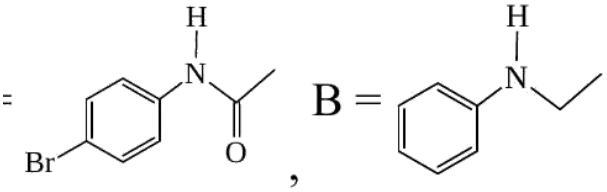
B.



C.

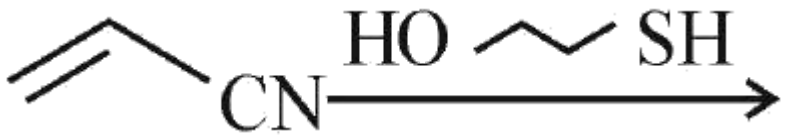


D.

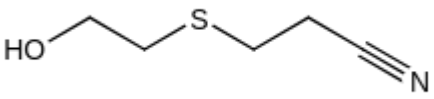


Question 132 View solution online

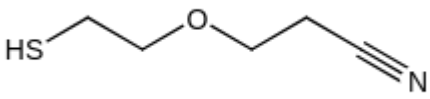
The major product for the following reaction is:



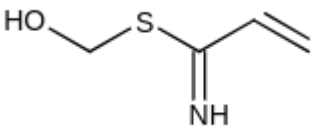
A.



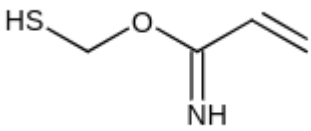
B.



C.

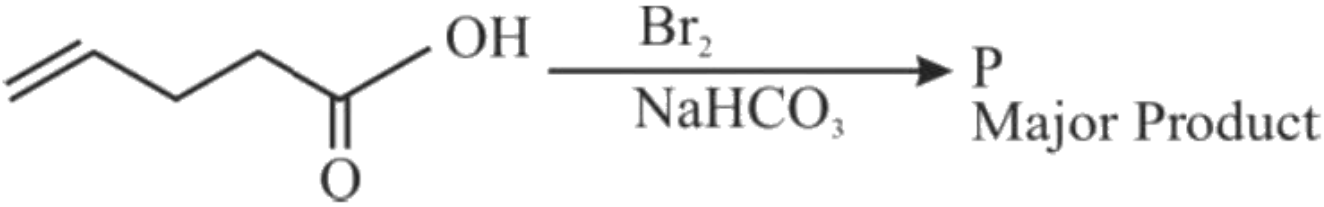


D.

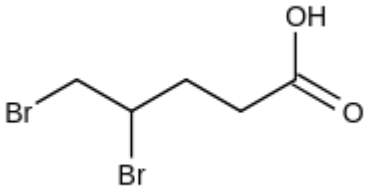


Question 133 View solution online

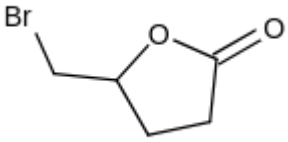
Major product ' P ' formed in the following reaction is :-



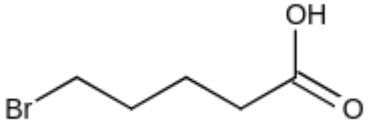
A.



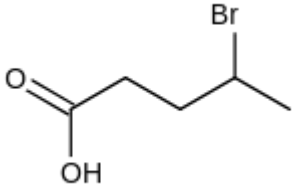
B.



C.

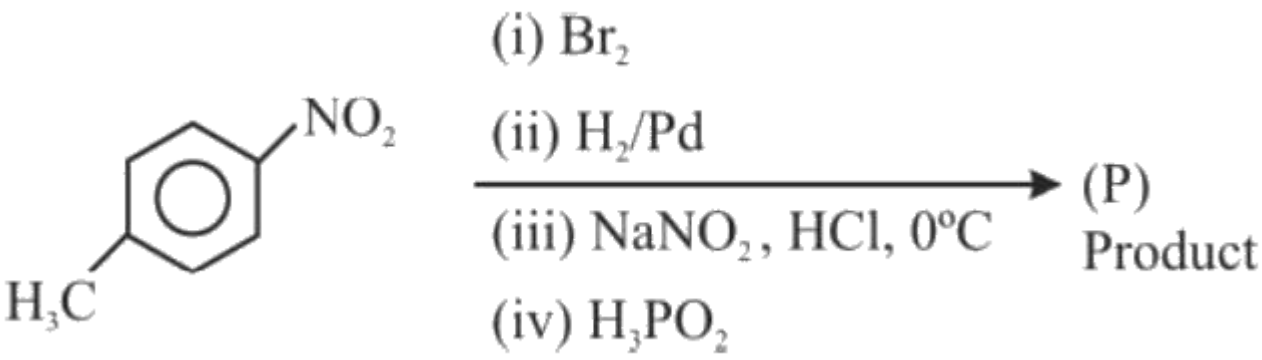


D.

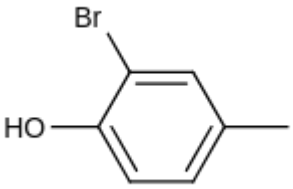


Question 134 View solution online

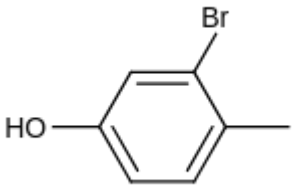
The product (P) formed from the following multistep reaction is :-



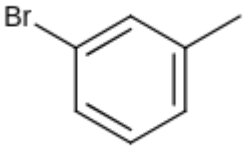
A.



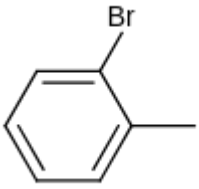
B.



C.



D.



Question 135 View solution online

Decreasing order of reactivity towards electrophilie substitution for the following compounds is :

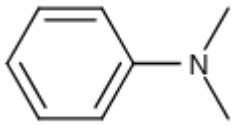
(a)

(b)

(c)

(d)

(e)



A. $c > b > a > d > e$

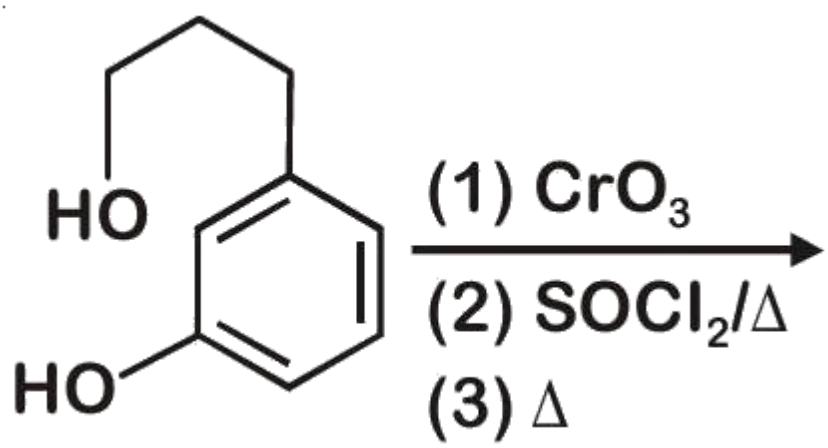
B. $e > d > a > b > c$

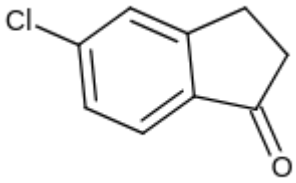
C. $a > d > e > b > c$

D. $d > a > e > c > b$

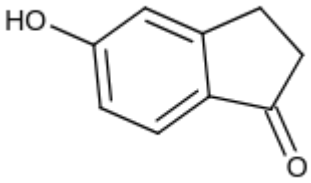
Question 136 View solution online

The major product of the following reaction is

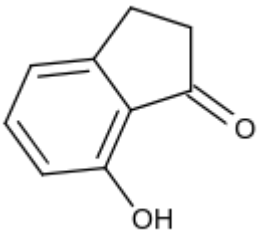




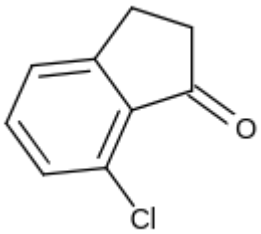
A.



B.



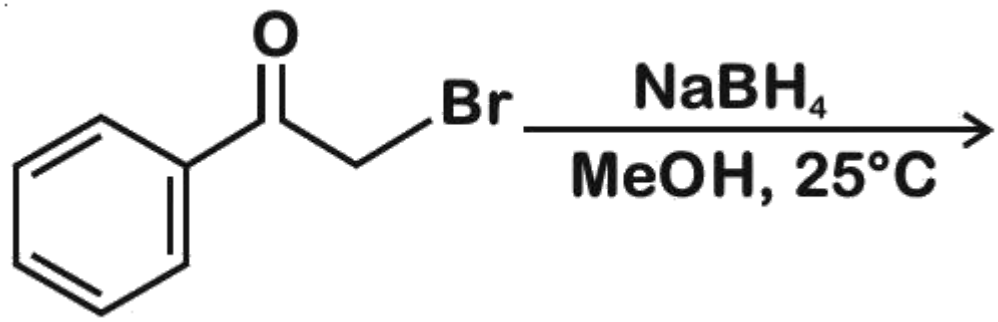
C.



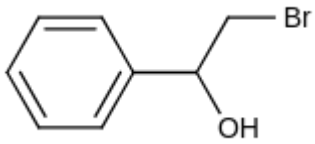
D.

Question 137 View solution online

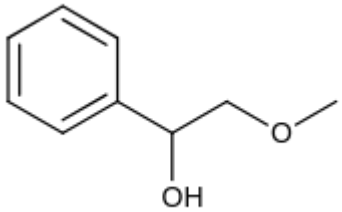
The major product of the following reaction is



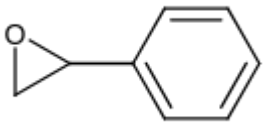
A.



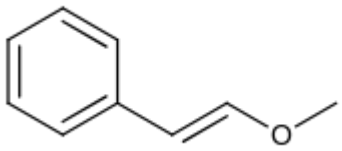
B.



C.

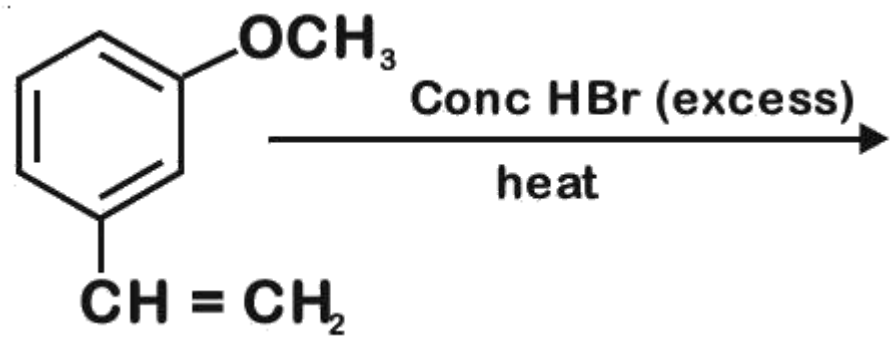


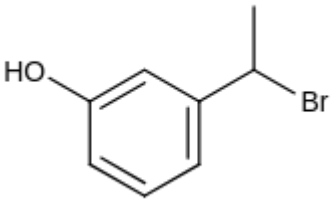
D.



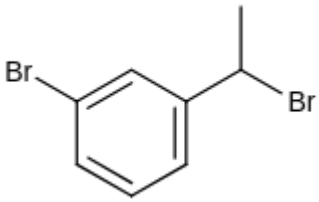
Question 138 View solution online

The major product of the following reaction is

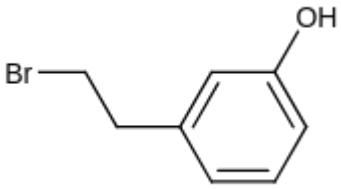




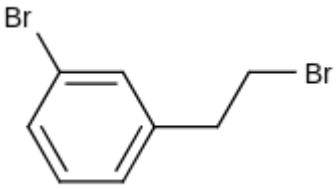
A.



B.



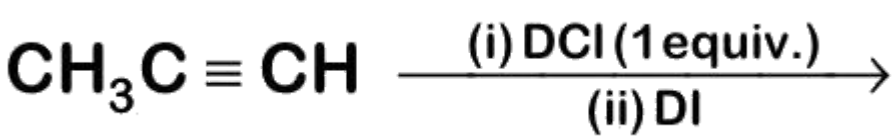
C.



D.

Question 139 View solution online

The major product of the following reaction is



A. $CH_3C(I)(Cl)CHD_2$

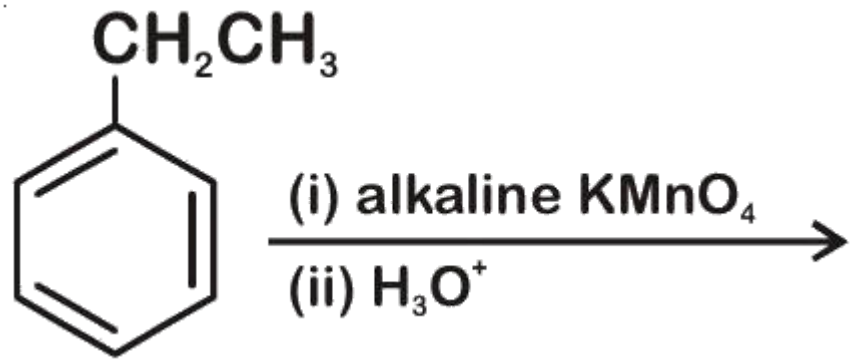
B. $CH_3CD(I)CHD(Cl)$

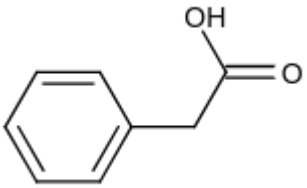
C. $CH_3CD(Cl)CHD(I)$

D. $CH_3CD_2CH(Cl)(I)$

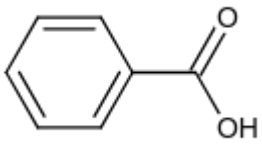
Question 140 View solution online

The major product of the following reaction is

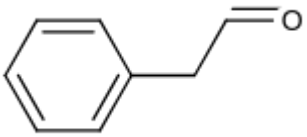




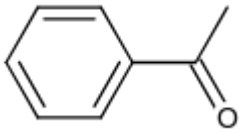
A.



B.



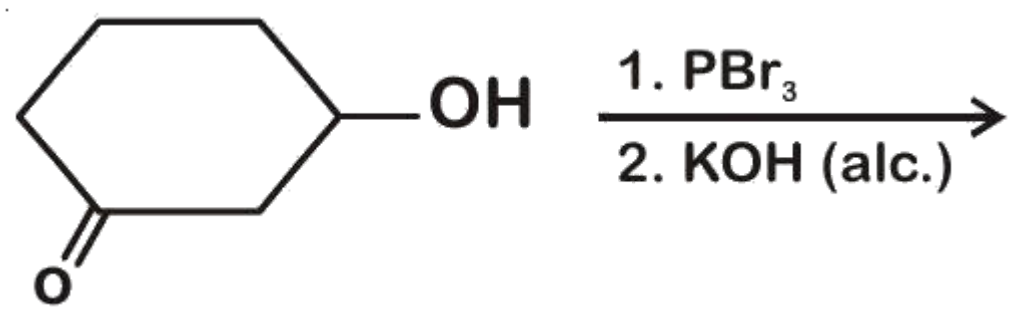
C.



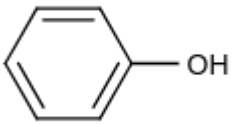
D.

Question 141 View solution online

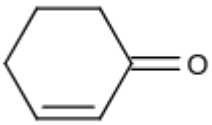
The major product of the following reaction is



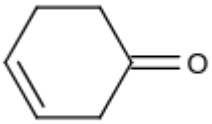
A.



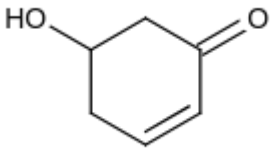
B.



C.

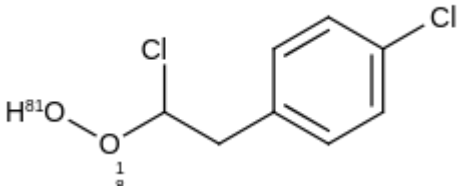


D.

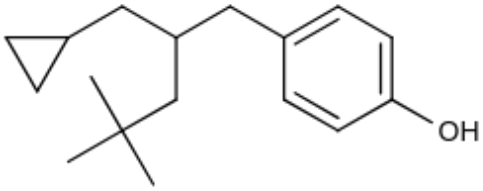


Question 142 View solution online

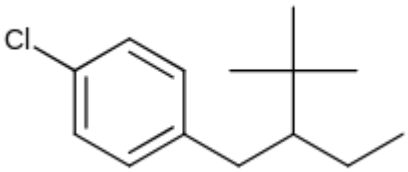
The major product of the following reaction is



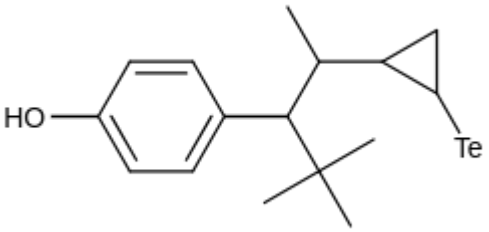
A.



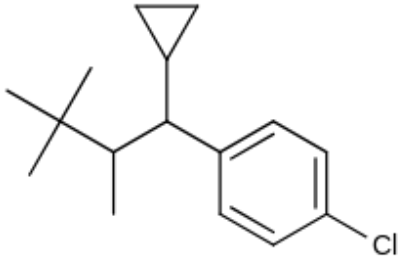
B.



C.

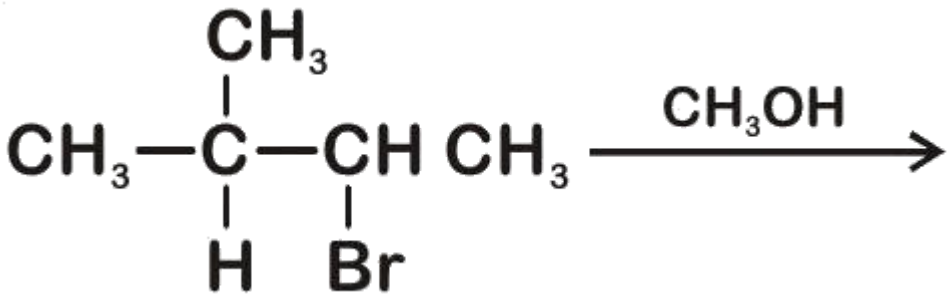


D.



Question 143 View solution online

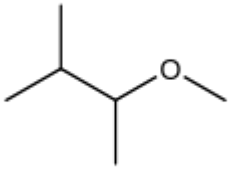
The major product of the following reaction is :



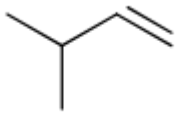
A.



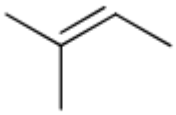
B.



C.

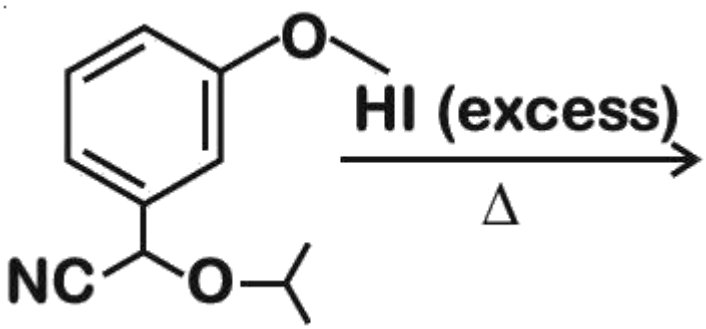


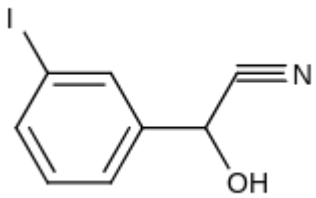
D.



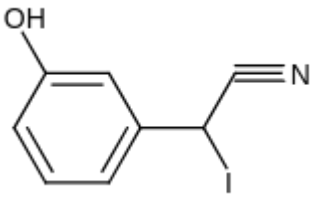
Question 144 View solution online

The major product of the following reaction is:

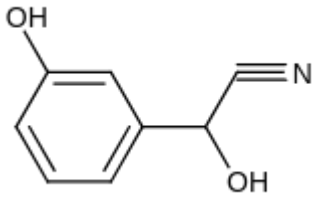




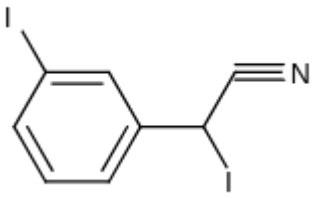
A.



B.



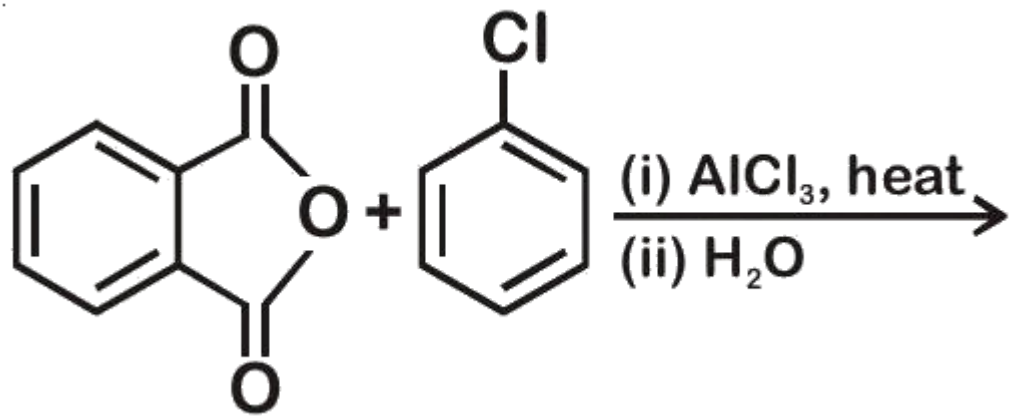
C.



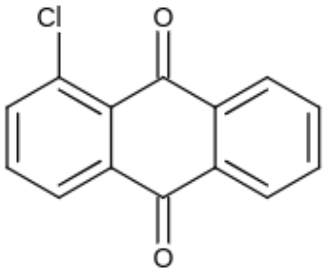
D.

Question 145 View solution online

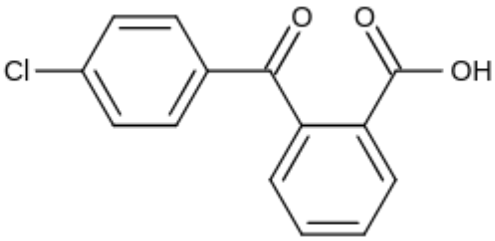
The major product of the following reaction is :



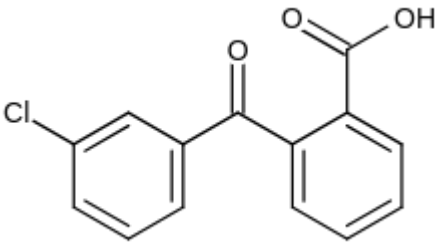
A.



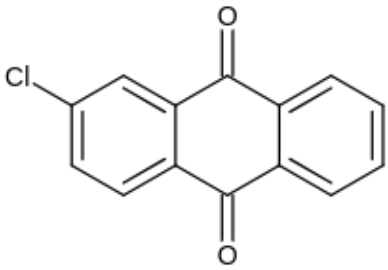
B.



C.

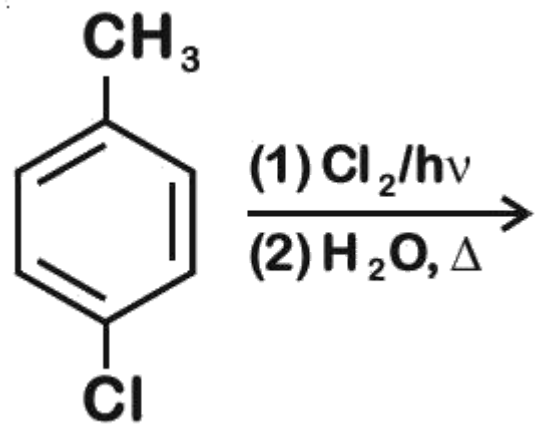


D.

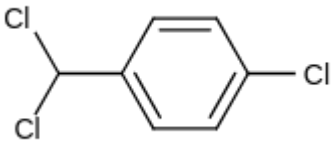


Question 146 View solution online

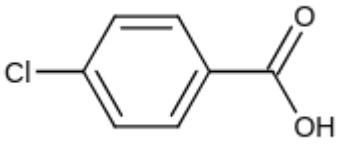
The major product of the following reaction is:



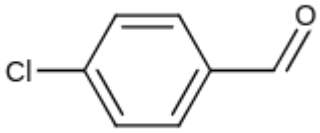
A.



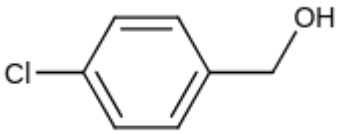
B.



C.

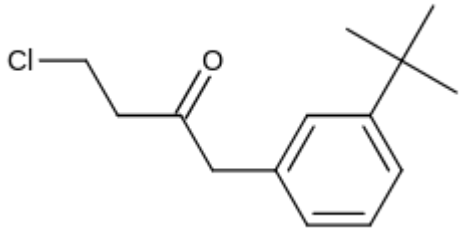


D.

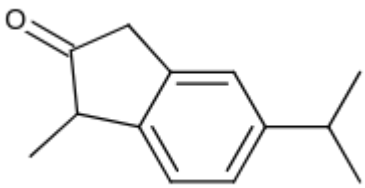


Question 147 View solution online

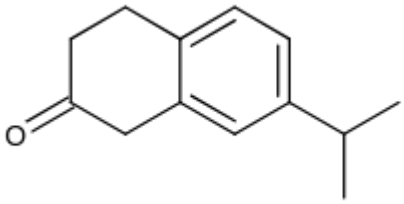
The major product of the following reaction is :



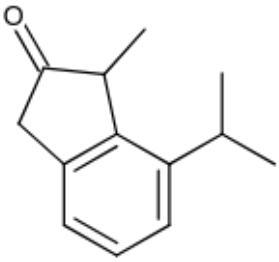
A. $\xrightarrow[(2)\ \text{Conc. } H_2SO_4/\Delta]{(1)\ \text{t BuOK}}$



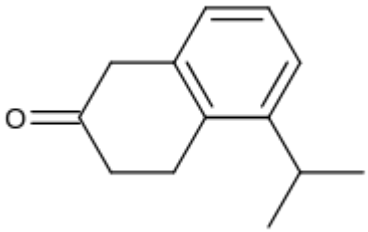
B.



C.



D.

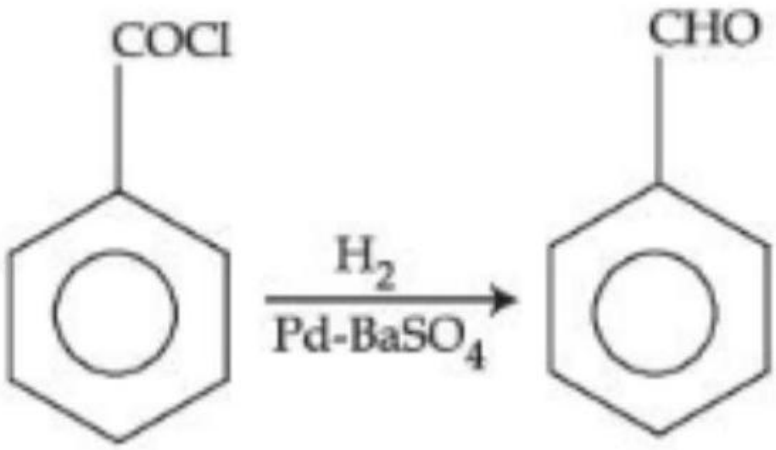


Question 148 View solution online

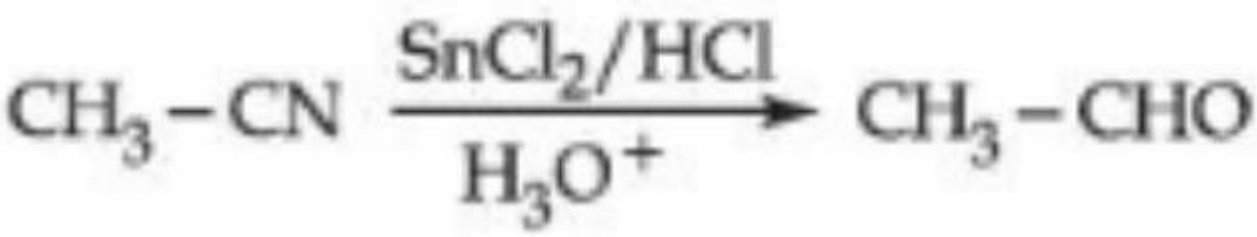
Match List-I with List-II.

List-I

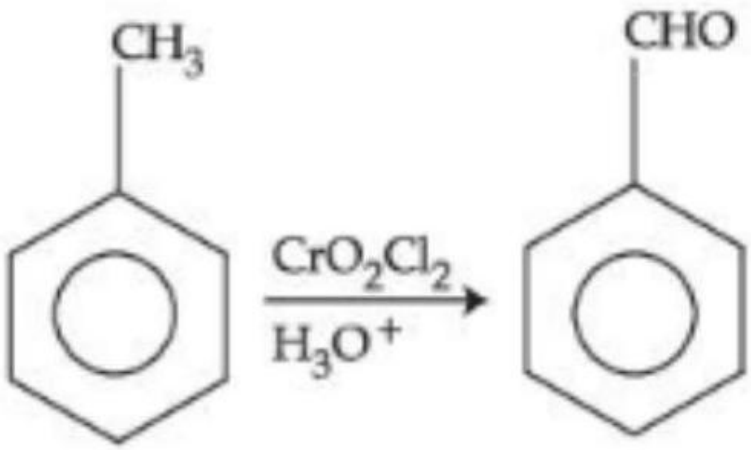
(A)



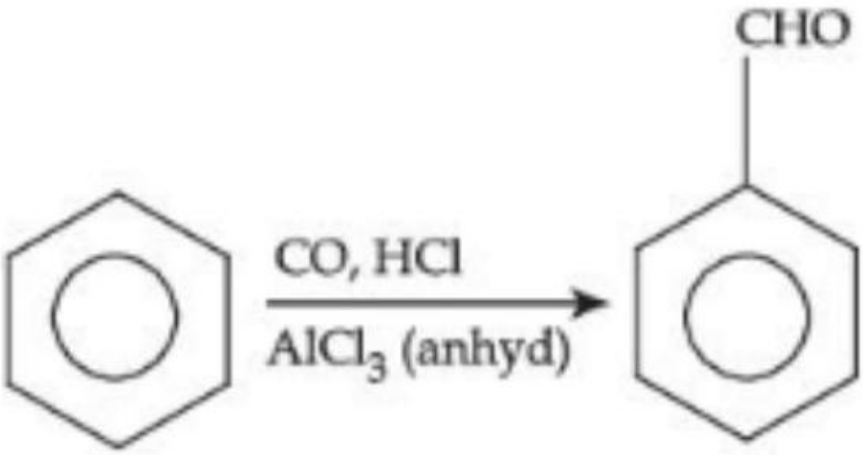
(B)



(C)



(D)



Lits-II

(I) Gatterman Koch reaction
(II) Etard reaction
(III) Stephen reaction
(IV) Rosenmund reaction

Choose the correct answer from the options given below:

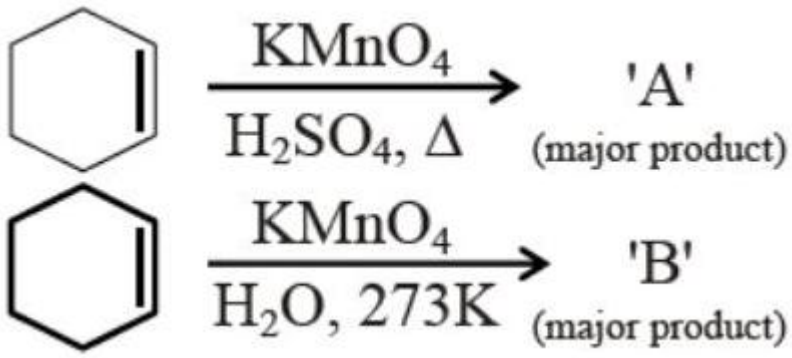
A. -(IV), (B)-(III), (C)-(II), (D)-(I)

B. (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

C. (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

D. (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

Question 149 View solution online



For above chemical reactions, identify the correct statement from the following:

A. Both compound 'A' and compound 'B' are dicarboxylic acids

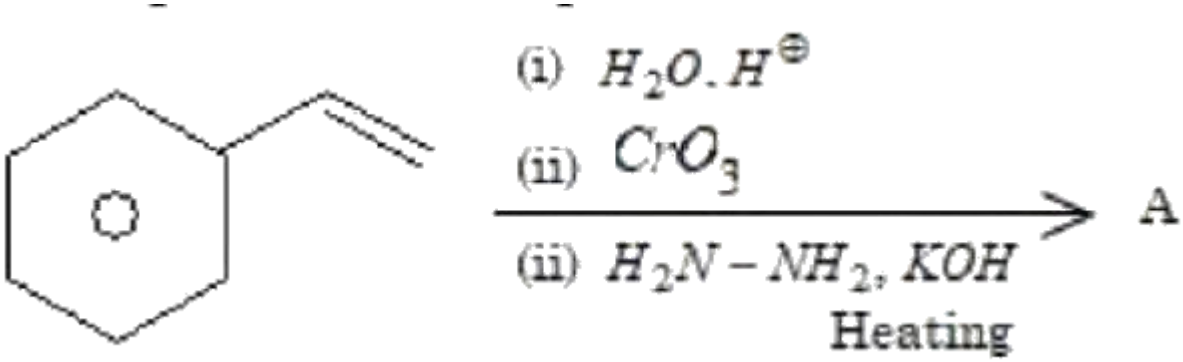
B. Both compound 'A' and compound 'B' are diols

C. Compound 'A' is diol and compound 'B' is dicarboxylic acid

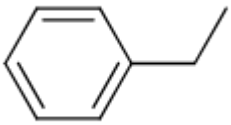
D. Compound 'A' is dicarboxylic acid and compound 'B' is diol

Question 150 View solution online

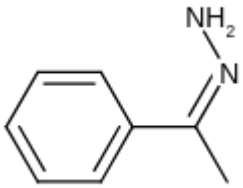
The final product A formed in the following multistep reaction sequence is



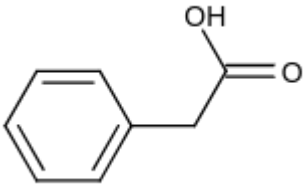
A.



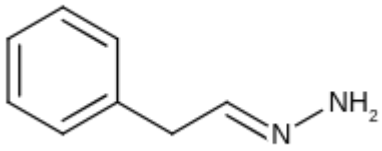
B.



C.

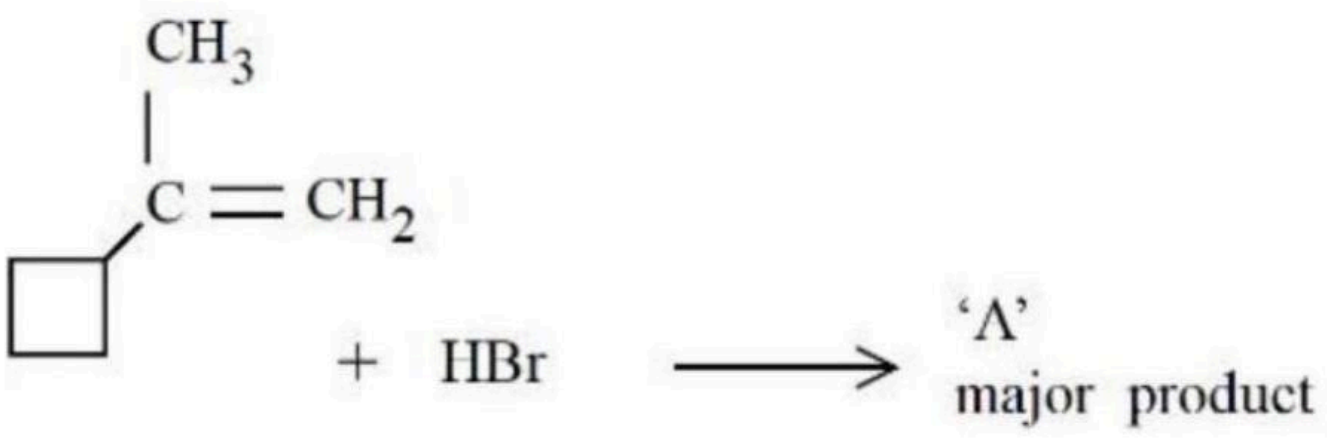


D.

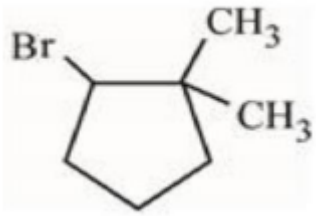


Question 151 View solution online

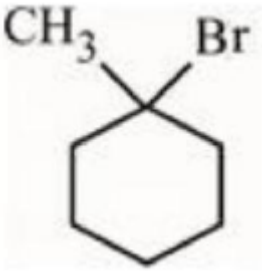
In the following given reaction, ' A ' is



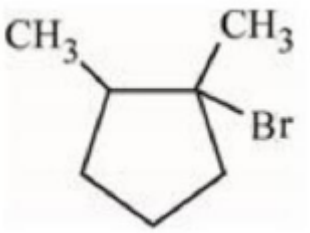
A.



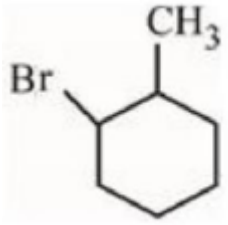
B.



C.

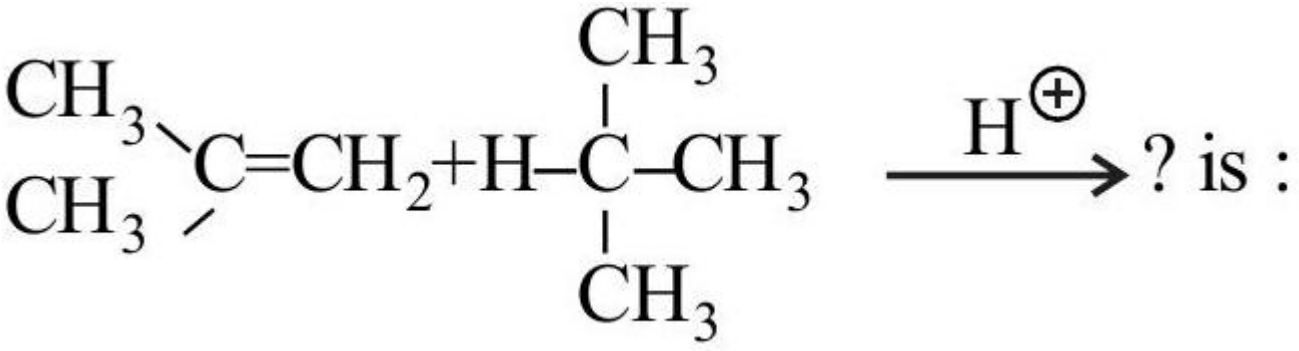


D.

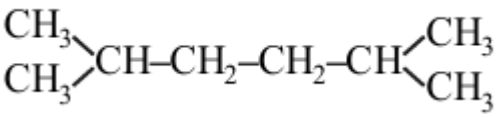


Question 152 View solution online

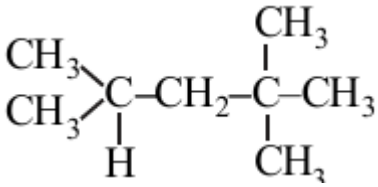
The products formed in the following reaction.



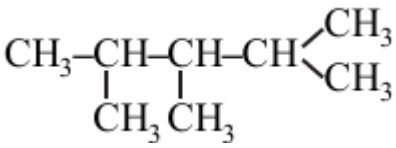
A.



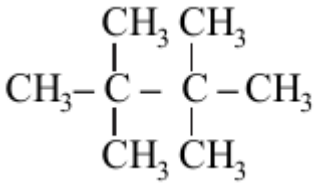
B.



C.

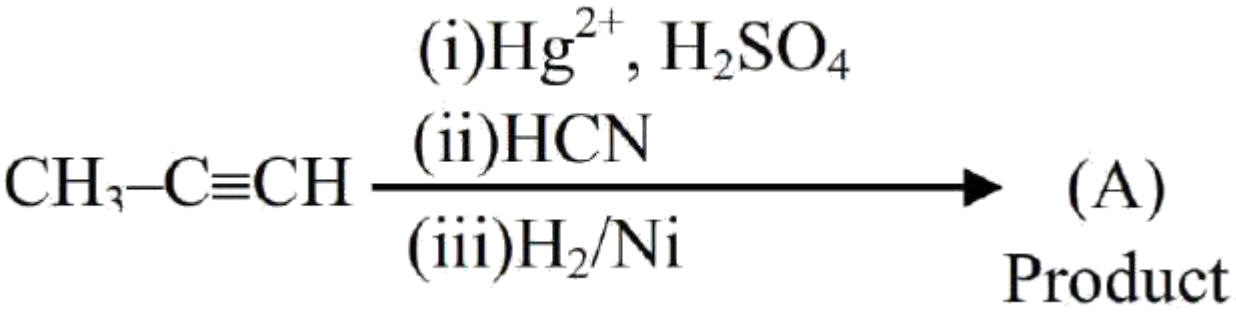


D.

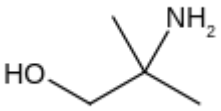


Question 153 View solution online

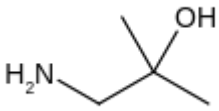
The product (A) formed in the following reaction sequence is :



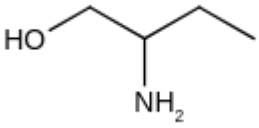
A.



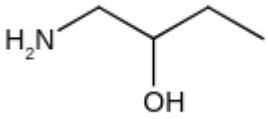
B.



C.

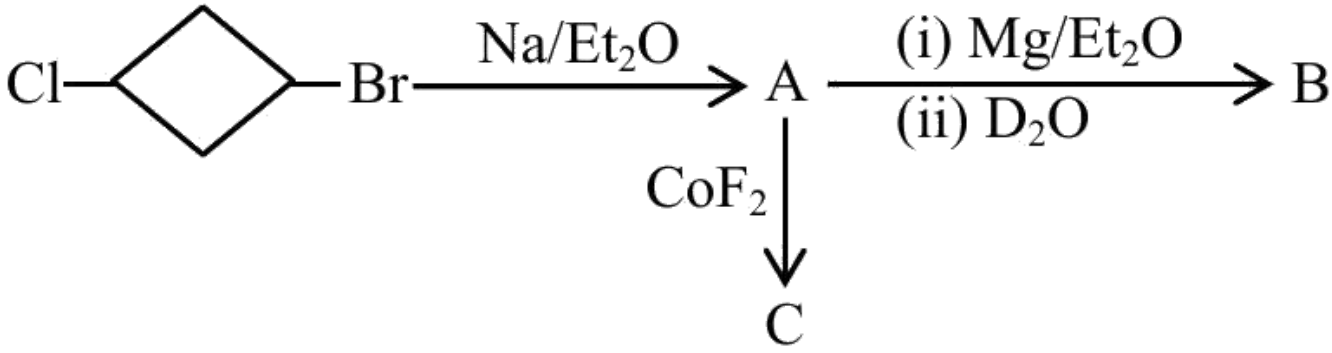


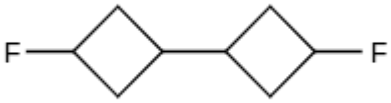
D.



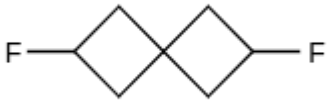
Question 154 View solution online

In the following sequence of reaction, the major products B and C respectively are :

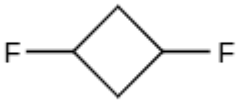




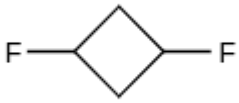
A.



B.



C.

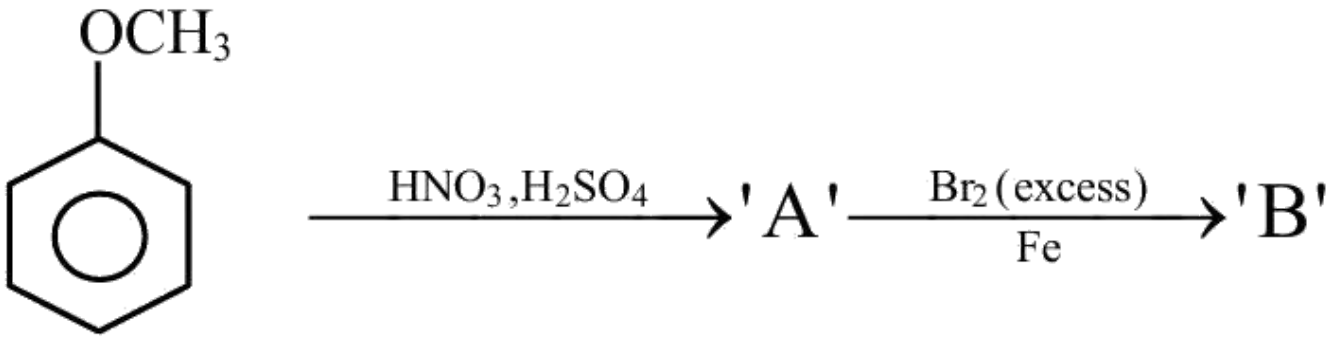


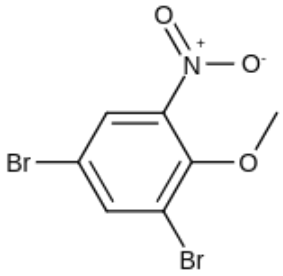
D.

Question 155 View solution online

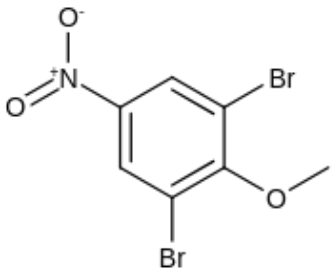
The major products formed:

A and B respectively are:

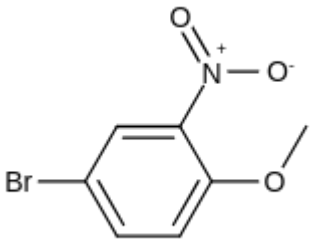




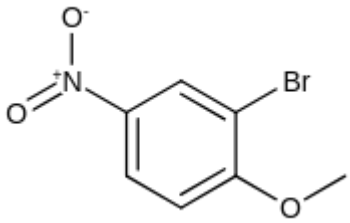
A.



B.



C.

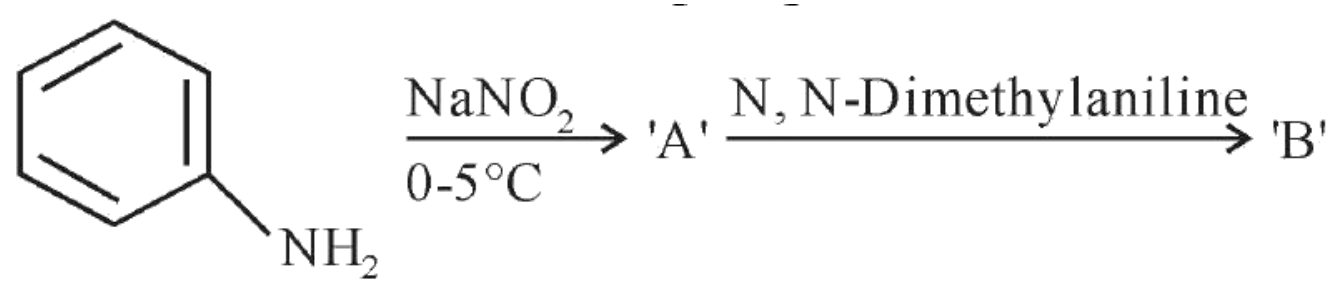


D.

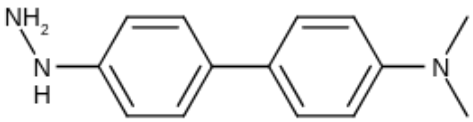
Question 156 View solution online

Consider the following sequence of reactions:

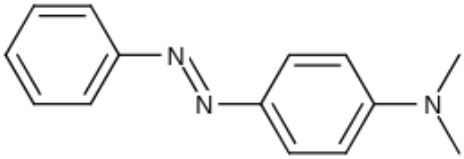
The product ' B ' is



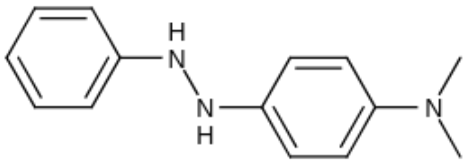
A.



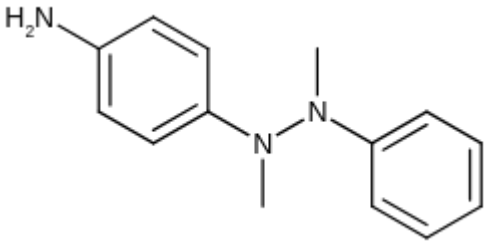
B.



C.

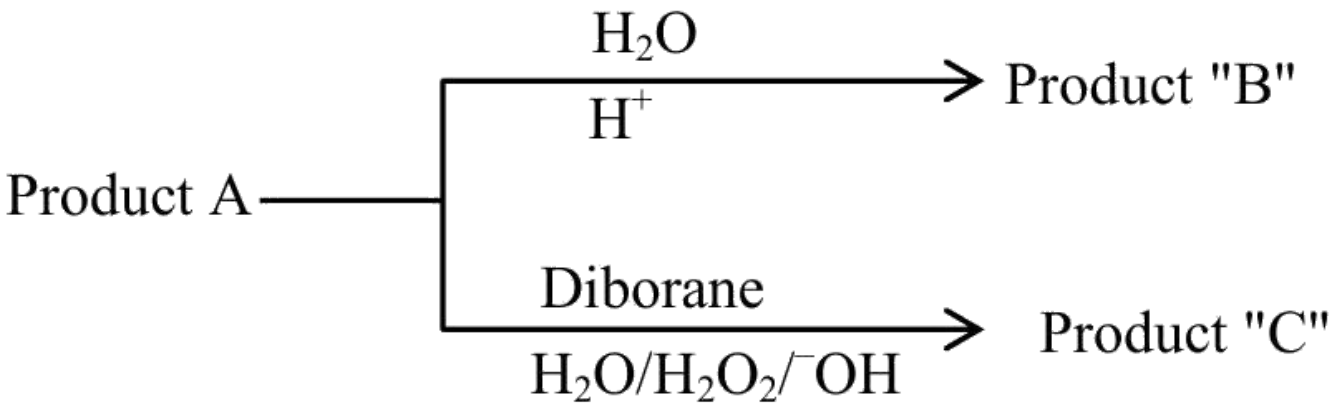


D.



Question 157 View solution online

Consider the above reactions, identify product B and product C .



A. $\mathbf{B} = \mathbf{C} = \mathbf{2}$-Propanol

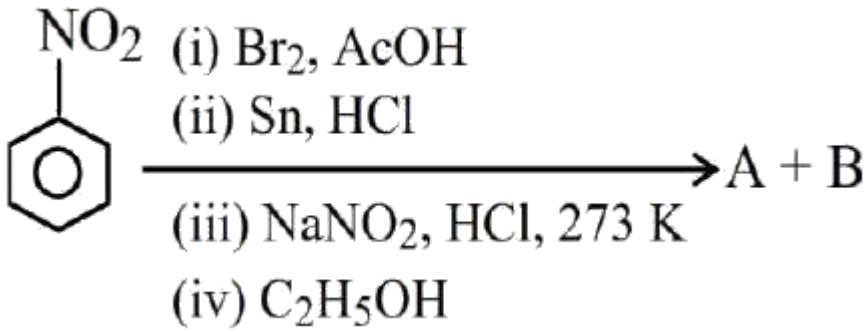
B. $\mathbf{B} = \mathbf{2}$-Propanol $\mathbf{C} = \mathbf{1}$-Propanol

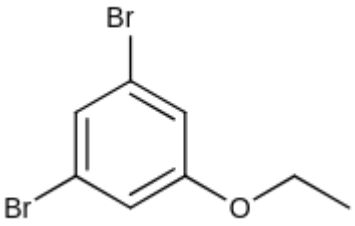
C. $\mathbf{B} = \mathbf{1}$-Propanol $\mathbf{C} = \mathbf{2}$-Propanol

D. $\mathbf{B} = \mathbf{C} = \mathbf{1}$-Propanol

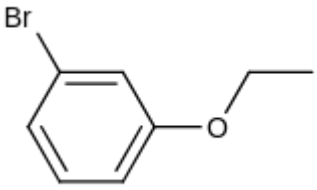
Question 158 View solution online

The products formed in the following reaction sequence are :



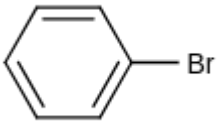


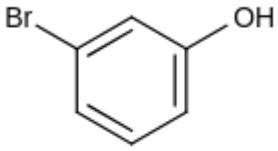
A.



B.

C. $CH_3 - CHO$

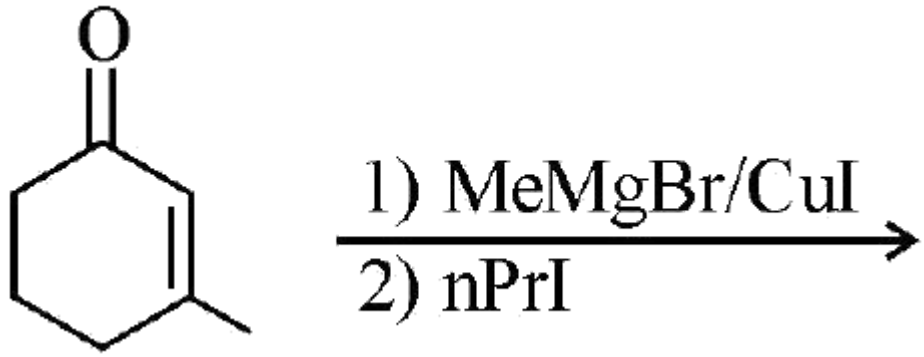


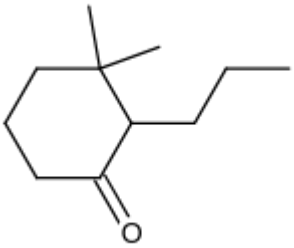


D.

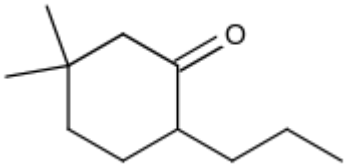
Question 159 View solution online

Find out the major product from the following reaction

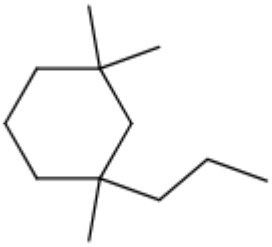




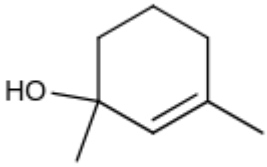
A.



B.



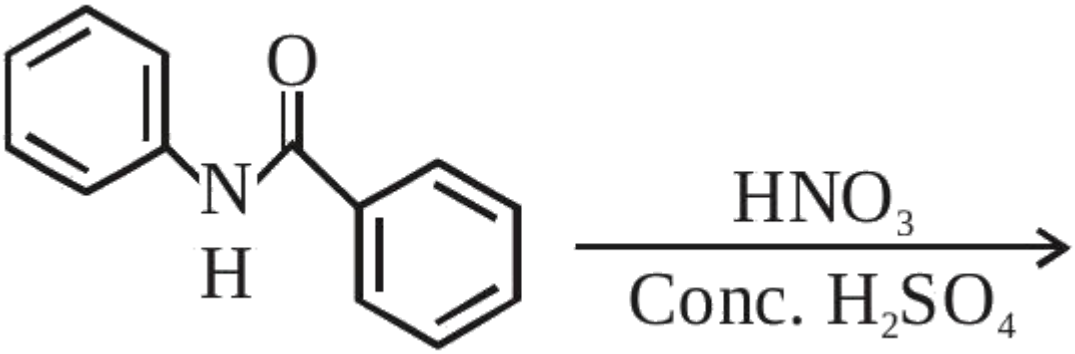
C.



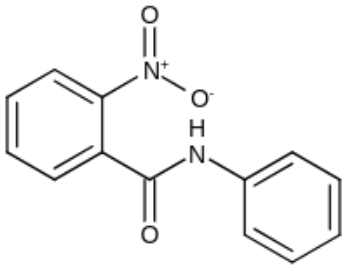
D.

Question 160 View solution online

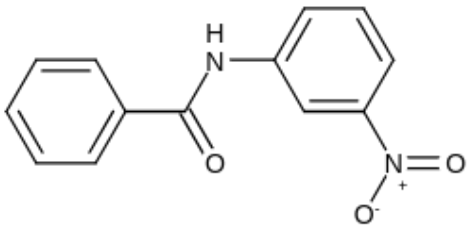
What will be the major product in the following mononitation reaction?



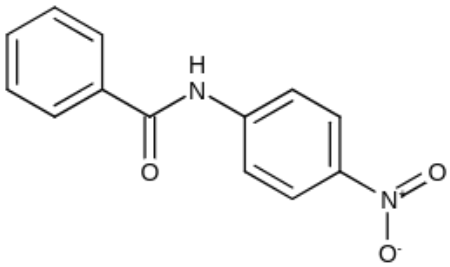
A.



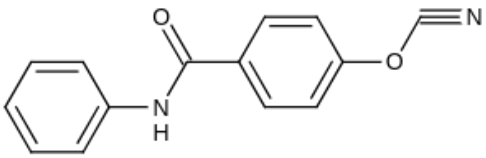
B.



C.

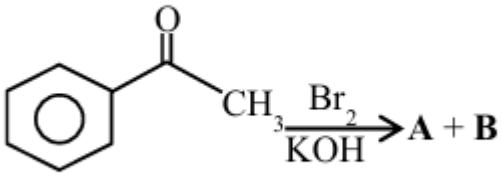


D.

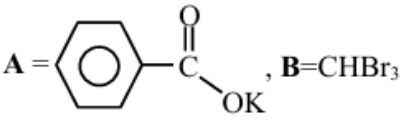


Question 161 View solution online

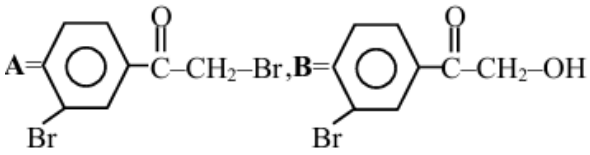
The major products formed in the following reaction sequence **A** and **B** are :



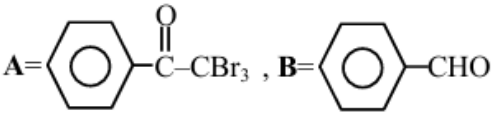
A.



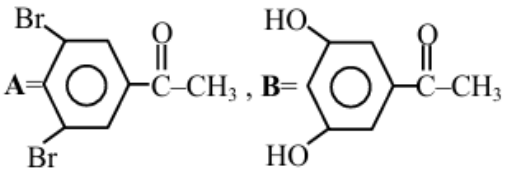
B. -2



C.

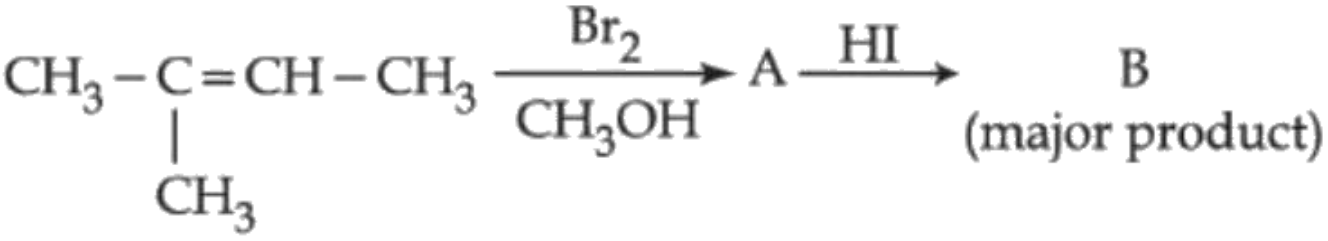


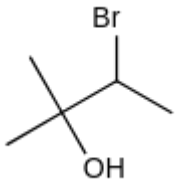
D.



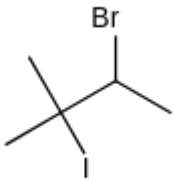
Question 162 View solution online

Major product ' B ' of the following reaction sequence is:

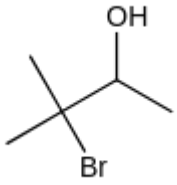




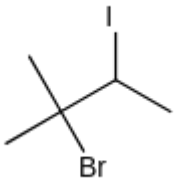
A.



B.



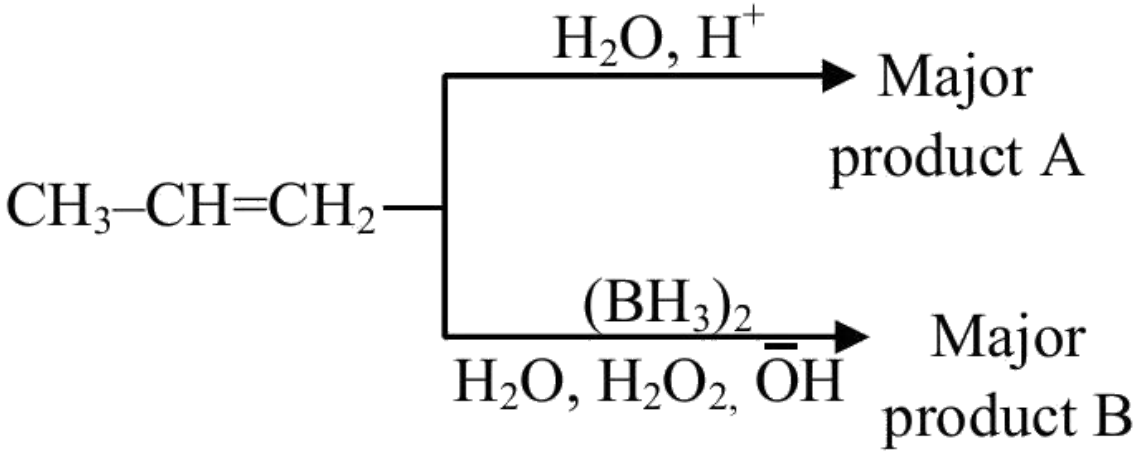
C.



D.

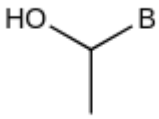
Question 163 View solution online

Identify the product A and product B in the following set of reactions.



A. $A - CH_3CH_2CH_2 - OH, B - CH_3CH_2CH_2 - OH$

B. $A - CH_3CH_2CH_2 - OH$,

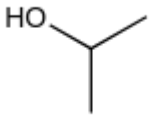


C. (2) Hydroboration Oxidation Reaction :}
(B)

$$3CH_3–CH=CH_2 + B_2H_6 \xrightarrow{THF} 2(CH_3CH_2CH_2)_3B$$

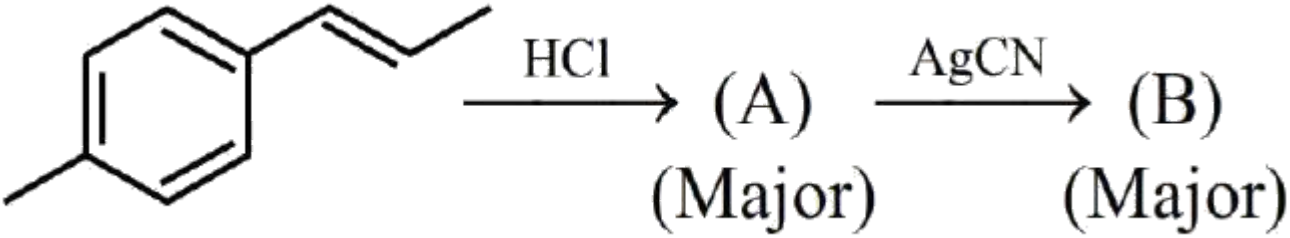
$$(CH_3CH_2CH_2)_3B + 3H_2O_2 \xrightarrow{OH^-} \underset{(B)}{3CH_3CH_2CH_2OH} + H_3BO_3$$

D. (3)

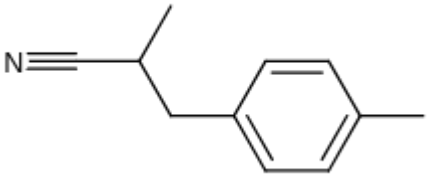


Question 164 View solution online

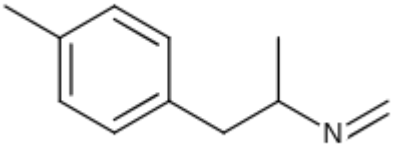
The product B formed in the following reaction sequence is :



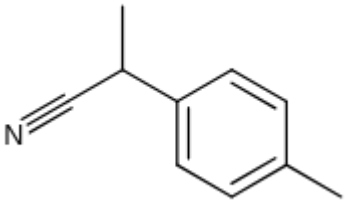
A.



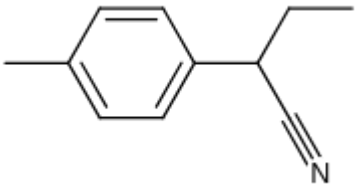
B.



C.

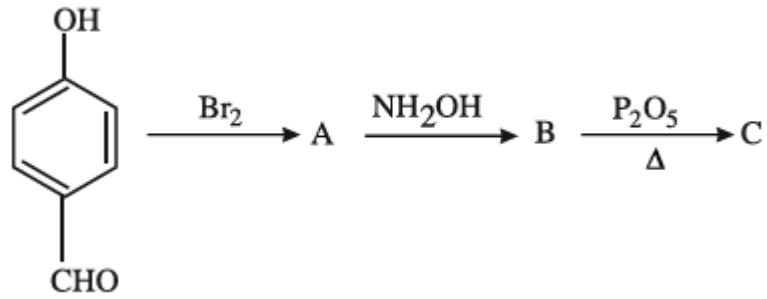


D.

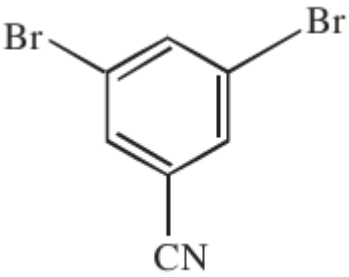


Question 165 View solution online

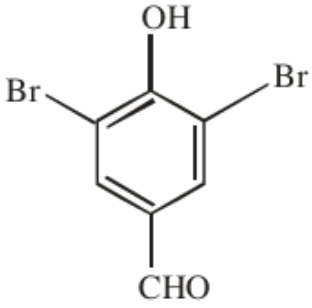
Consider the above reaction sequence, the Product ' C ' is :



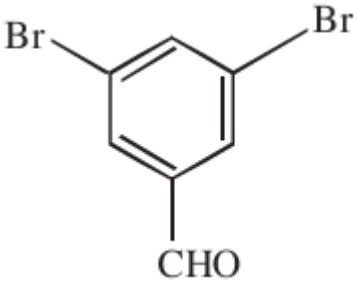
A.



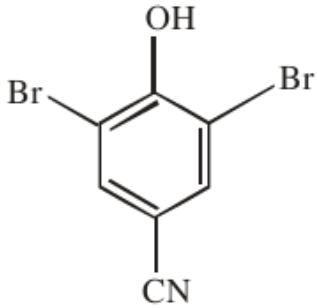
B.



C.

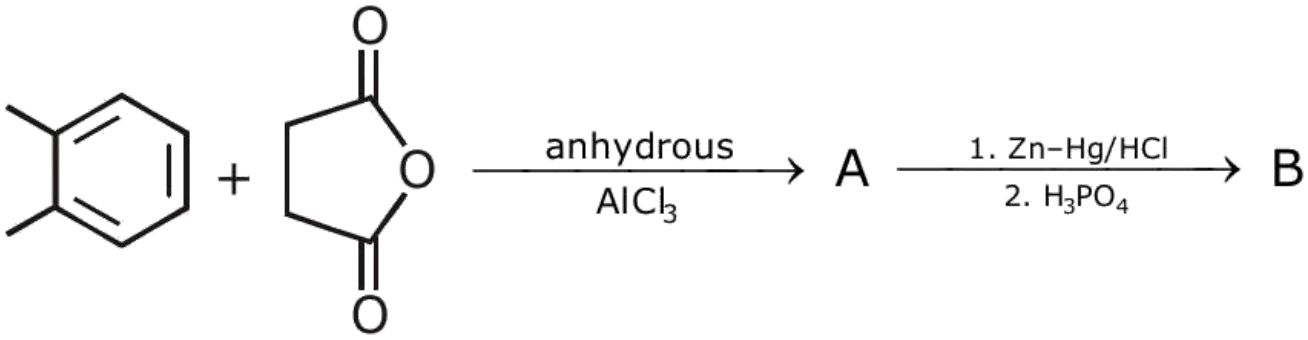


D.

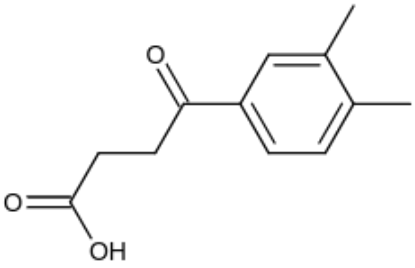


Question 166 View solution online

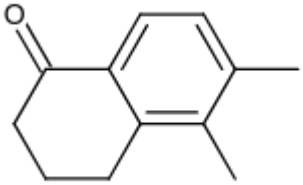
In the following reaction sequence the major products A and B are:



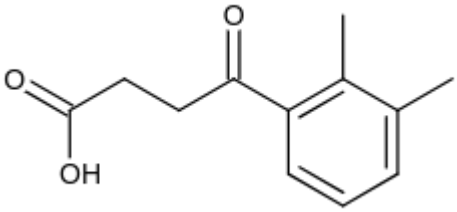
A. $A =$



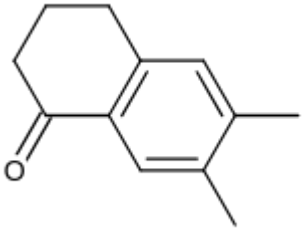
B. $A =$



C. $A =$

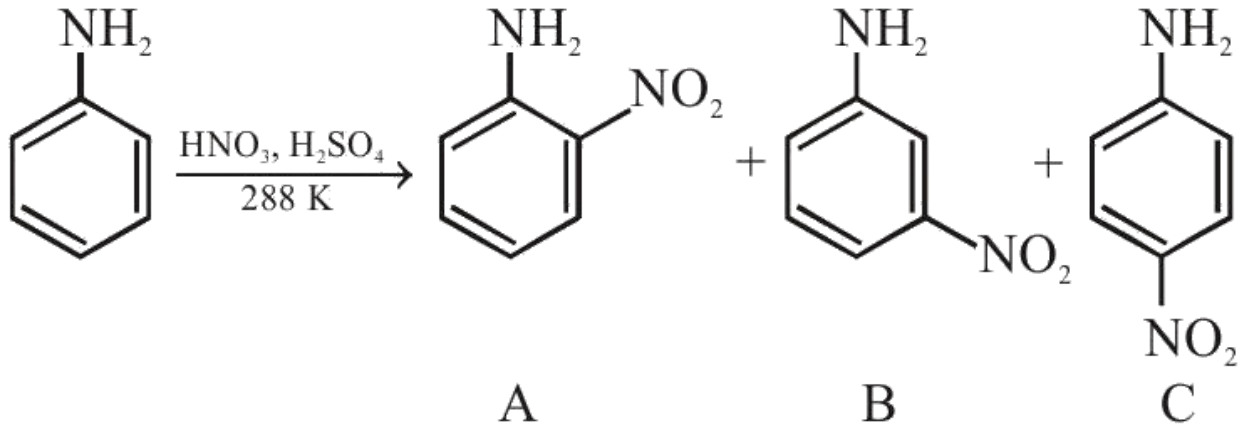


D. $A =$



Question 167 View solution online

Consider the given reaction, percentage yield of :



A. $C > A > B$

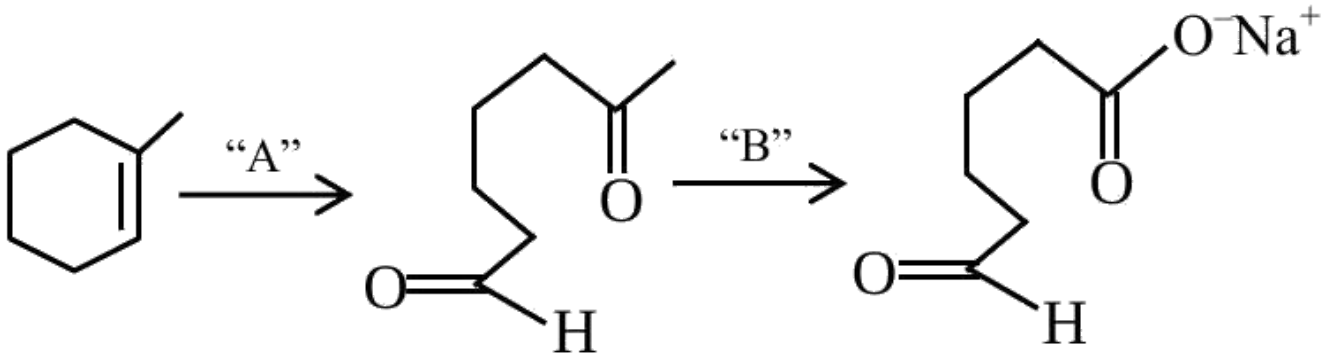
B. $B > C > A$

C. $A > C > B$

D. $C > B > A$

Question 168 View solution online

In the above chemical reaction sequence "A" and " B " respectively are :



A. $O_3, Zn/H_2O$ and $NaOH_{(alc.)}$ /I_2

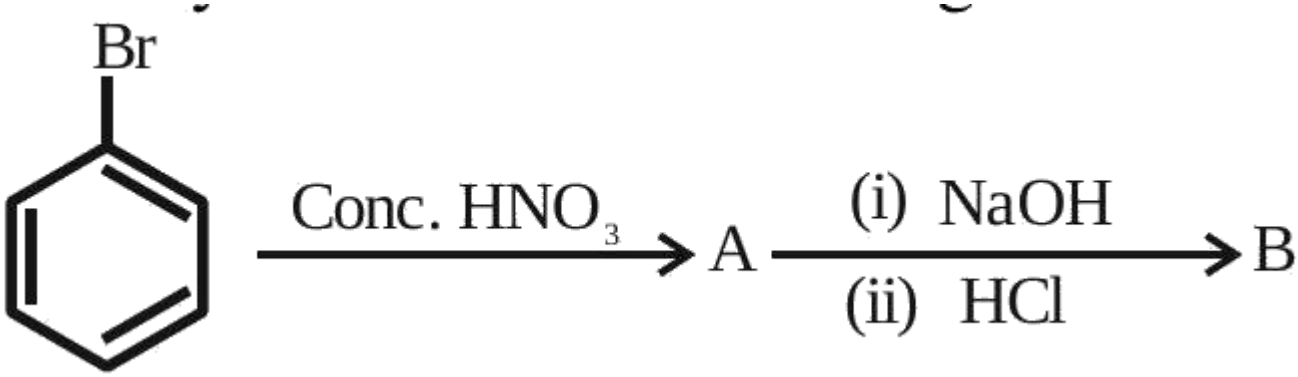
B. $H_2O, H^+$and $NaOH_{(alc.)}$ /I_2

C. $H_2O, H^+$and $KMnO_4$

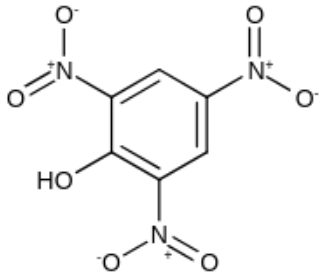
D. $O_3, Zn/H_2O$ and $KMnO_4$

Question 169 View solution online

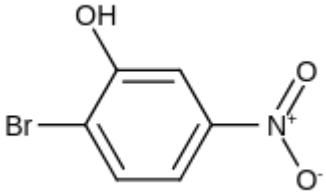
Identify A and B in the following reaction sequence.



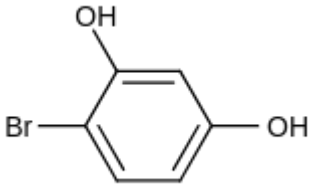
A.



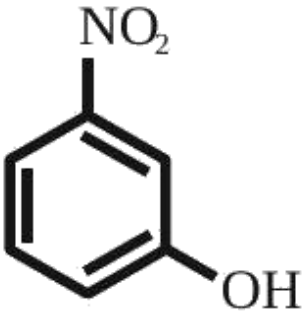
B.



C. B=

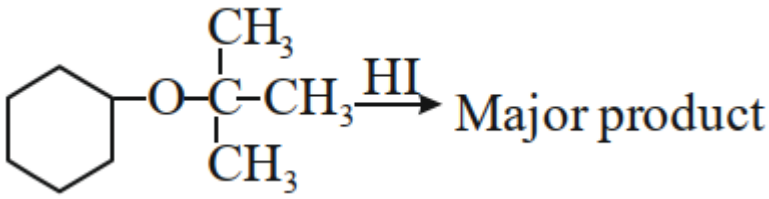


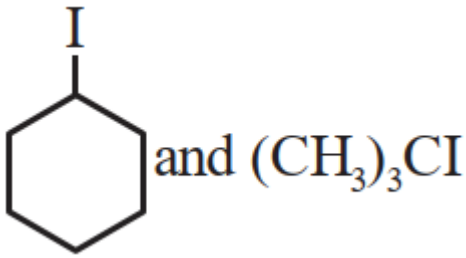
D. A =

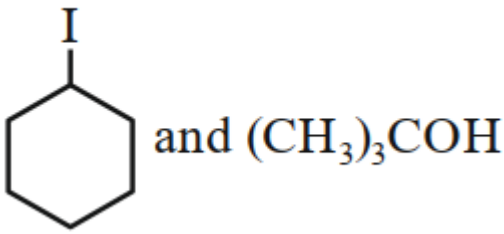


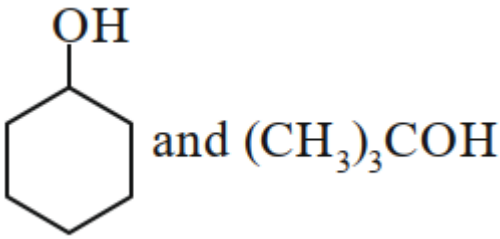
Question 170 View solution online

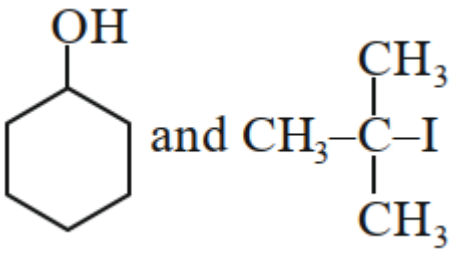
Major product formed in the following reaction is a mixture of:



A. 

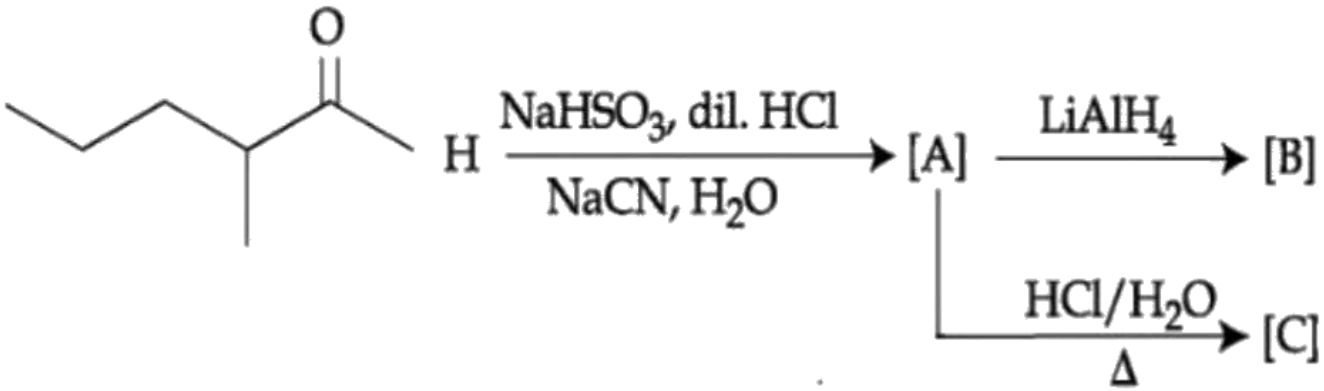
B. 

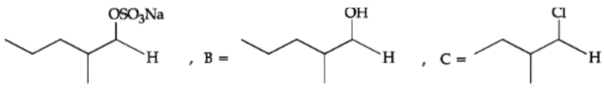
C. 

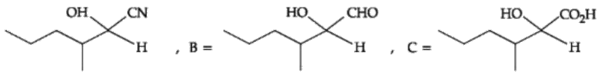
D. 

Question 171 View solution online

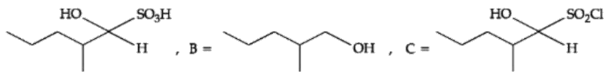
The structures of major products **A, B** and C in the following reaction are sequence.



A. 

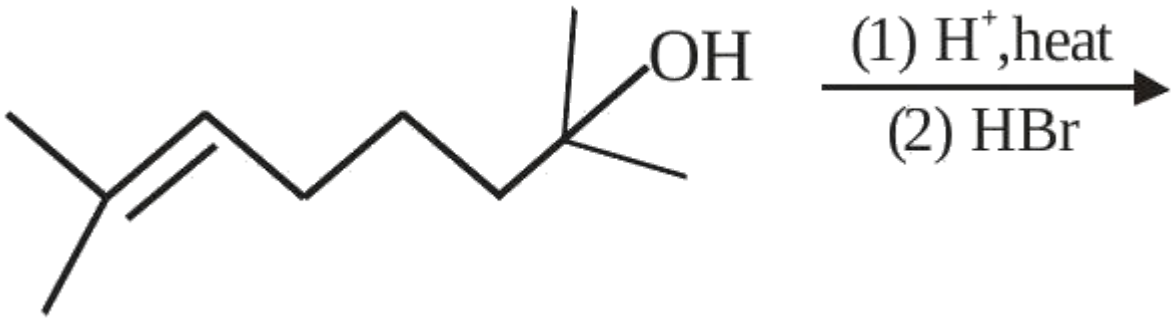
B. 

C.

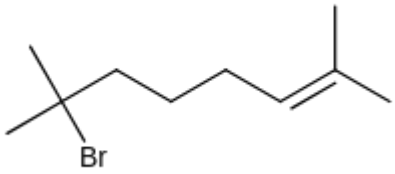
D. 

Question 172 View solution online

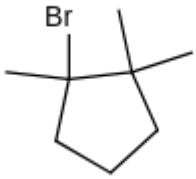
The major product in the given reaction is



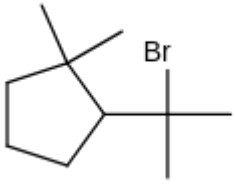
A.



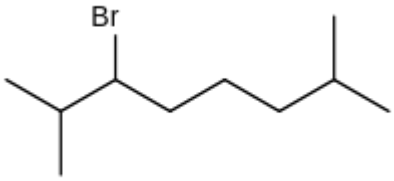
B.



C.

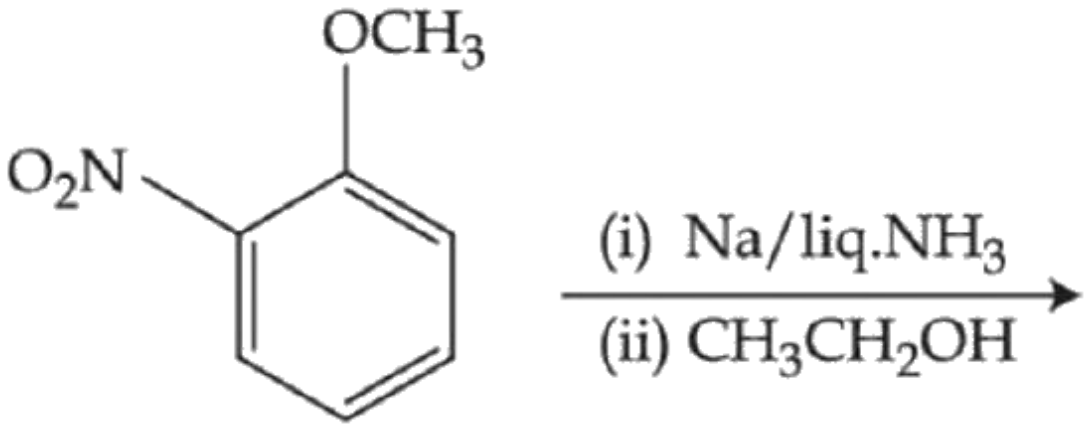


D.

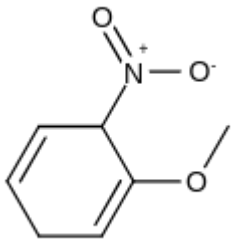


Question 173 View solution online

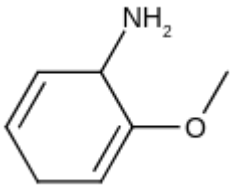
The major product of the following reaction is



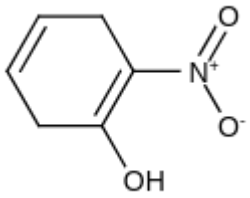
A.



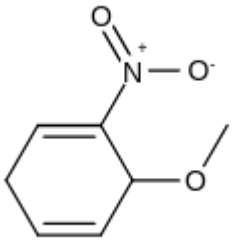
B.



C.

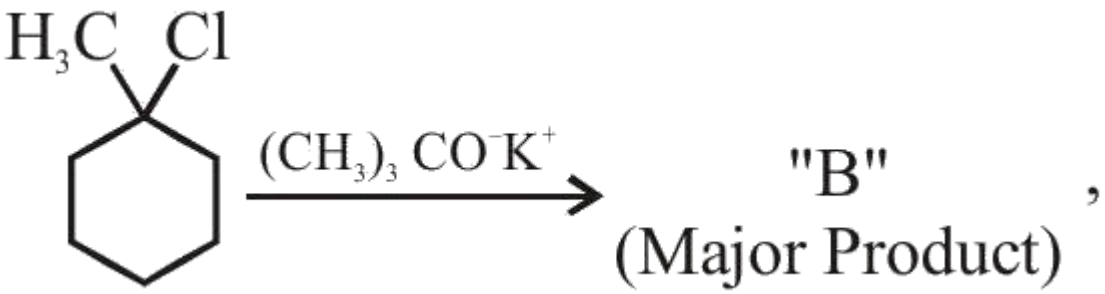


D.

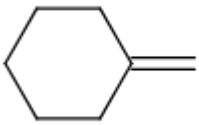


Question 174 View solution online

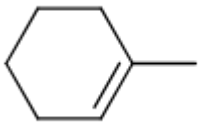
The product " A " and " B " formed in above reactions are :

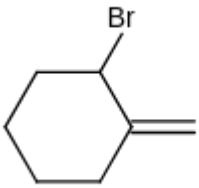


A. B-

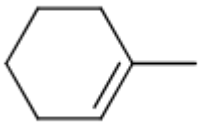


B. B-





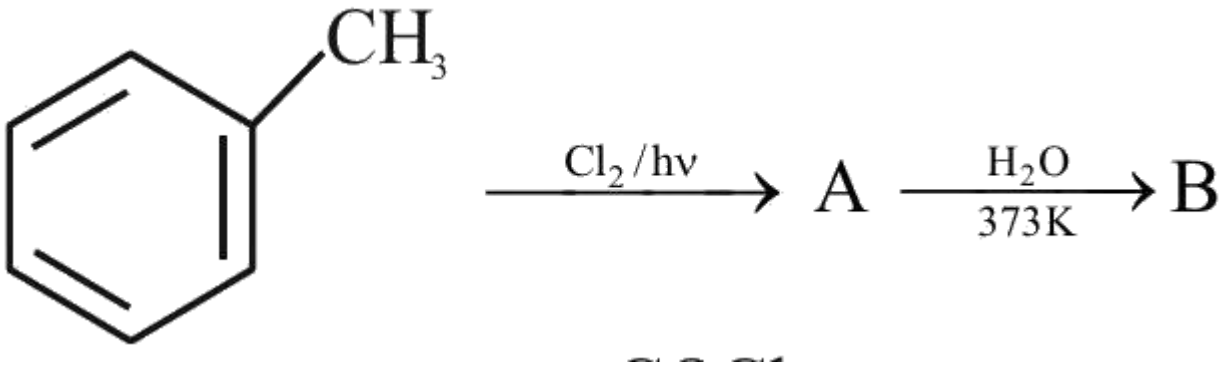
C.



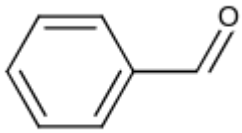
D.

Question 175 View solution online

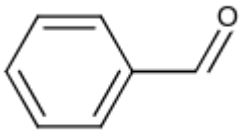
Identify A and B in the following sequence of reaction



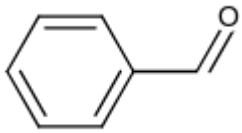
A.



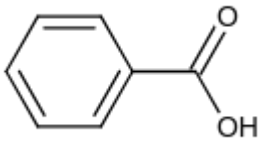
B.



C.

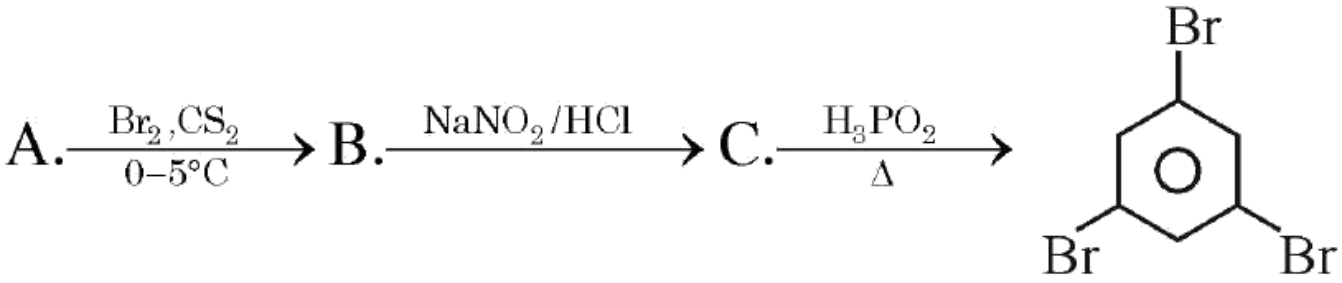


D.



Question 176 View solution online

Compound A from the following reaction sequence is:



A. Benzoic Acid

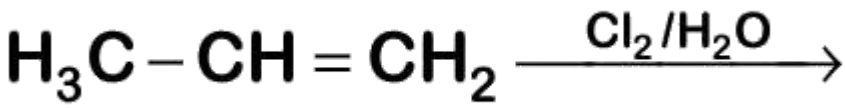
B. Phenol

C. Salicylic Acid

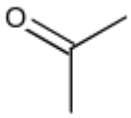
D. Aniline

Question 177 View solution online

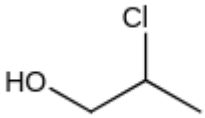
The major product of the following addition reaction is



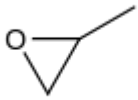
A.



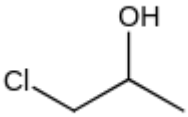
B.



C.

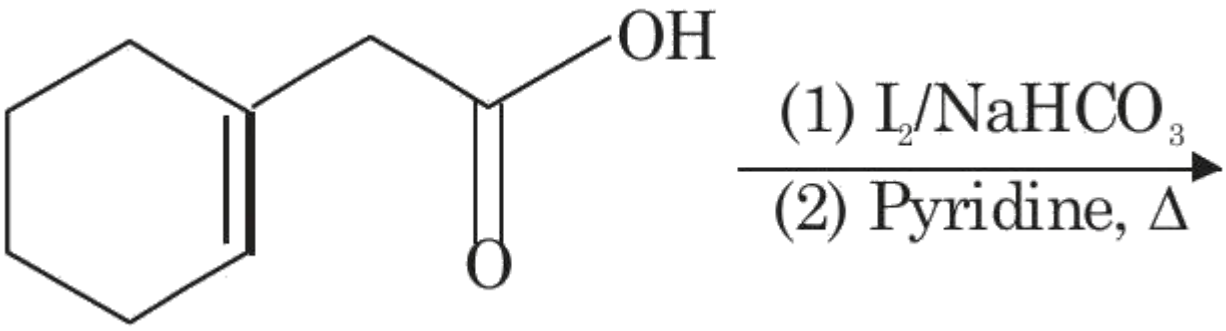


D.

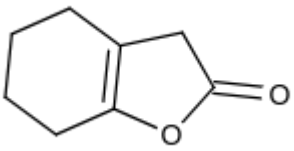


Question 178 View solution online

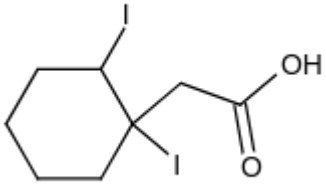
Find out the major product for the above reaction.



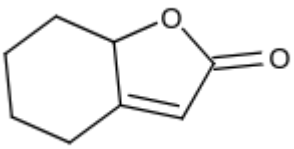
A.



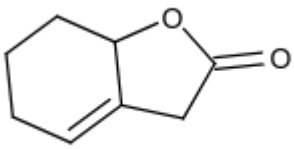
B.



C.

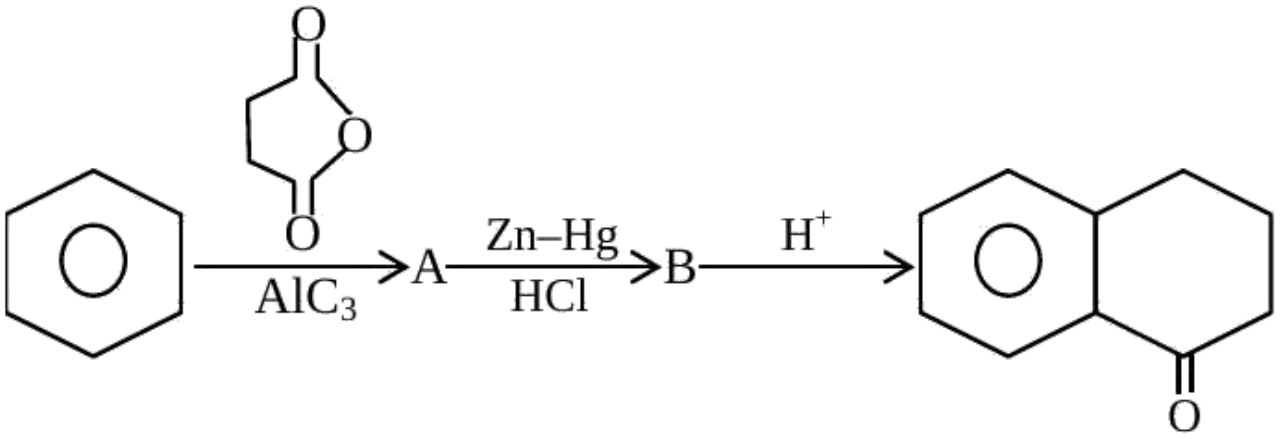


D.

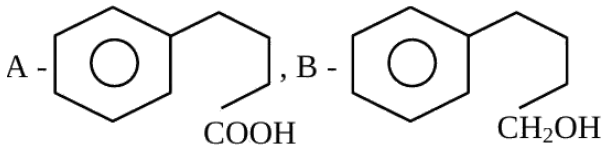


Question 179 View solution online

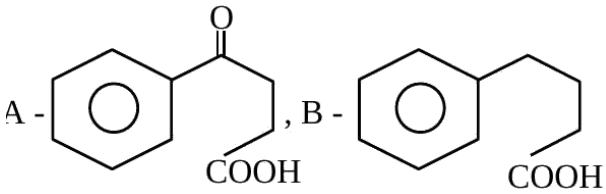
Identify A and B in the given chemical reaction sequence : -



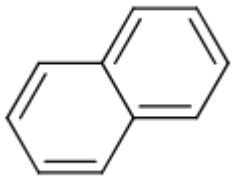
A.



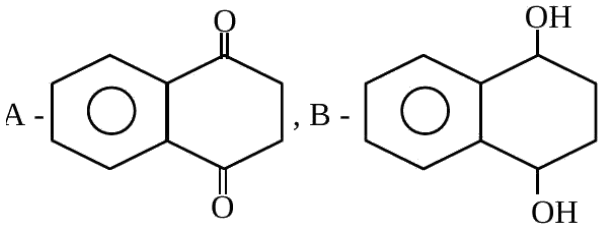
B.



C.

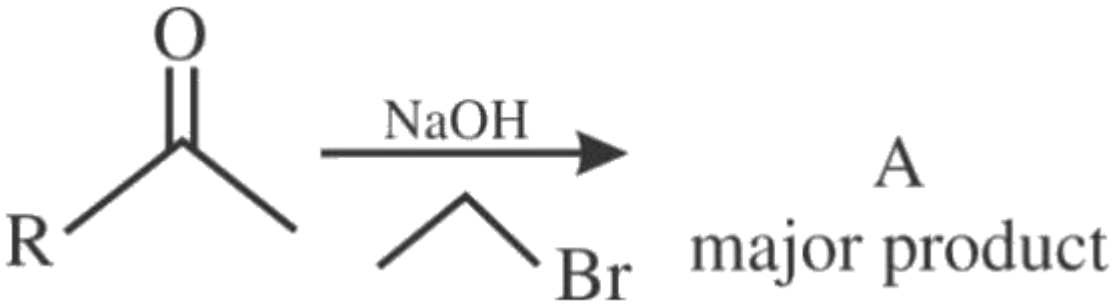


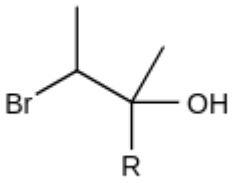
D.



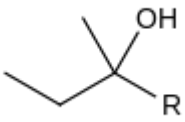
Question 180 View solution online

The structure of A in the given reaction is:

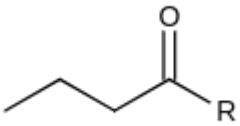




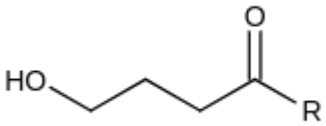
A.



B.



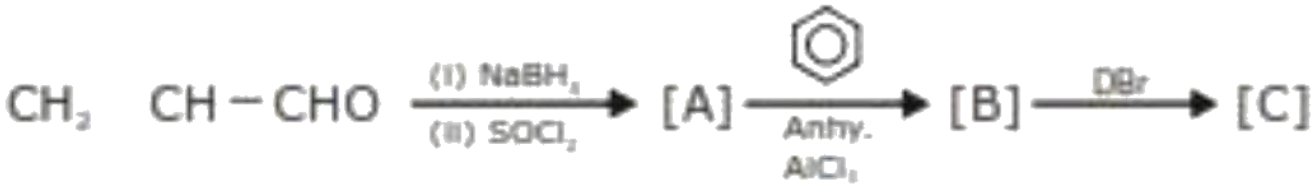
C.

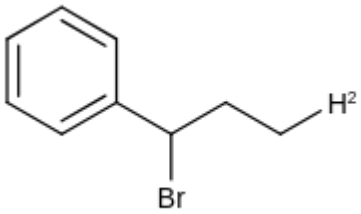


D.

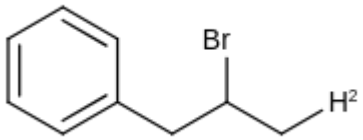
Question 181 View solution online

The major product [C] of the following reaction sequence will be :

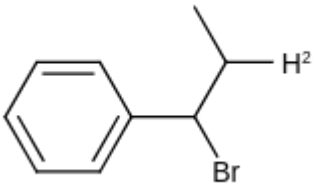




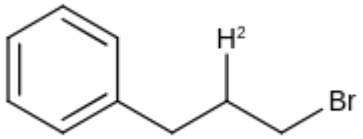
A.



B.



C.



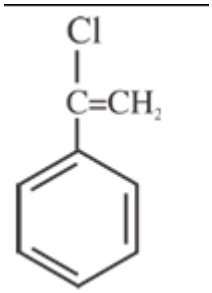
D.

Question 182 View solution online

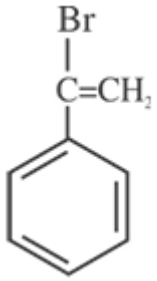
Product ' A ' of following sequence of reactions is

$$\text{Ethylbenzene} \xrightarrow[(c)\ \text{alc. KOH}]{(a)\ Br_2, Fe \\ (b)\ Cl_2, \Delta} \text{'A'(Major product)}$$

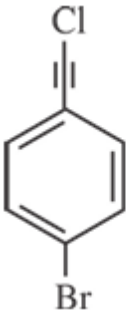
A.



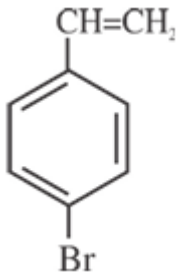
B.



C.

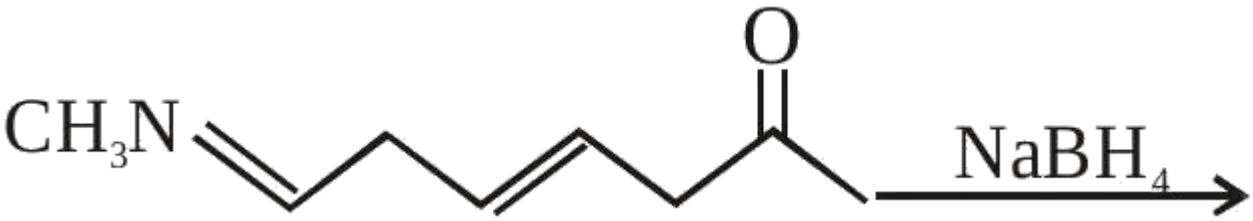


D.

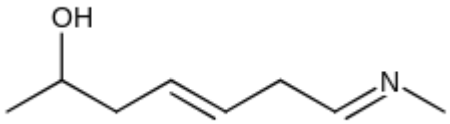


Question 183 View solution online

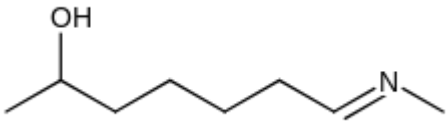
The major product of the following recation is:



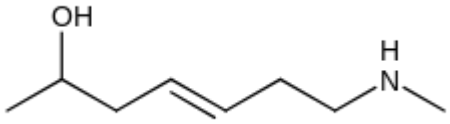
A.



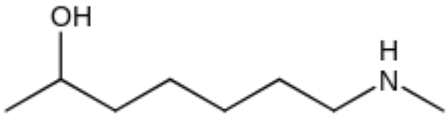
B.



C.

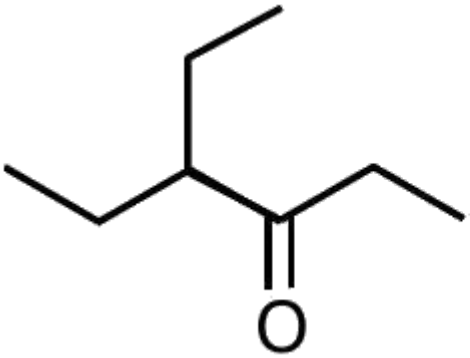


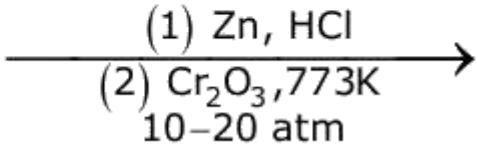
D.



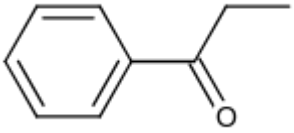
Question 184 View solution online

Considering the above reaction, the major product among the following is:

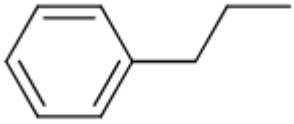




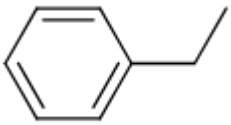
A.



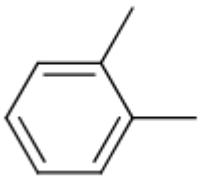
B.



C.

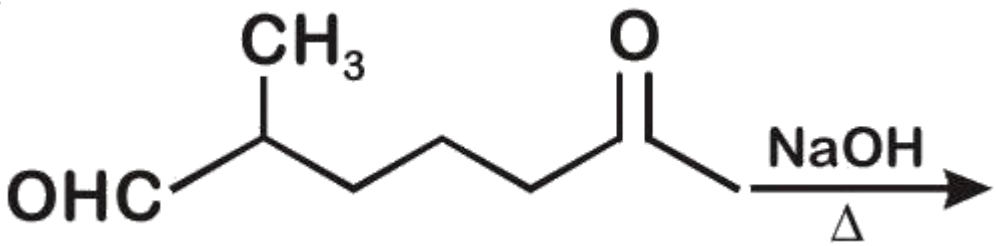


D.

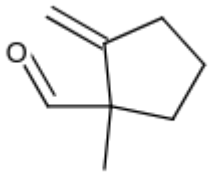


Question 185 View solution online

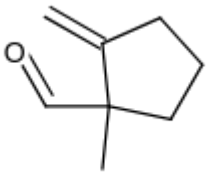
The major product obtained in the following reaction is



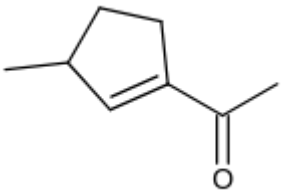
A.



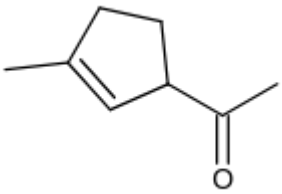
B.



C.



D.

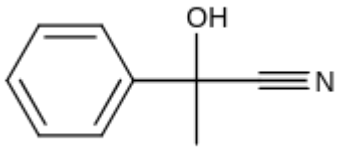


Question 186 View solution online

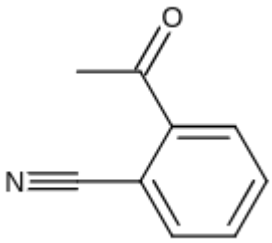
The structure of product C, formed by the following sequence of reactions is :

$$CH_3COOH + SOCl_2 \longrightarrow A \xrightarrow[AlCl_3]{\text{Benzene}} B \xrightarrow[-OH]{KCN} C$$

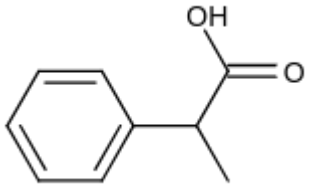
A.



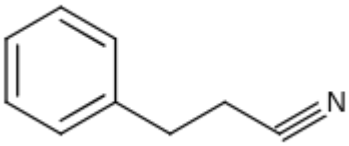
B.



C.

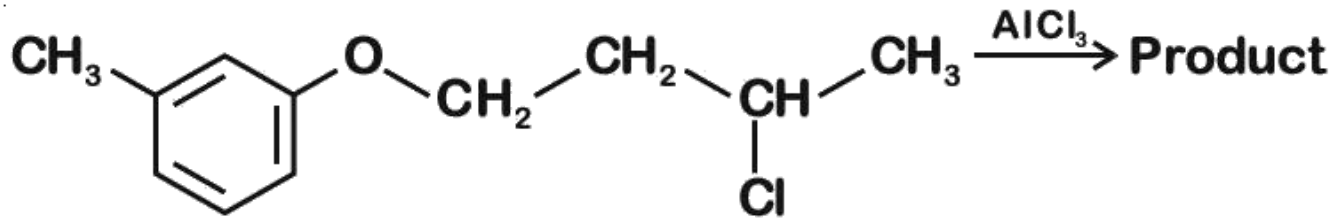


D.

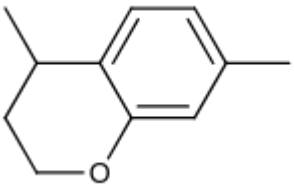


Question 187 View solution online

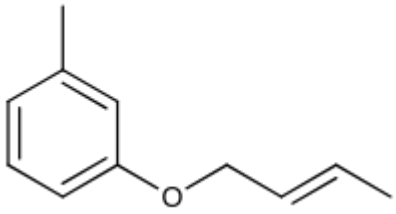
The major product obtained in the given reaction is :



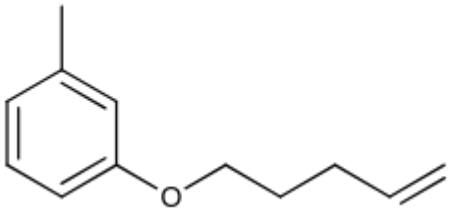
A.



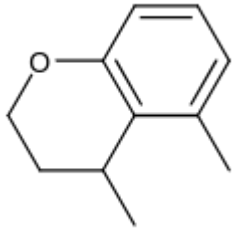
B.



C.

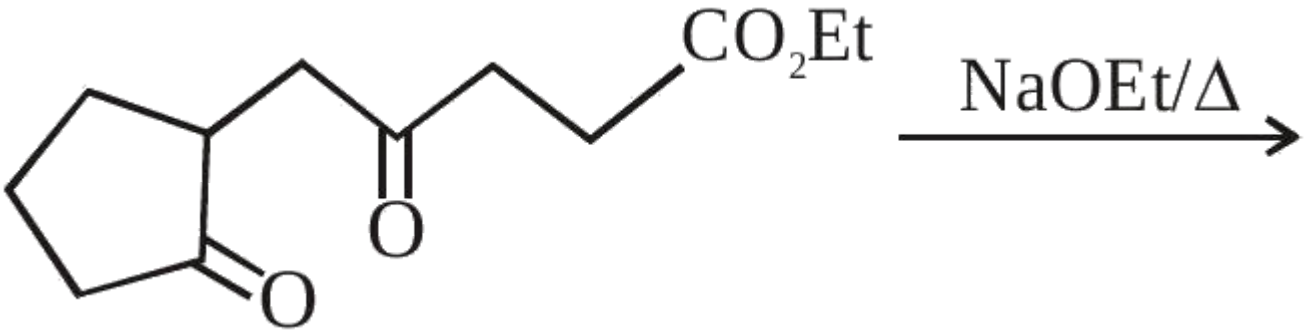


D.

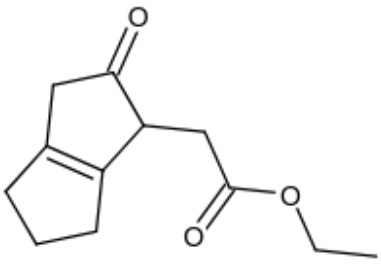


Question 188 View solution online

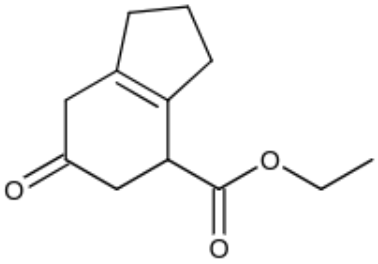
The major product obtained in the following reaction is :



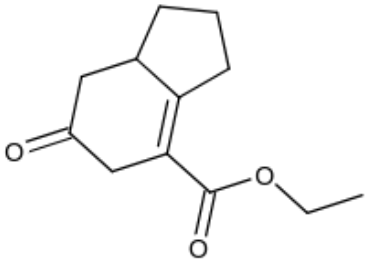
A.



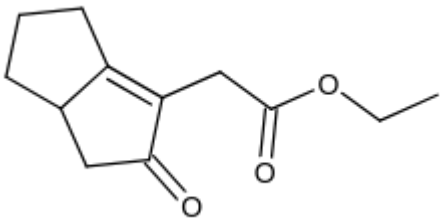
B.



C.

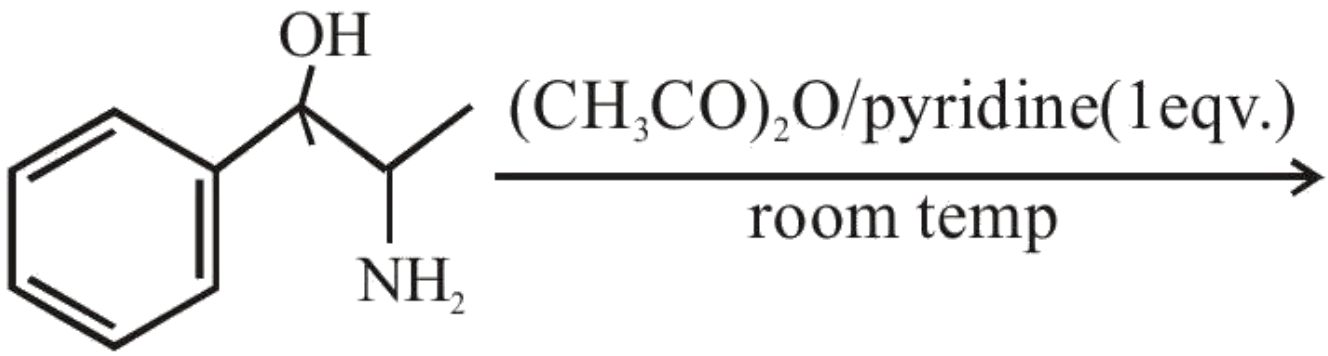


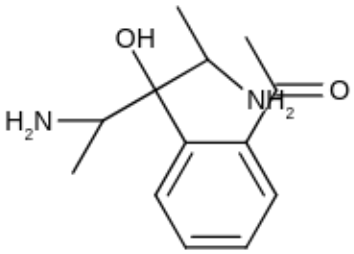
D.



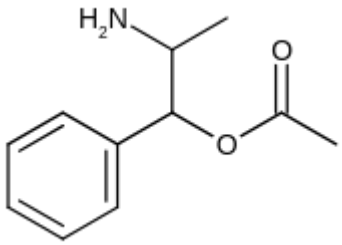
Question 189 View solution online

The major product obtained in the following reaction is :

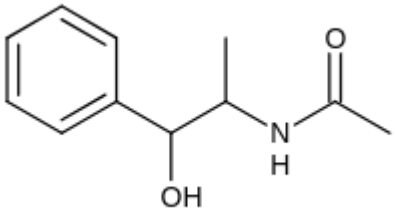




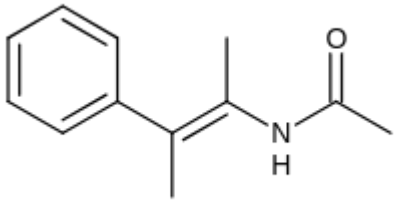
A.



B.



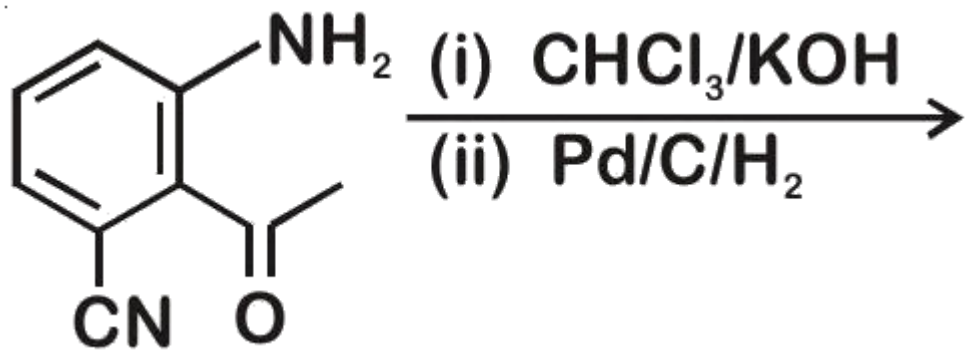
C.

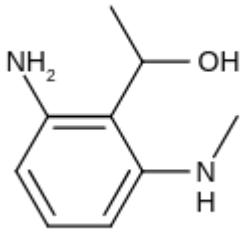


D.

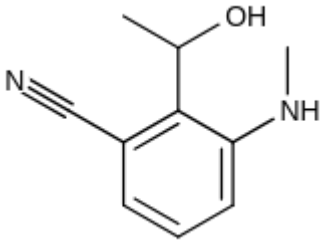
Question 190 View solution online

The major product obtained in the following reaction is:

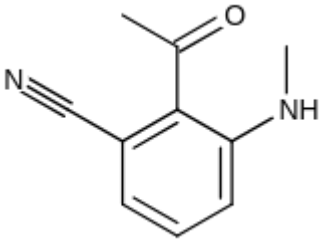




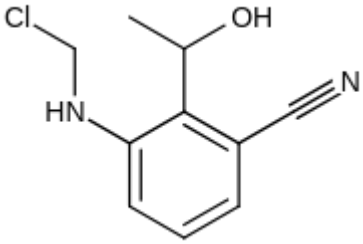
A.



B.



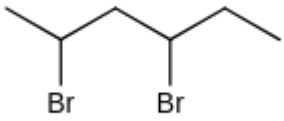
C.

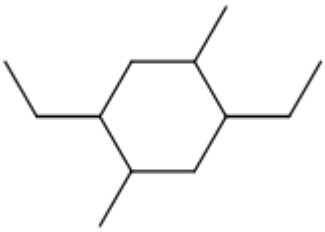


D.

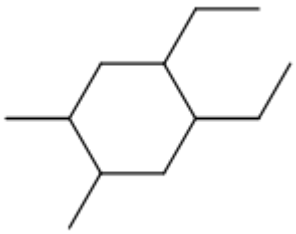
Question 191 View solution online

The product formed in the first step of the reaction of

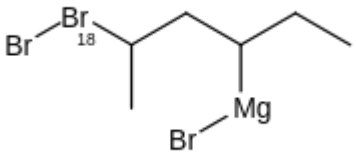




A.



B.



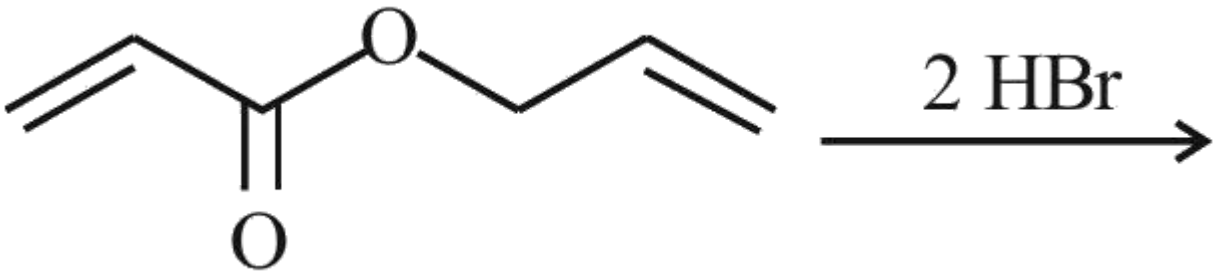
C.



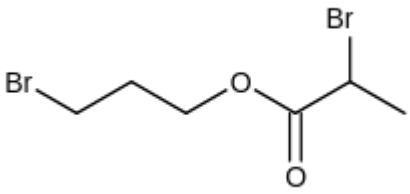
D.

Question 192 View solution online

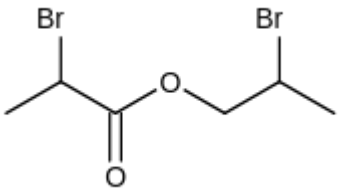
Major product of the following reaction is



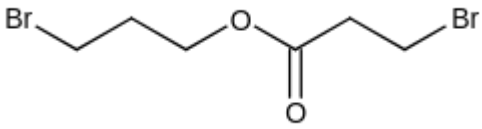
A.



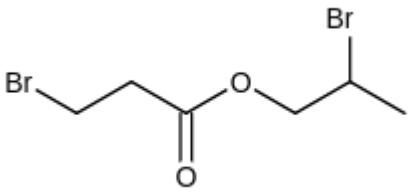
B.



C.

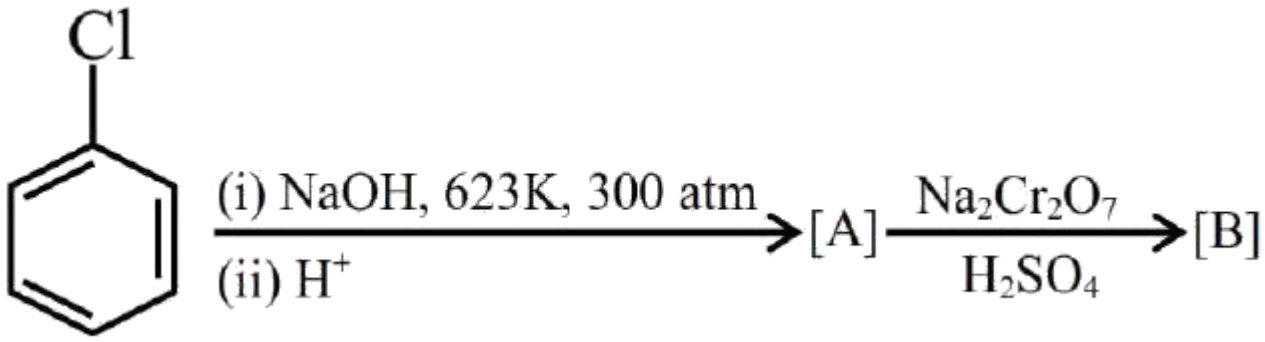


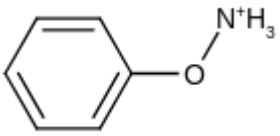
D.



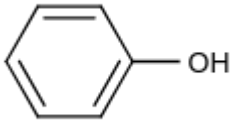
Question 193 View solution online

Identify the products [A] and [B], respectively in the following reaction :





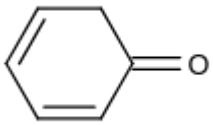
A.



B.



C.



D.

Solutions

Questions 194-199 / 6 selected / 2.0% practice weight / Consolidate

Topics to prioritise in this collection

- Solution properties: 2 questions / 33.3% of this chapter
- Colligative properties: 1 question / 16.7% of this chapter
- Electrolyte colligative properties: 1 question / 16.7% of this chapter
- Freezing point depression: 1 question / 16.7% of this chapter
- Henry's law: 1 question / 16.7% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 194 View solution online

A 1 molal $\mathbf{K_4Fe(CN)_6}$ solution has a degree of dissociation of 0.4 . Its boiling point is equal to that of another solution which contains 18.1 weight percent of a non electrolytic solute A. The molar mass of A is u. (Round off to the Nearest Integer).

[Density of water $= \mathbf{1.0\ g\ cm^{-3}}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 195 View solution online

$\mathbf{20\%}$ of acetic acid is dissociated when its 5 g is added to 500 mL of water. The depression in freezing point of such water is $\times\mathbf{10^{-3}}^{\circ}\mathbf{C}$

Atomic mass of C, H and O are 12,1 and 16 a.m.u. respectively.

[Given : Molal depression constant and density of water are $\mathbf{1.86\ K\ kg\ mol^{-1}}$ and $\mathbf{1\ g\ cm^{-3}}$ respectively.

Numerical answer: _____

Enter the requested value or coefficient rounded to the nearest integer (0 decimal places).

Question 196 View solution online

Henry's constant (in kbar) for four gases α, β, γ and δ in water at 298 K is given below :

	α	β	γ	δ
K_H	50	2	2×10^{-5}	0.5

(density of water $= 10^3\ kg\ m^{-3}$ at 298 K)
This table implies that :

A. solubility of γ at 308 K is lower than at 298 K

B. The pressure of a 55.5 molal solution of δ is 250 bar

C. α has the highest solubility in water at a given pressure

D. The pressure of a 55.5 molal solutio of γ is 1 bar

Question 197 View solution online

224 mL of $SO_{2(g)}$ at 298 K and 1 atm is passed through 100 mL of 0.1 M NaOH solution. The non-volatile solute produced is dissolved in 36 g of water. The lowering of vapour pressure of solution (assuming the solution is dilute) $\left(P^*_{(H_2O)} = 24\ mm \text{ of Hg}\right)$ is $x \times 10^{-2}\ mm$ of Hg , the value of x is .

Numerical answer: _____

Enter the requested value to 2 decimal places. Use the units and scaling stated in the question.

Question 198 View solution online

1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionised. The boiling point of the solution at 1 atm is K . (Rounded-off to the nearest integer)
[Given K_b for $(H_2O) = 0.52\ K\ kg\ mol^{-1}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 199 View solution online

If a compound AB dissociates to the extent of 75% in an aqueous solution, the molality of the solution which shows a 2.5 K rise in the boiling point of the solution is molal.
(Rounded - off to the nearest integer)
$\left[\mathrm{K_b} = 0.52\ \mathrm{K\ kg\ mol^{-1}}\right]$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Electrochemistry

Questions 200-201 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

- Electrochemical cells: 1 question / 50.0% of this chapter
- Molar conductivity: 1 question / 50.0% of this chapter

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Question 200

View solution online

Match List I with List II

LIST-I (Cell)		LIST-II (Use/Property/Reaction)	
A.	Leclanche cell	I.	Converts energy of combustion into electrical energy
B.	Ni-Cd cell	II.	Does not involve any ion in solution and is used in hearing aids
C.	Fuel cell	III.	Rechargeable
D.	Mercury cell	IV.	Reaction at anode $Zn \rightarrow Zn^{2+} + 2e^-$

Choose the correct answer from the options given below:

A. A-I, B-II, C-III, D-IV

B. A-III, B-I, C-IV, D-II

C. A-IV, B-III, C-I, D-II

D. A-II, B-III, C-IV, D-I

Question 201 View solution online

Match List-I with List-II

List-I (Parameter)	**List-II** (Unit)
(a) Cell constant	(i) $S\,cm^2\,mol^{-1}$
(b) Molar conductivity	(ii) Dimensionless
(c) Conductivity	(iii) m^{-1}
(d) Degree of dissociation of electrolyte	(iv) $\Omega^{-1}\,m^{-1}$

Choose the most appropriate answer from the options given below.

A. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

B. (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

C. (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

D. (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

Chemical Kinetics

Questions 202-202 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Initial-rate method: 1 question / 100.0% of this chapter

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Question 202

View solution online

The following data was obtained for chemical reaction given below at 975 K .

$$2NO_{(g)} + 2H_{2(g)} \rightarrow N_{2(g)} + 2H_2O_{(g)}$$

$[NO]$	$[H_2]$	Rate
$molL^{-1}$	$mol\ L^{-1}$	$mol\ L^{-1}\ s^{-1}$

(A) 8×10^{-5} 8×10^{-5} 7×10^{-9}
(B) 24×10^{-5} 8×10^{-5} 2.1×10^{-8}
(C) 24×10^{-5} 32×10^{-5} 8.4×10^{-8}

The order of the reaction with respect to NO is
. [Integer answer]

Numerical answer: _____

Enter the requested integer (0 decimal places).

The p-Block Elements

Questions 203-207 / 5 selected / 1.7% practice weight / Consolidate

Topics to prioritise in this collection

- Main group element chemistry: 3 questions / 60.0% of this chapter
- Gas-evolution reactions: 1 question / 20.0% of this chapter
- Group 16 properties: 1 question / 20.0% of this chapter

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Question 203 View solution online

Choose the correct statements from the following A. All group 16 elements form oxides of general formula EO_2 and EO_3 where $E = S, Se, Te$ and Po. Both the types of oxides are acidic in nature.
B. TeO_2 is an oxidising agent while SO_2 is reducing in nature.
C. The reducing property decreases from H_2S to H_2Te down the group.
D. The ozone molecule contains five lone pairs of electrons.
Choose the correct answer from the options given below:

A. A and D only

B. B and C only

C. C and D only

D. A and B only

Question 204 View solution online

Match List-I with List-II, match the gas evolved during each reaction.

	List-I		List-II
(A)	$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$	(I)	H_2
(B)	$KMnO_4 + HCl \rightarrow$	(II)	N_2
(C)	$Al + NaOH + H_2O \rightarrow$	(III)	O_2
(D)	$NaNO_3 \xrightarrow{\Delta}$	(IV)	Cl_2

Choose the correct answer from the options given below:

A. - (II), (B) - (III), (C) - (I), (D) - (IV)

B. (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

C. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

D. (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Question 205 View solution online

Choose the correct statement(s):
A. Beryllium oxide is purely acidic in nature.
B. Beryllium carbonate is kept in the atmosphere of CO_2.
C. Beryllium sulphate is readily soluble in water.
D. Beryllium shows anomalous behavior.

Choose the correct answer from the options given below:

A. B, C and D only

B. A only

C. A, B and C only

D. A and B only

Question 206 View solution online

Given below are two statements:

Statement I: Chlorine can easily combine with oxygen to form oxides; and the product has a tendency to explode.
Statement II: Chemical reactivity of an element can be determined by its reaction with oxygen and halogens.
In the light of the above statements, choose the correct answer from the options given below

A. Both the Statements I and II are true

B. Both the Statements I and II are false

C. Statement I is false but Statement II is true

D. Statement I is true but Statement II is false

Question 207 View solution online

Match List I with List II

	List I	List II
(A)	Slaked lime	(I) NaOH
(B)	Dead burnt plaster	(II) $Ca(OH)_2$
(C)	Caustic soda	(III) $Na_2CO_3 \cdot 10H_2O$
(D)	Washing soda	(IV) $CaSO_4$

Choose the correct answer from the options given below:

A. - III, (B) - IV, (C) - II, (D) - I

B. (A) - III, (B) - II, (C) - IV, (D) - I

C. (A) - I, (B) - IV, (C) - II, (D) - III

D. (A) -II, (B) - IV, (C) - I, (D) - III

The d- and f-Block Elements

Questions 208-210 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Properties of transition elements: 3 questions / 100.0% of this chapter

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Question 208 View solution online

Number of complexes from the following with even number of unpaired " d " electrons is ..... .
$[V(H_2O)_6]^{3+}$, $[Cr(H_2O)_6]^{2+}$, $[Fe(H_2O)_6]^{3+}$, $[Ni(H_2O)_6]^{3+}$, $[Cu(H_2O)_6]^{2+}$
[Given atomic numbers : $V = 23, Cr = 24, Fe = 26, Ni = 28, Cu = 29$]

A. 2

B. 4

C. 5

D. 1

Question 209 View solution online

Number of complexes with even number of electrons in t_{2g} orbitals is -
$[Fe(H_2O)_6]^{2+}$, $[Co(H_2O)_6]^{2+}$, $[Co(H_2O)_6]^{3+}$,
$[Cu(H_2O)_6]^{2+}$, $[Cr(H_2O)_6]^{2+}$

A. 1

B. 3

C. 2

D. 5

Question 210 View solution online

Lanthanoid ions with $4f^7$ configuration are :

(A) Eu^{2+}

(B) Gd^{3+}

(C) Eu^{3+}

(D) Tb^{3+}

(E) Sm^{2+}

Choose the correct answer from the options given below:

A. (A) and (B) only

B. (A) and (D) only

C. (B) and (E) only

D. (B) and (C) only

Coordination Compounds

Questions 211-219 / 9 selected / 3.0% practice weight / Next

Topics to prioritise in this collection

- Coordination chemistry: 5 questions / 55.6% of this chapter
- Crystal field splitting: 2 questions / 22.2% of this chapter
- Coordination and crystal field theory: 1 question / 11.1% of this chapter
- Coordination Compounds: 1 question / 11.1% of this chapter

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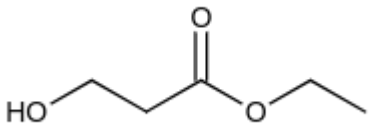
Question 211 View solution online

Identify the coordination complexes in which the central metal ion has $\mathbf{d^4}$ configuration.
(A) $[\mathbf{FeO_4}]^{2-}$
(B) $[\mathbf{Mn(CN)_6}]^{3-}$
(C) $[\mathbf{Fe(CN)_6}]^{3-}$
(D)
(E) $[\mathbf{NiF_6}]^{2-}$

Choose the correct answer from the options given below:



A. (C) and (E) only

B. (B), (C) and (D) only

C. (B) and (D) only

D. (A), (B) and (E) only

Question 212 View solution online

Identify the homoleptic complexes with odd number of d electrons in the central metal.
(A) $[FeO_4]^{2-}$
(B) $[Fe(CN)_6]^{3-}$
(C) $[Fe(CN)_5NO]^{2-}$
(D) $[CoCl_4]^{2-}$
(E) $[Co(H_2O)_3\ F_3]$

Choose the correct answer from the options given below :

A. (B) and (D) only

B. (C) and (E) only

C. (A), (B) and (D) only

D. (A), (C) and (E) only

Question 213 View solution online

Identify the homoleptic complex(es) that is/are low spin.
(A) $[Fe(CN)_5NO]^{2-}$
(B) $[CoF_6]^{3-}$
(C) $[Fe(CN)_6]^{4-}$
(D) $[Co(NH_3)_6]^{3+}$
(E) $[Cr(H_2O)_6]^{2+}$

Choose the correct answer from the options given below:

A. (B) and (E) only

B. (A) and (C) only

C. (C) and (D) only

D. (C) only

Question 214 View solution online

Match List-I with List-II.

List-I (Complex)

(A) $[CoF_6]^{3-}$
(B) $[NiCl_4]^{2-}$
(C) $[Co(NH_3)_6]^{3+}$
(D) $[Ni(CN)_4]^{2-}$

List-II
(Hybridisation of central metal ion)
(I) d^2sp^3
(II) sp^3
(III) $sp^3\ d^2$
(IV) dsp^2

Choose the correct answer from the options given below:

A. -(I), (B)-(IV), (C)-(III), (D)-(II)

B. (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

C. (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

D. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Question 215 View solution online

The correct order of the following complexes in terms of their crystal field stabilization energies is :

A. $[Co(NH_3)_4]^{2+} < [Co(NH_3)_6]^{2+} < [Co(en)_3]^{3+} < [Co(NH_3)_6]^{3+}$

B. $[Co(NH_3)_4]^{2+} < [Co(NH_3)_6]^{2+} < [Co(NH_3)_6]^{3+} < [Co(en)_3]^{3+}$

C. $[Co(NH_3)_6]^{2+} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_4]^{2+} < [Co(en)_3]^{3+}$

D. $[Co(en)_3]^{3+} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_6]^{2+} < [Co(NH_3)_4]^{2+}$

Question 216 View solution online

List I (Complex)	List II (Hybridisation)
$(A)\ [CoF_6]^{3-}$	$(I)\ d^2sp^3$
$(B)\ [NiCl_4]^{2-}$	$(II)\ sp^3$
$(C)\ [Co(NH_3)_6]^{3+}$	$(III)\ sp^3d^2$
$(D)\ [Ni(CN)_4]^{2-}$	$(IV)\ dsp^2$

A. (A)-(I), (B)-(IV), (C)-(III), (D)-(II)

B. (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

C. (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

D. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Question 217 View solution online

The correct increasing order of stability of the complexes based on Δ_o value is :
(I) $[Mn(CN)_6]^{3-}$
(II) $[Co(CN)_6]^{4-}$
(III) $[Fe(CN)_6]^{4}$
(IV) $[Fe(CN)_6]^{3-}$

A. II $<$ III $<$ I $<$ IV

B. IV $<$ III $<$ II $<$ I

C. I $<$ II $<$ IV $<$ III

D. III $<$ II $<$ IV $<$ I

Question 218 View solution online

List-I (Complex)		List-II (Hybridisation & Magnetic)	
(A)	$[MnBr_4]^{2-}$	(I)	d^2sp^3 & diamagnetic
(B)	$[FeF_6]^{3-}$	(II)	sp^3d^2 & paramagnetic
(C)	$[Co(C_2O_4)_3]^{3-}$	(III)	sp^3 & diamagnetic
(D)	$[Ni(CO)_4]$	(IV)	sp^3 & paramagnetic

A. (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

B. (A)-(III), (B)-(I), (C)-(II), (D)-(IV)

C. (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

D. (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

Question 219 View solution online

Consider the following low-spin complexes

$K_3[Co(NO_2)_6], K_4[Fe(CN)_6], K_3[Fe(CN)_6]$,

$Cu_2[Fe(CN)_6]$ and $Zn_2[Fe(CN)_6]$.

The sum of the spin-only magnetic moment values of complexes having yellow colour is

B.M. (answer is nearest integer)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Haloalkanes and Haloarenes

Questions 220-230 / 11 selected / 3.7% practice weight / Focus first

Topics to prioritise in this collection

- Nucleophilic substitution: 8 questions / 72.7% of this chapter
- Reactivity of aryl halides: 1 question / 9.1% of this chapter
- Silver nitrate test: 1 question / 9.1% of this chapter
- SN2 mechanism: 1 question / 9.1% of this chapter

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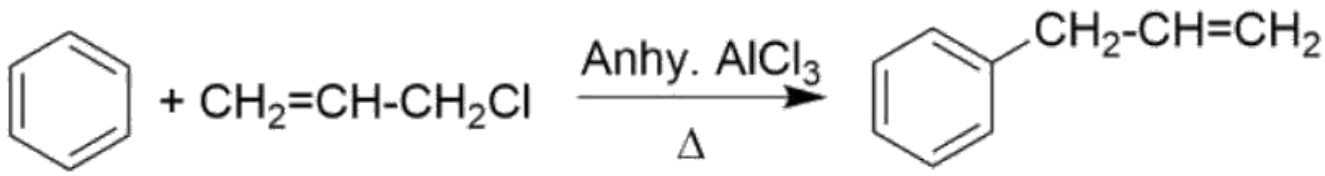
Question 220

View solution online

Which of the following reactions are possible?



A. A, B, C

B. **B, D**

C. A, C, D

D. **A, C**

Question 221 View solution online

Match List I with List II

List I Name of reaction		List II Reagent used	
A	Hell-VolhardZelinsky reaction	I.	$NaOH + I_2$
B	Iodoform reaction	II.	(i) CrO_2Cl_2, CS_2 (ii) H_2O
C	Etard reaction	III.	(i) $Br_2/$ red phosphorus (ii) H_2O
D	Gatterman-Koch reaction	IV.	CO, HCl, anhyd. $AlCl_3$

Choose the correct answer from the options given below:

A. A-III, B-II, C-I, D-IV

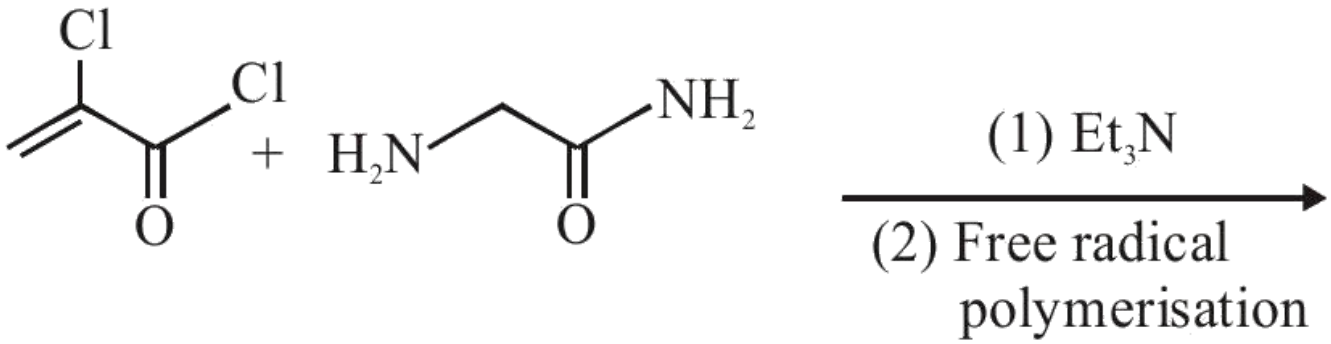
B. A-III, B-I, C-IV, D-II

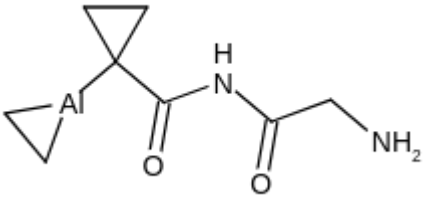
C. A-I, B-II, C-III, D-IV

D. A-III, B-I, C-II, D-IV

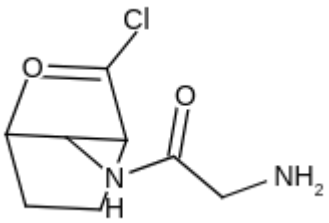
Question 222 View solution online

Major product of the following reaction is :

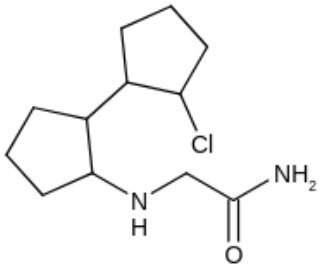




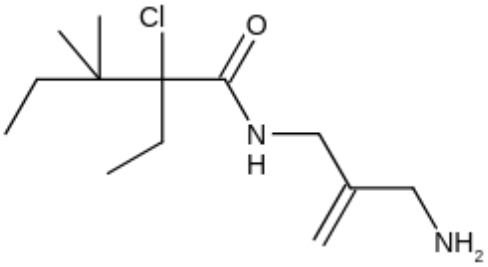
A.



B.



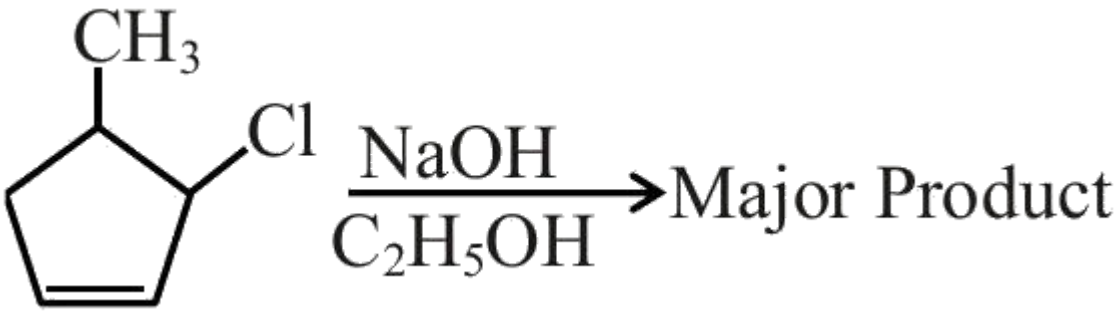
C.



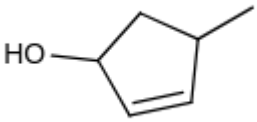
D.

Question 223 View solution online

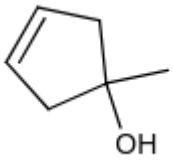
The major product of the following reaction is :



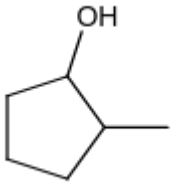
A.



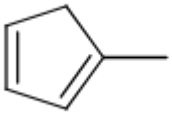
B.



C.



D.

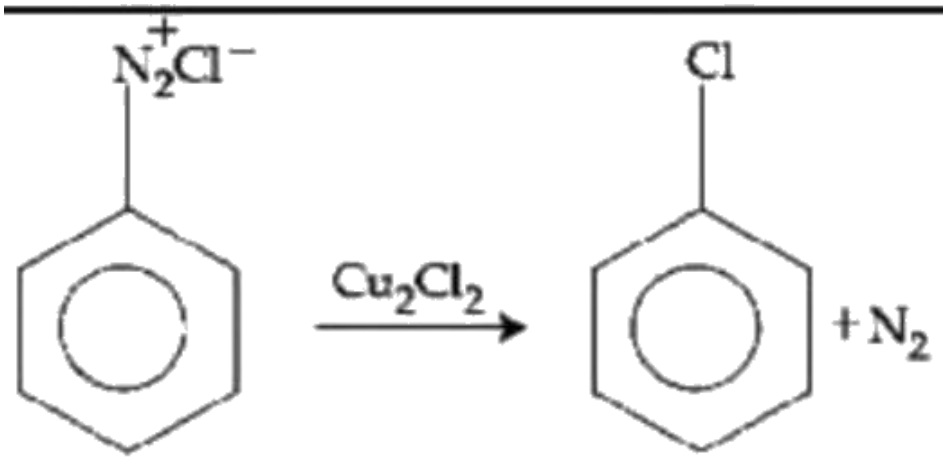


Question 224 View solution online

Match List I with List II

LIST I			LIST II	
		I.	Fittig reaction	
	II.	Wurtz Fittig reaction		
	III.	Finkelstein reaction		
D.	$C_2H_5Cl + NaI \rightarrow C_2H_5I + NaCl$		IV.	Sandmeyer reaction

Choose the correct answer from the options given below:



A. A - II, B - I, C - IV, D - III

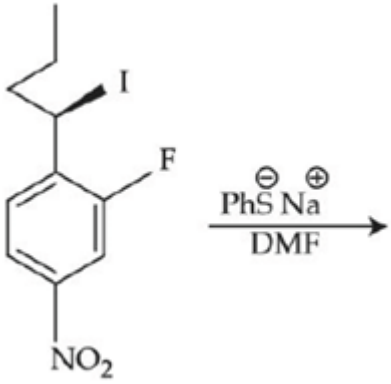
B. A - IV, B - II, C - III, D - I

C. A - III, B - II, C - IV, D - I

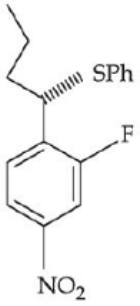
D. A - II, B - I, C - III, D - IV

Question 225 View solution online

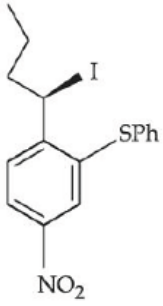
The major product of the following reaction is:



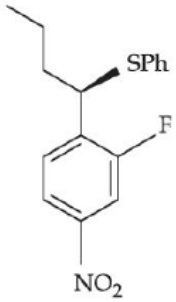
A.



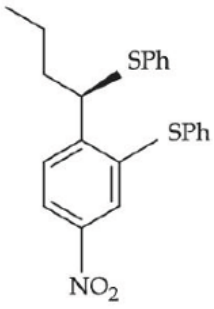
B.



C.



D.



Question 226 View solution online

Identify the correct order of reactivity for the following pairs towards the respective mechanism

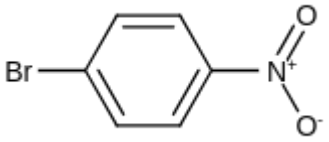
(A)

(B)

(C) Electrophilic substitution

(D) Nucleophilic substitution

Choose the correct answer from the options given below:



A. (A), (B) and (D) only

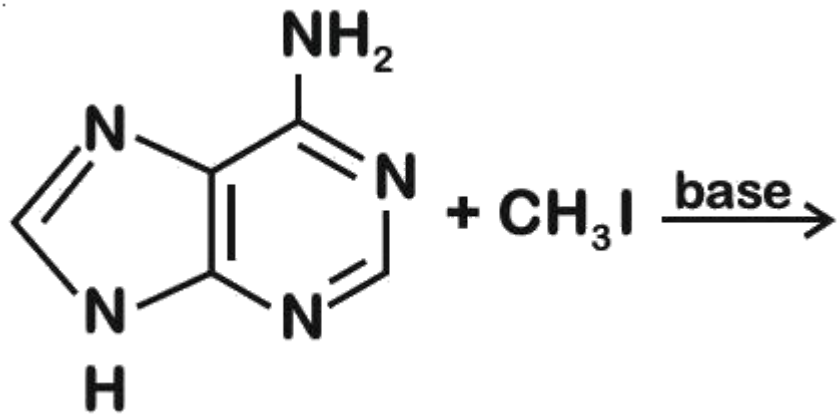
B. (A), (B), (C) and (D)

C. (A), (C) and (D) only

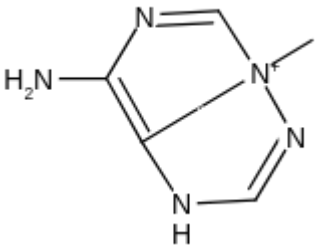
D. (B), (C) and (D) only

Question 227 View solution online

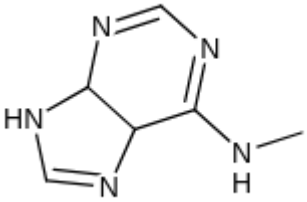
The major product in the following reaction is:



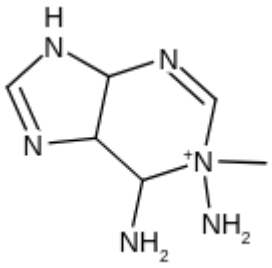
A.



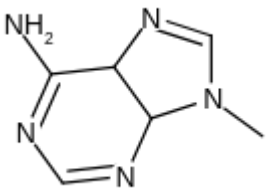
B.



C.



D.



Question 228 View solution online

Match the LIST-I with LIST-II

LIST-I Name reaction		LIST-II Product obtainable	
A.	Swarts reaction	I.	Ethyl benzene
B.	Sandmeyer's reaction	II.	Ethyl iodide
C.	Wurtz Fittig reaction	III.	Cyanobenzene
D.	Finkelstein reaction	IV.	Ethyl fluoride

Choose the correct answer from the options given below:

A. A-II, B-III, C-I, D-IV

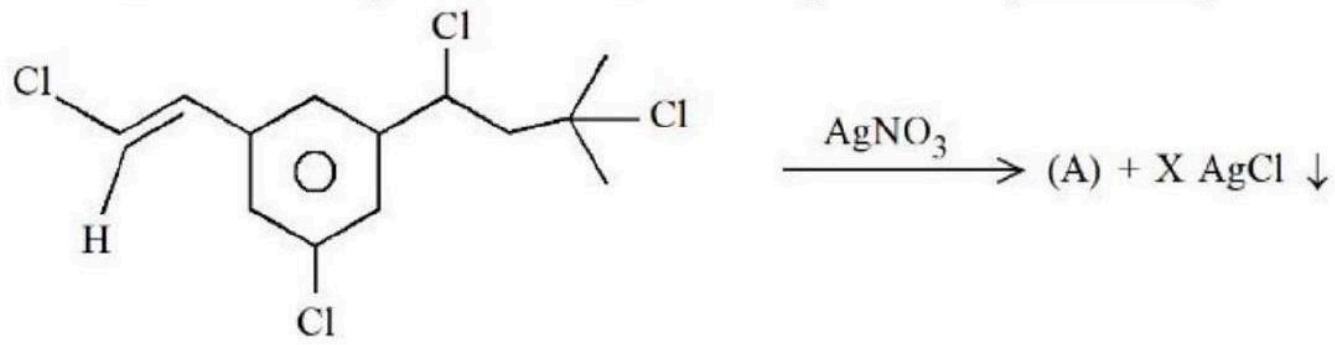
B. A-IV, B-I, C-III, D-II

C. A-IV, B-III, C-I, D-II

D. A-II, B-I, C-III, D-IV

Question 229 View solution online

Number of moles of AgCl formed in the following reaction is



Numerical answer: _____

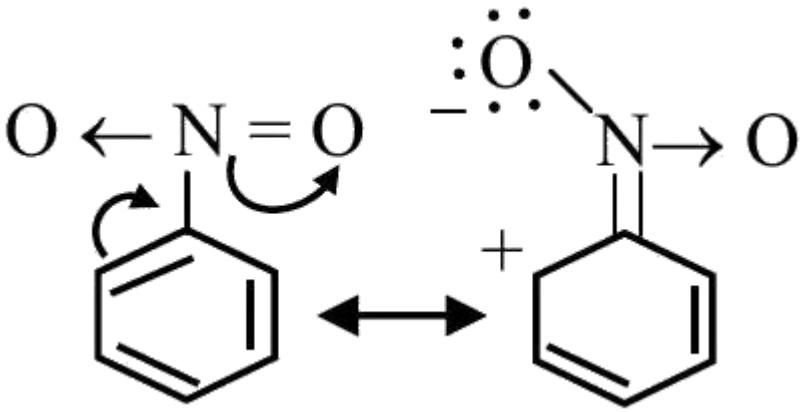
Enter the requested value or coefficient rounded to the nearest integer (0 decimal places).

Question 230 View solution online

Match List -I with List II:

\multirow{2}{*}{List - I Mechanism steps}		\multirow{2}{*}{List - II Effect}	
	(I)	- E effect	
	(IV)	+ R effect	

Choose the correct answer from the options given below:



A. (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

B. (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

C. (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

D. (A) - (I), (B) - (II), (C) - (IV), (D) - (III)

Alcohols, Phenols and Ethers

Questions 231-258 / 28 selected / 9.3% practice weight / Focus first

Topics to prioritise in this collection

- Reactions of alcohols, phenols and ethers: 17 questions / 60.7% of this chapter
- Acid-catalysed dehydration: 2 questions / 7.1% of this chapter
- Phenol acidity: 2 questions / 7.1% of this chapter
- Acid-catalysed cyclisation: 1 question / 3.6% of this chapter
- Alcohol and phenol reactivity: 1 question / 3.6% of this chapter
- Cumene process and phenol reactions: 1 question / 3.6% of this chapter
- Epoxide ring opening: 1 question / 3.6% of this chapter
- Hydrogen halide reactions: 1 question / 3.6% of this chapter
- Phenol reactions: 1 question / 3.6% of this chapter
- Reactions of alcohols and phenols: 1 question / 3.6% of this chapter

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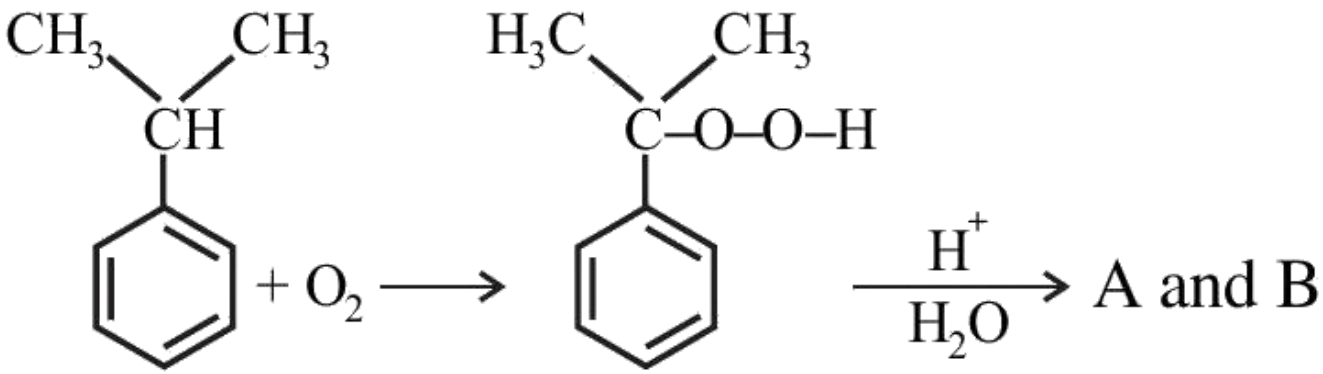
Question 231

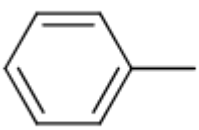
View solution online

In the following reaction:

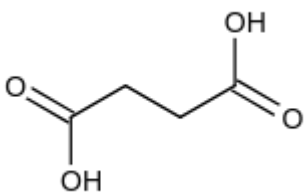


The compounds A and B respectively are :-

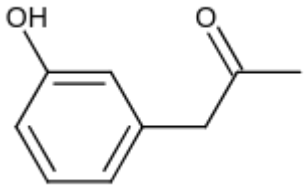
A.



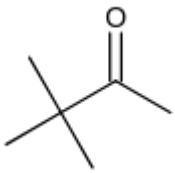
B.



C.



D.

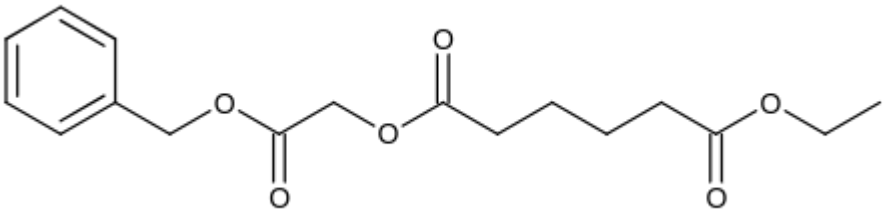


Question 232 View solution online

Match List - I with List -II.

List - I (Reactions)		List - II (Reagents)	
(B)	$C_6H_5COC_6H_5 \rightarrow C_6H_5CH_2C_6H_5$	(II)	$Zn(Hg)$ and conc. HCl
(C)	$C_6H_5CHO \rightarrow C_6H_5CH(OH)CH_3$	(III)	$NaBH_4, H^+$

Choose the correct answer from options given below:



A. A-(III), (B)-(IV), (C)-(I), (D)-(II)

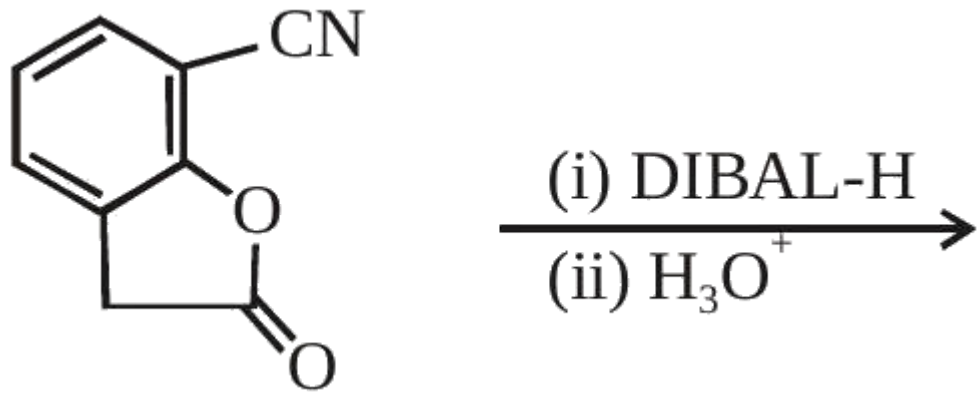
B. A-(IV), (B)-(II), (C)-(I), (D)-(III)

C. A-(IV), (B)-(II), (C)-(III), (D)-(I)

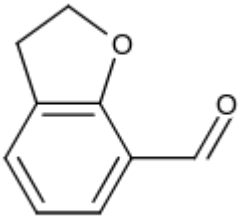
D. A-(III), (B)-(IV), (C)-(II), (D)-(I)

Question 233 View solution online

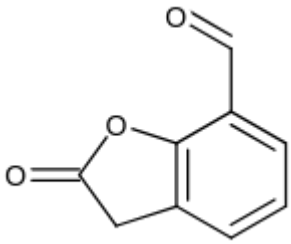
The major product of the following reaction is:



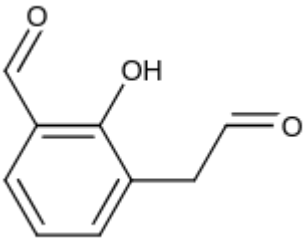
A.



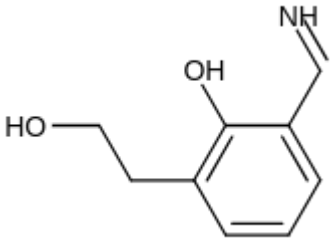
B.



C.

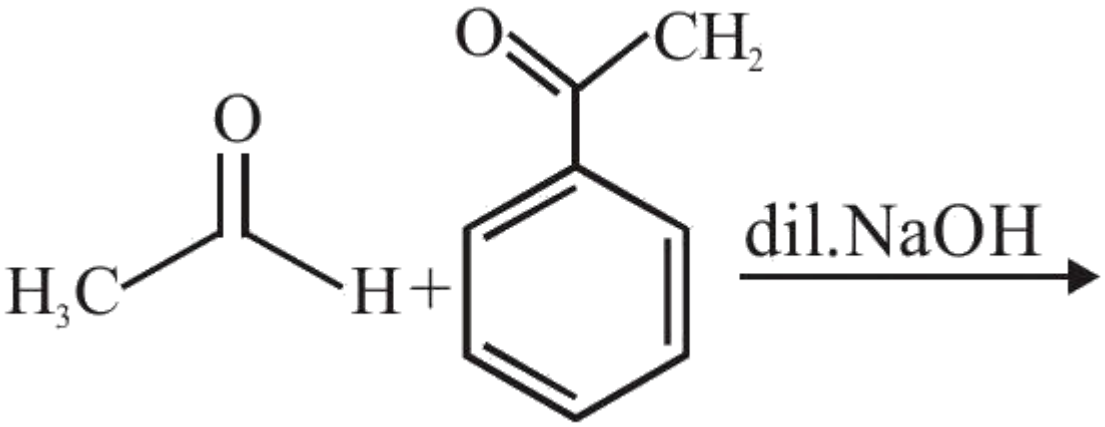


D.

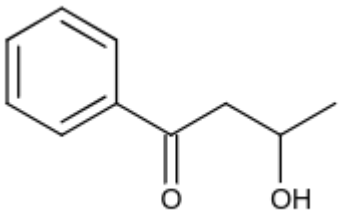


Question 234 View solution online

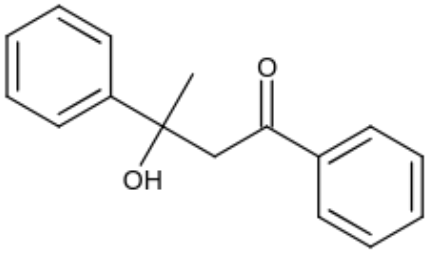
The major product formed in the following reaction is:



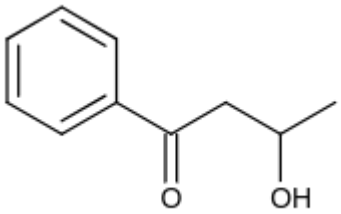
A.



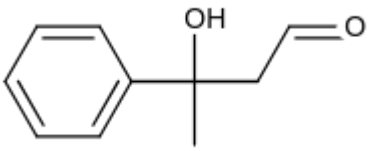
B.



C.

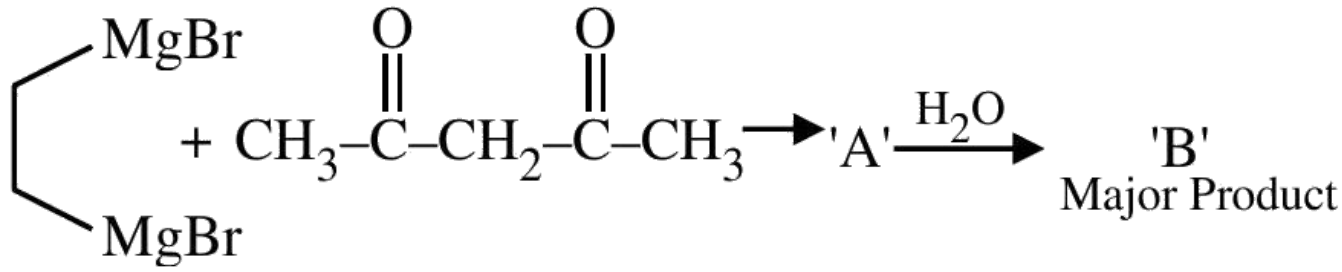


D.

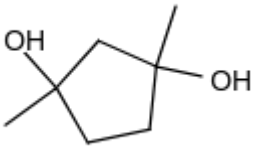


Question 235 View solution online

Consider the above reaction sequence and identify the product B.



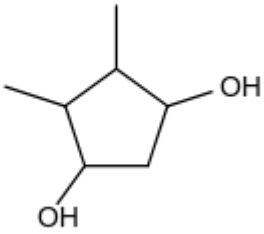
A.



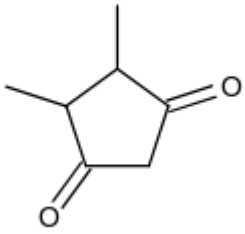
B.



C.



D.



Question 236 View solution online

Match List I with List II

\multirow{2}{*}{}	LIST I	LIST II	
	Isomeric pairs		Type of isomers
A.	Propanamine and N-Methylethanamine	I.	Metamers
B.	Hexan-2-one and Hexan-3-one	II.	Positional isomers
C.	Ethanamide and Hydroxyethanimine	III.	Functional isomers
D.	o-nitrophenol and p-nitrophenol	IV.	Tautomers

Choose the correct answer from the options given below:

A. A-II, B-III, C-I, D-IV

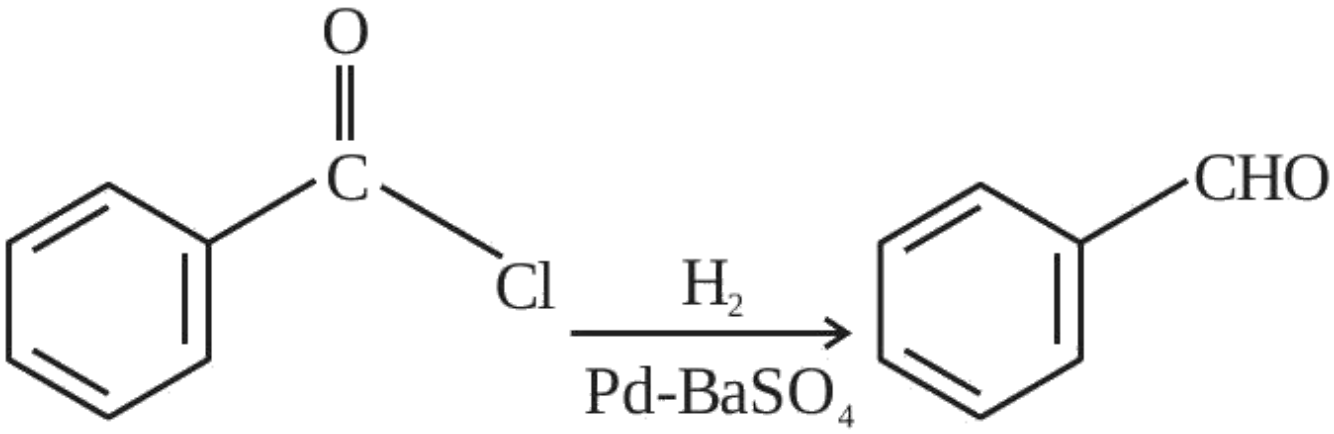
B. A-III, B-I, C-IV, D-II

C. A-III, B-IV, C-I, D-II

D. A-IV, B-III, C-I, D-II

Question 237 View solution online

This reduction reaction is known as:



A. Rosenmund reduction

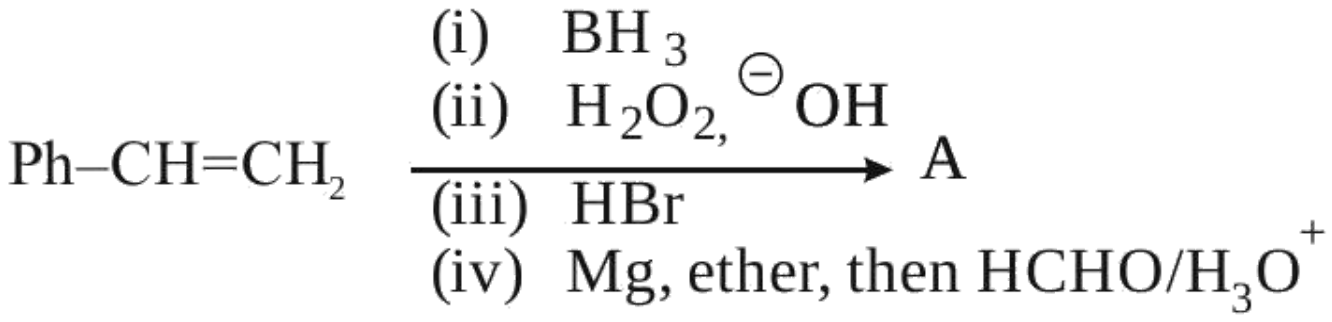
B. Wolff-Kishner reduction

C. Stephen reduction

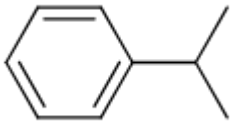
D. Etard reduction

Question 238 View solution online

The final product A, formed in the following reaction sequence is:

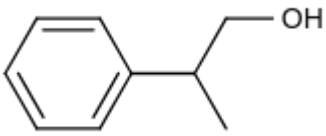


A. $Ph - CH_2 - CH_2 - CH_3$



B.

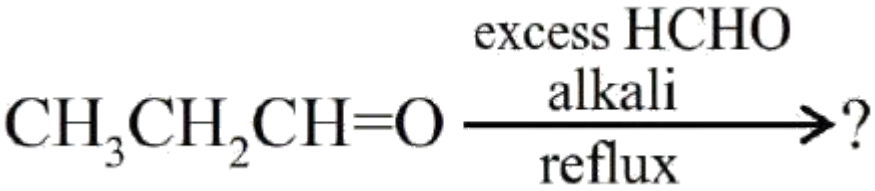
D. $Ph - CH_2 - CH_2 - CH_2 - OH$



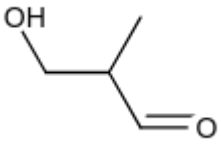
C.

Question 239 View solution online

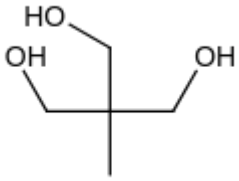
The major product of the following reaction is :



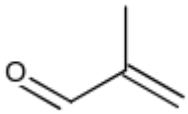
A. $CH_3 - CH_2 - CH_2 - OH$



B.



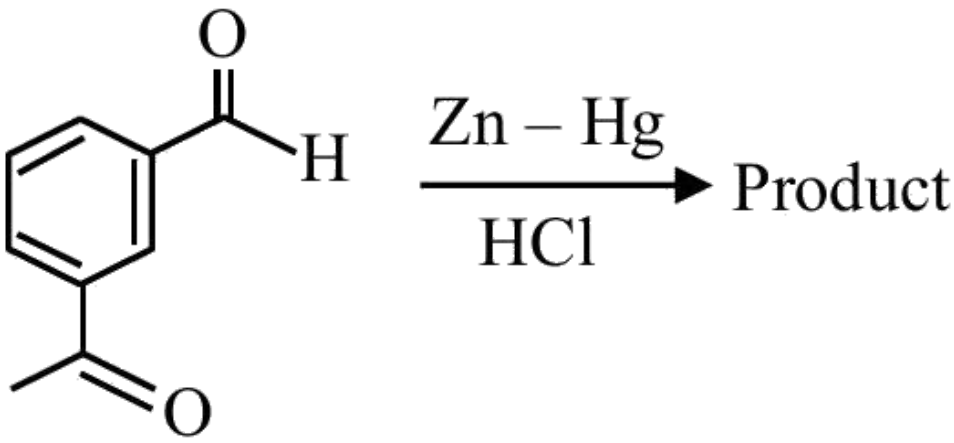
C.



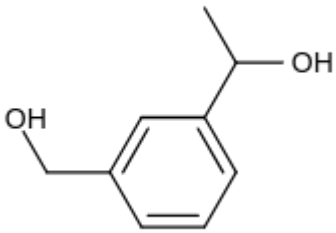
D.

Question 240 View solution online

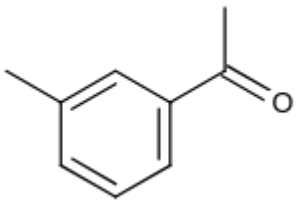
Identify the product in the following reaction :



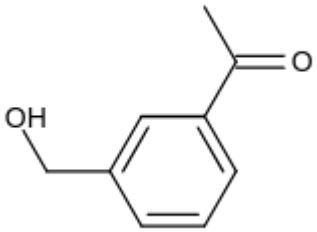
A.



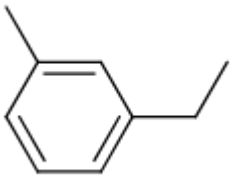
B.



C.



D.



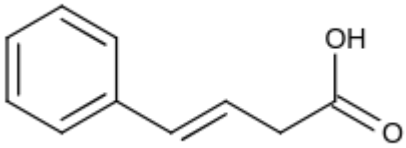
Question 241 View solution online

The major product ' P ' formed in the following sequence of reactions is

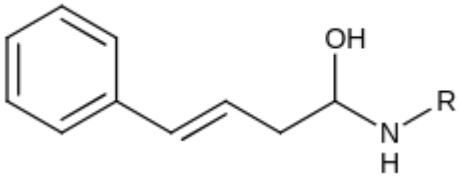
$\xrightarrow[\text{(ii) } R-NH_2]{\text{(i) } SOCl_2}$ 'P' (Major Product)

(iii) $LiAlH_4$

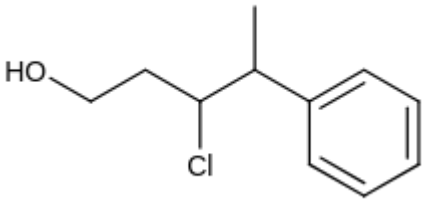
(iv) H_3O^+



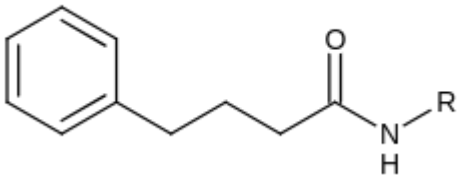
A. $H-N-R$



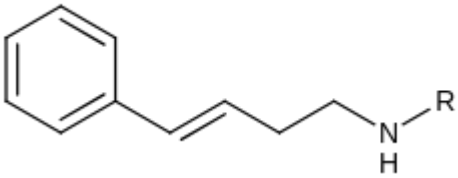
B.



C. H



D.



Question 242 View solution online

The major product of the following reaction is

$$CH_3CH=CHCO_2CH_3 \xrightarrow{LiAlH_4}$$

A. $CH_3CH_2CH_2CH_2OH$

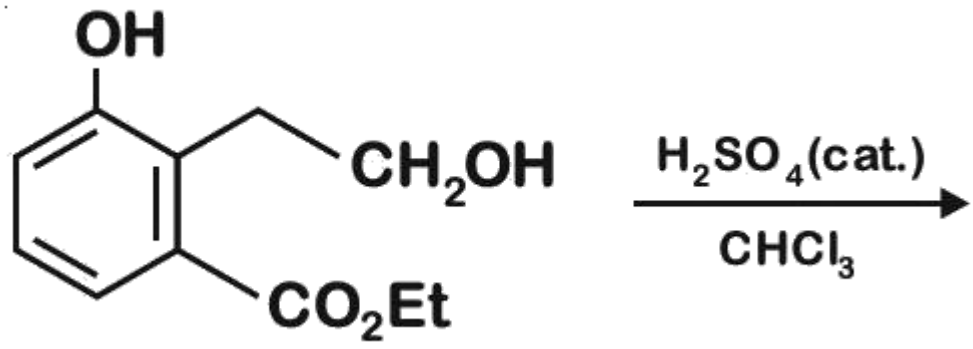
B. $CH_3CH_2CH_2CHO$

C. $CH_3CH_2CH_2CO_2CH_3$

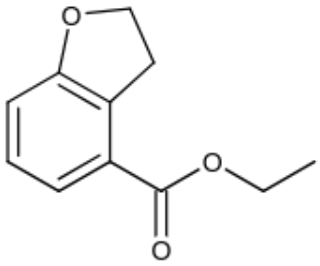
D. $CH_3CH=CHCH_2OH$

Question 243 View solution online

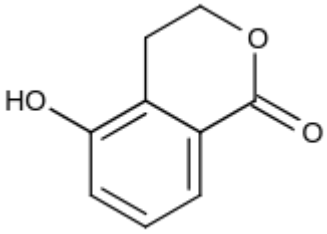
The major product of the following reaction is :



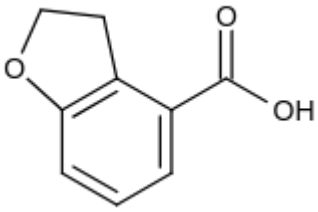
A.



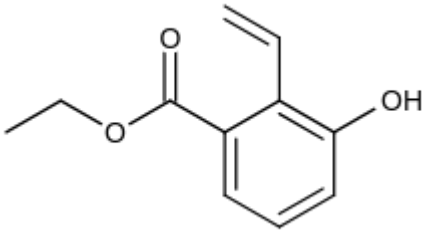
B.



C.

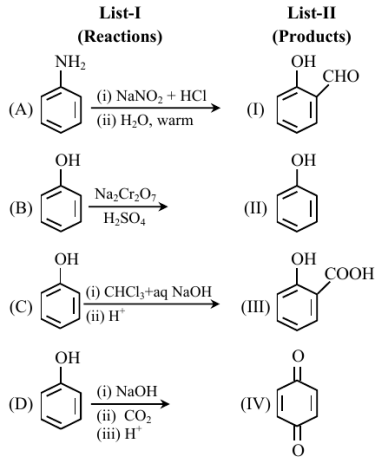


D.



Question 244 View solution online

Match List-I (Reactions) with List-II (Products):



Choose the correct answer from the options given below.

A. -(III), (B)-(II), (C)-(I), (D)-(IV)

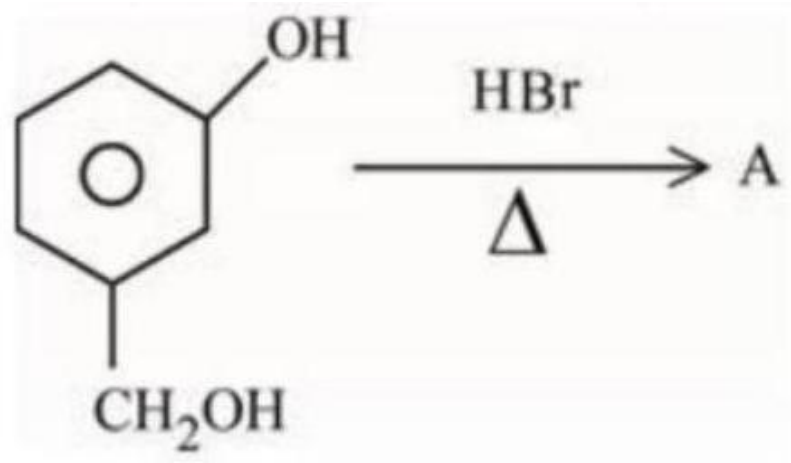
B. (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

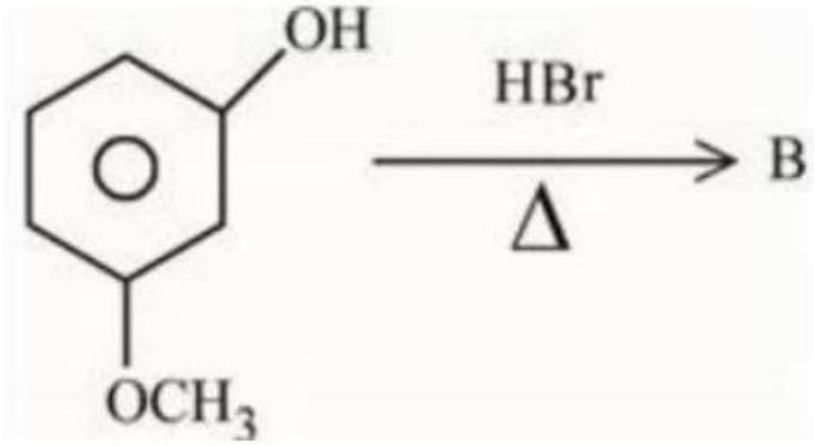
C. (A)-(I), (B)-(IV), (C)-(II), (D)-(III)

D. (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

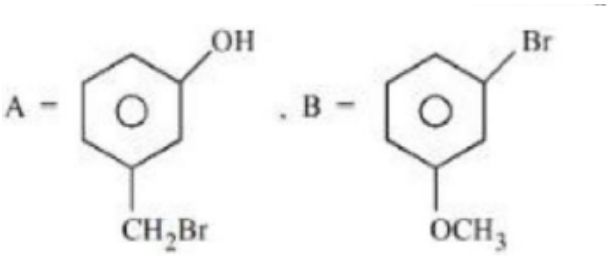
Question 245 View solution online

' A ' and ' B ' formed in the following set of reactions are:

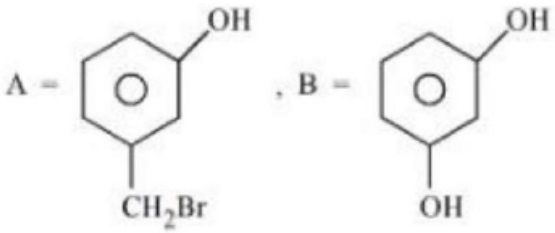




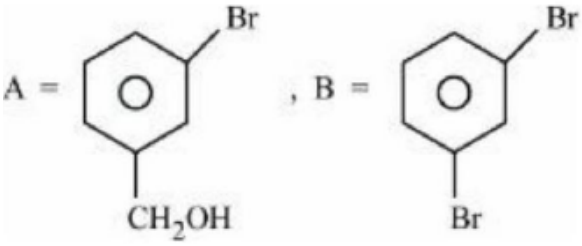
A.



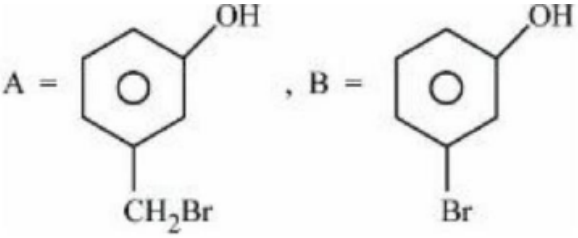
B.



C.

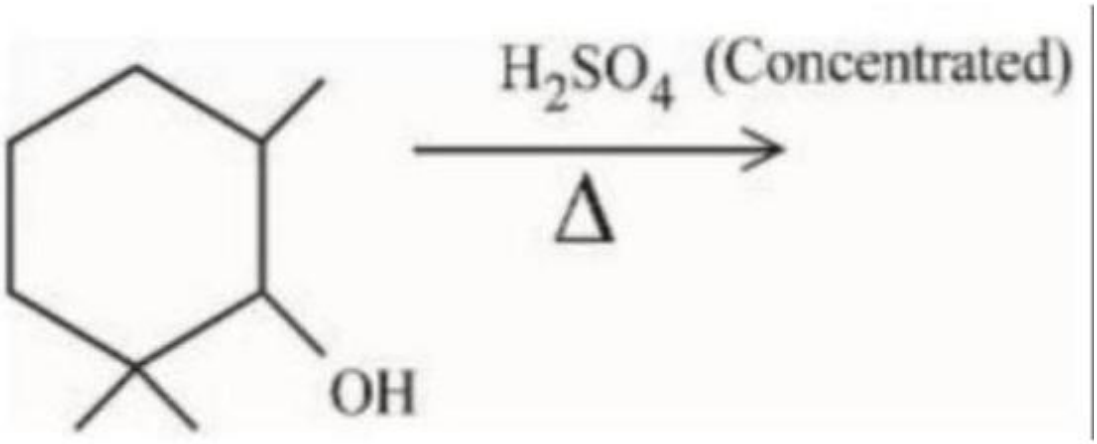


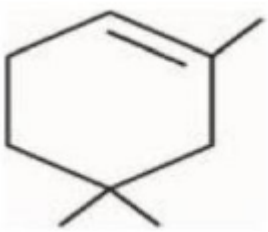
D.

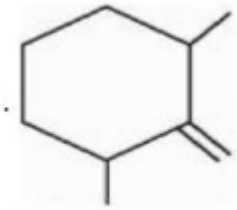


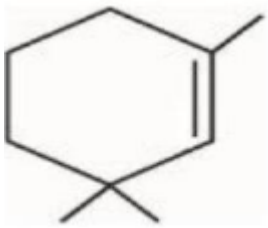
Question 246 View solution online

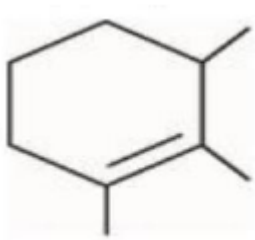
Find out the major product from the following reaction.



A. 

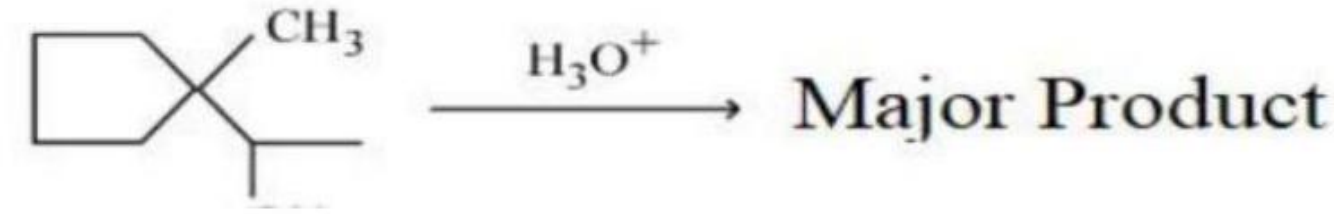
B. 

C. 

D. 

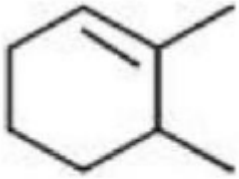
Question 247 View solution online

Find out the major product for the following reaction.



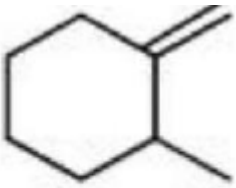


A.

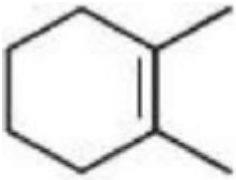


B.

3.



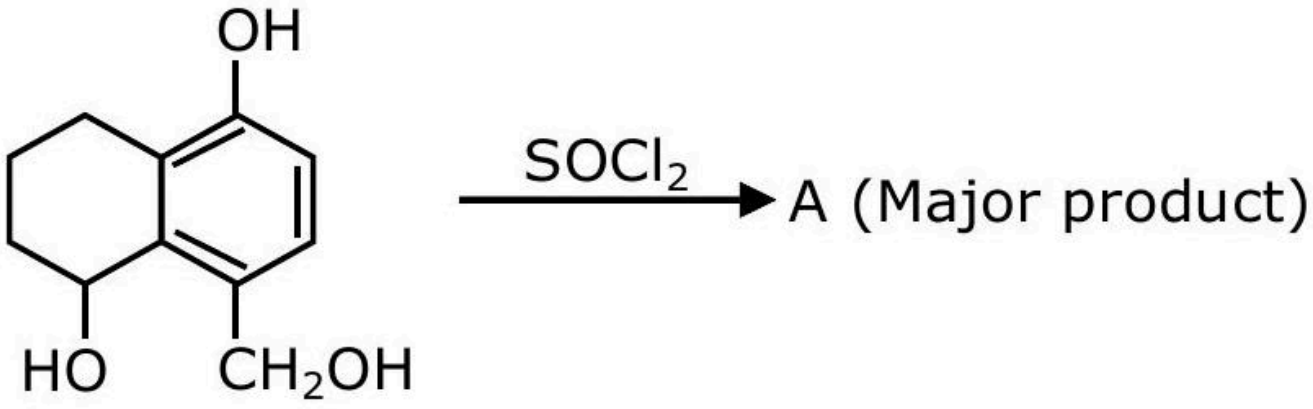
C.

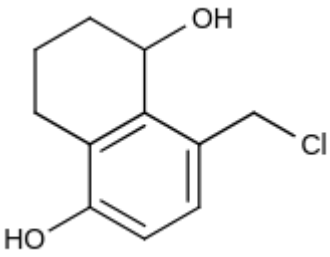


D.

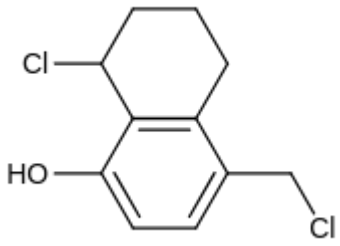
Question 248 View solution online

Identify A in the given reaction

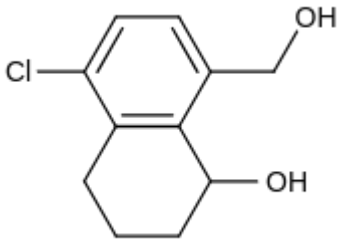




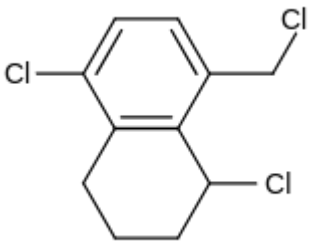
A.



B.



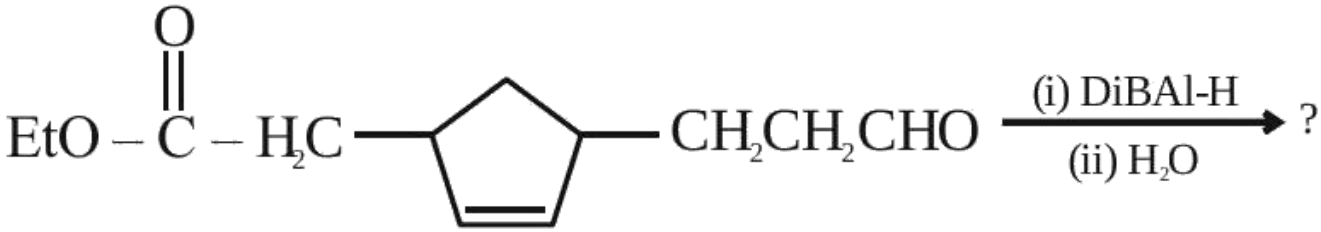
C.



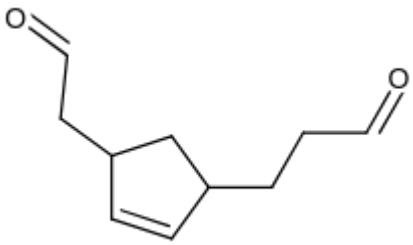
D.

Question 249 View solution online

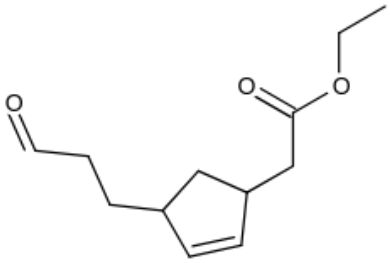
Consider the above reaction and predict the major product.



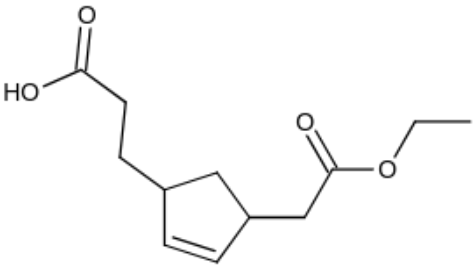
A.



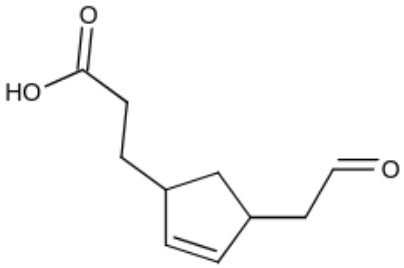
B.



C.



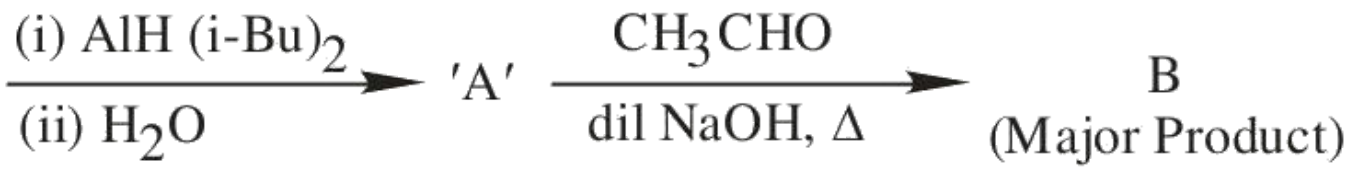
D.



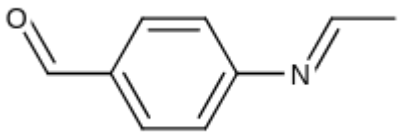
Question 250 View solution online

Consider the following reaction sequence :

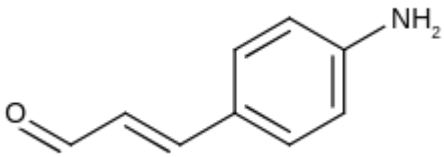
The product ' B ' is :



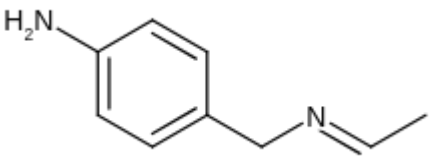
A.



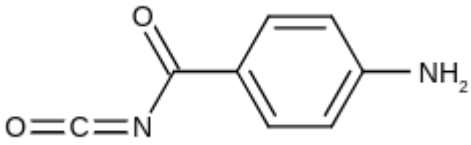
B.



C.

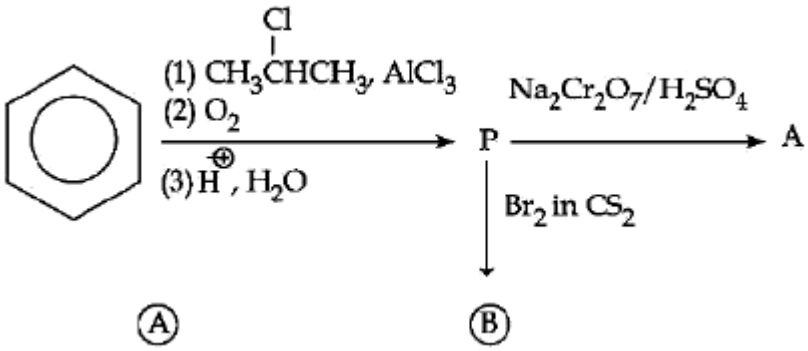


D.

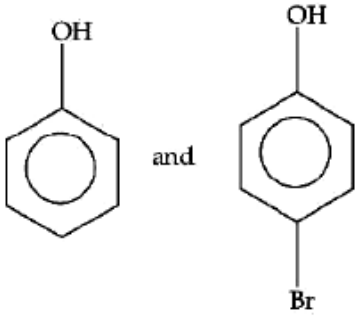


Question 251 View solution online

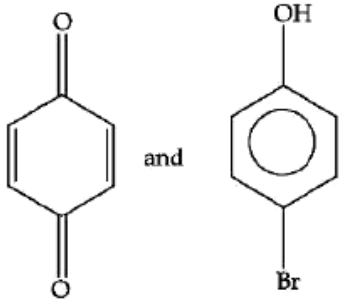
Identify the major products A and B in the following sequence:



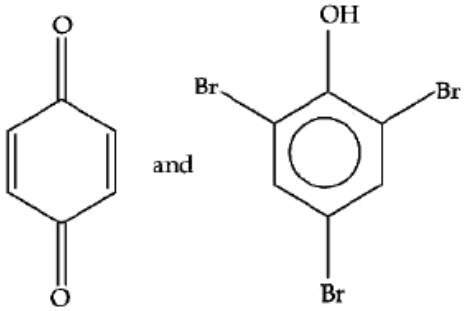
A.



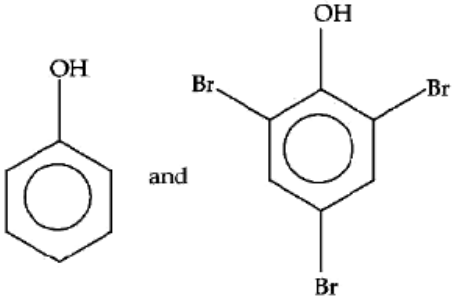
B.



C.

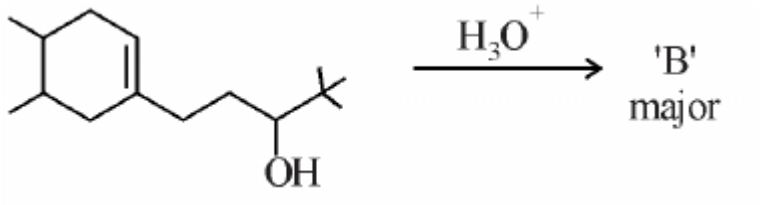


D.

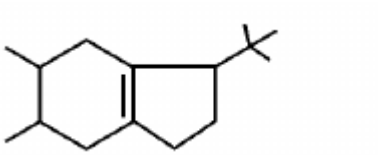


Question 252 View solution online

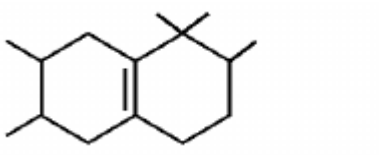
Identify the major product B in the following acid-catalysed reaction:



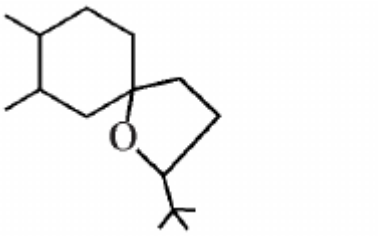
A.



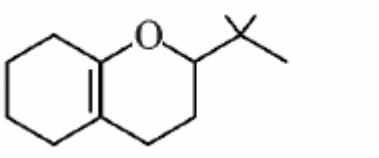
B.



C.

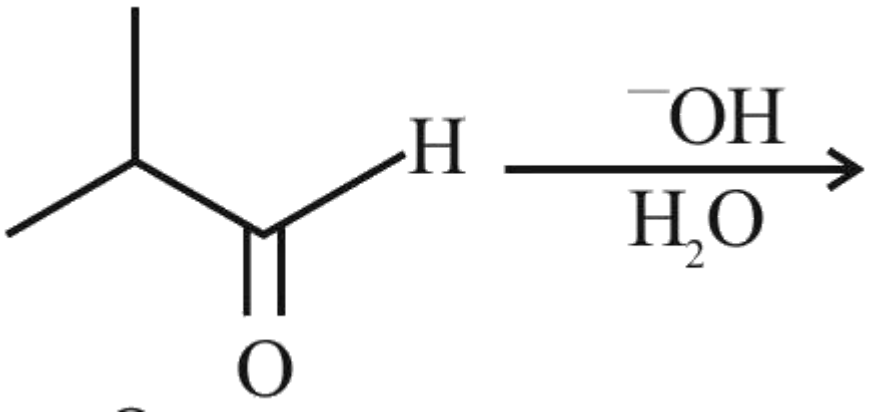


D.

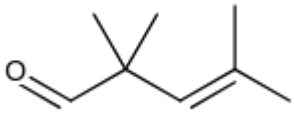


Question 253 View solution online

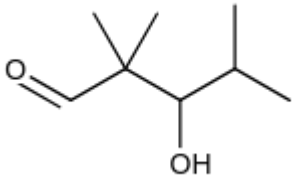
What is the major product of the following reaction?



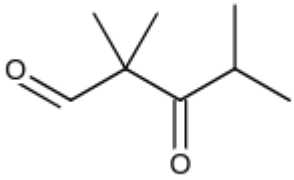
A.



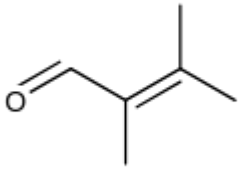
B.



C.

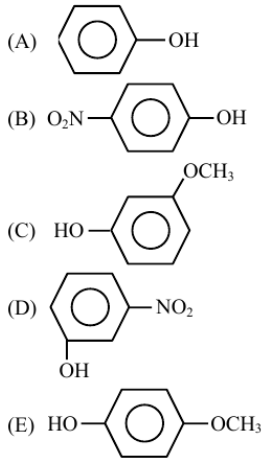


D.



Question 254 View solution online

For the compounds below, choose the correct order of increasing pKa:



A. (E) < (D) < (C) < (B) < (A)

B. (D) < (E) < (C) < (B) < (A)

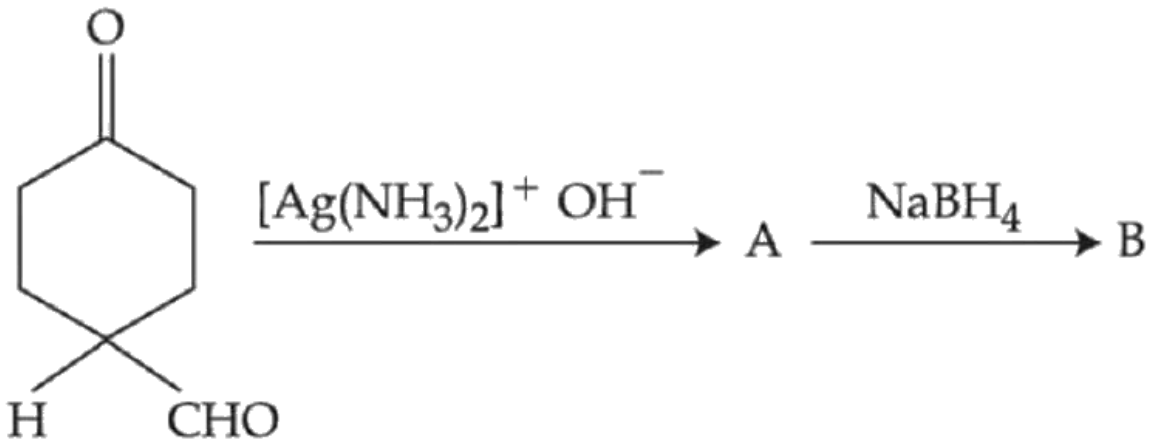
C. (E) < (D) < (B) < (A) < (C)

D. $(B) < (D) < (C) < (A) < (E)$

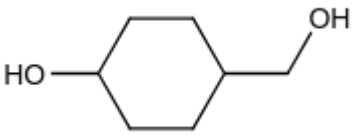
This question was incorrect in the original exam paper. ALLEN marked it BONUS because all options were incorrect. For practice, option 4 is corrected to B < D < C < A < E, following the ALLEN worked solution.

Question 255 View solution online

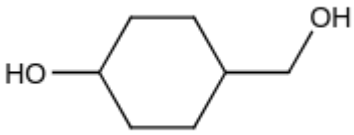
The products formed in the following reaction, A and B are



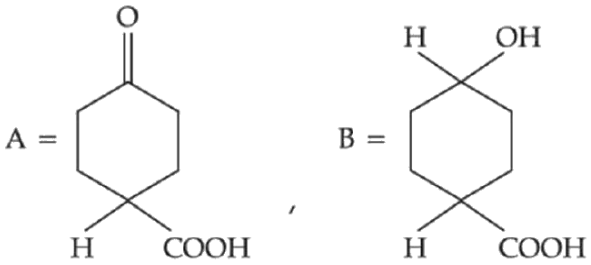
A. B =



B.

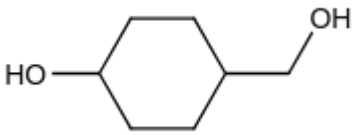


C.



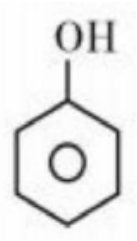
D. $A =$

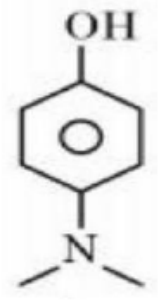
$B =$

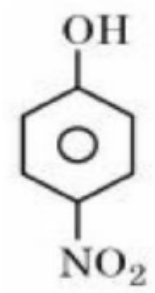


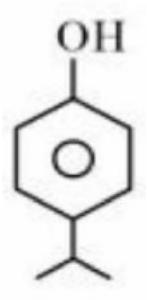
Question 256 View solution online

Choose the correct order of pKa values for compounds a, b, c and d below:

a 

b 

c 

d 

A. $c > a > d > b$

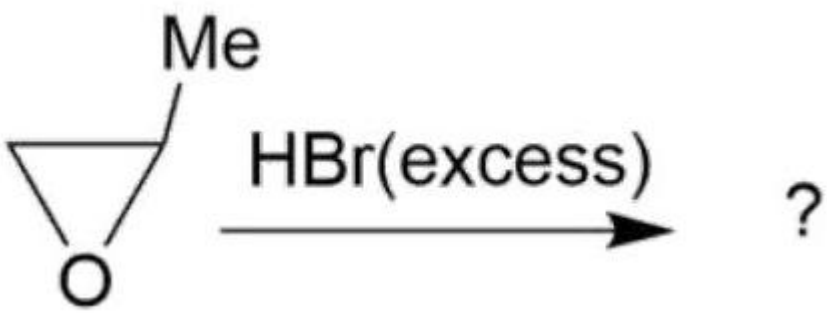
B. b > a > d > c

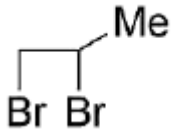
C. $b > d > a > c$

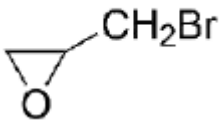
D. $a > b > c > d$

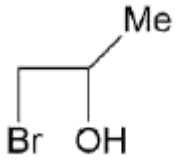
Question 257 View solution online

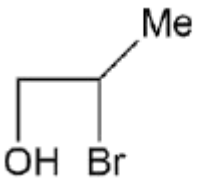
Predict the product of the following reaction with excess HBr:



A. 

B. 

C. 

D. 

Question 258 View solution online

In the following reaction

Rate of the reaction is the highest for



A. Acetone as substrate and methanol in excess

B. Propanal as substrate and methanol in stoichiometric amount

C. Propanal as substrate and methanol in excess

D. Acetone as substrate and methanol in stoichiometric amount

Aldehydes, Ketones and Carboxylic Acids

Questions 259-267 / 9 selected / 3.0% practice weight / Next

Topics to prioritise in this collection

- Aldehydes, Ketones and Carboxylic Acids: 4 questions / 44.4% of this chapter
- Acetal and ester formation: 1 question / 11.1% of this chapter
- Cannizzaro reaction: 1 question / 11.1% of this chapter
- Cyanohydrin formation and reduction: 1 question / 11.1% of this chapter
- Cyanohydrin reaction sequence: 1 question / 11.1% of this chapter
- Gattermann-Koch reaction: 1 question / 11.1% of this chapter

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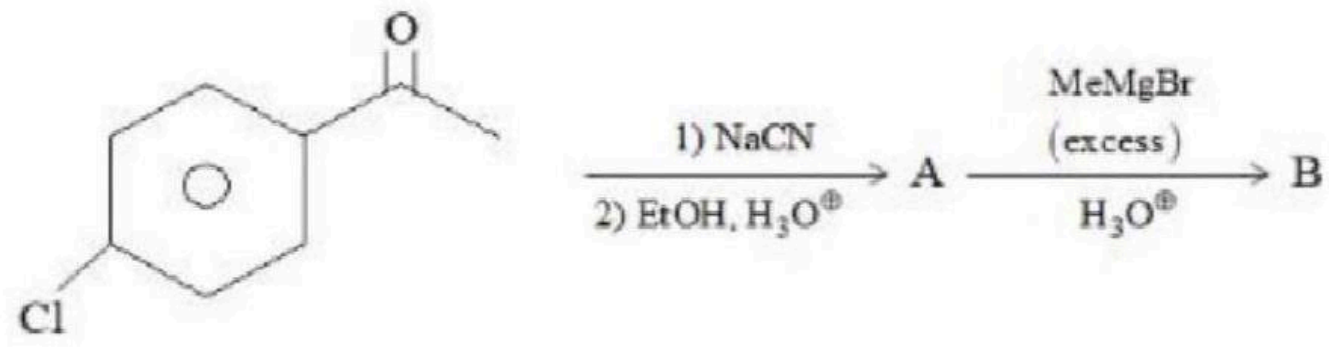
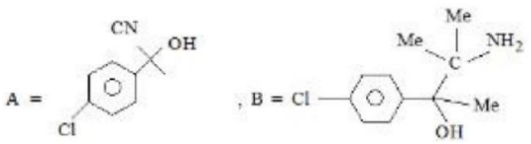
Question 259

View solution online

Find out the major products from the following reaction sequence.



A.



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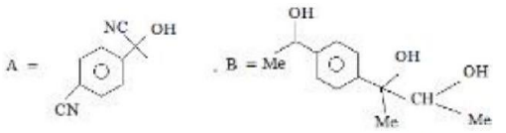

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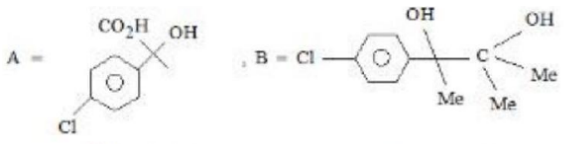

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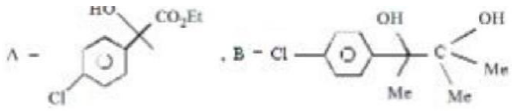
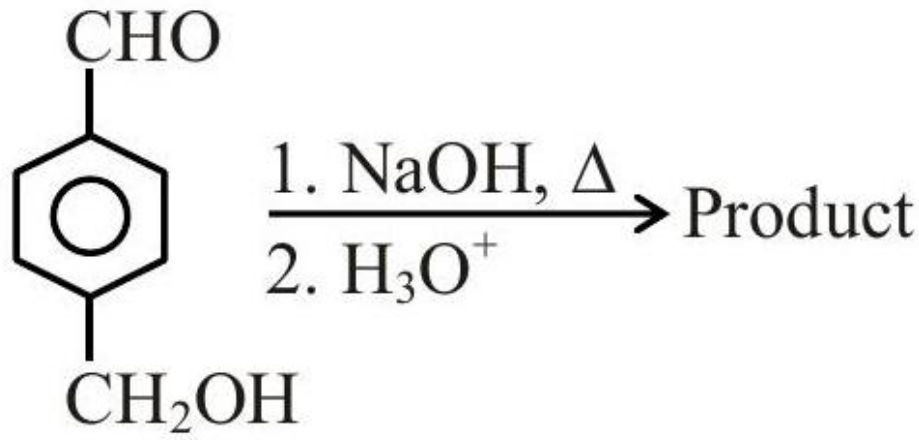


Question 260 View solution online

For the reaction given below:



. The compound which is not formed as a product is a:

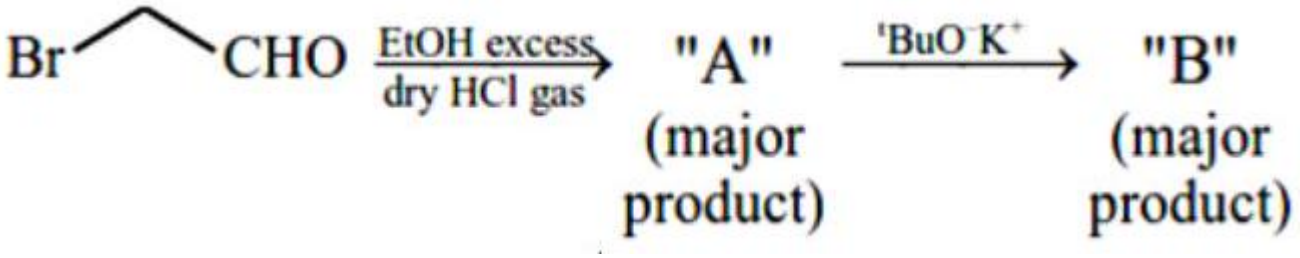
A. Compound with both alcohol and acid functional groups

B. Monocarboxylic acid

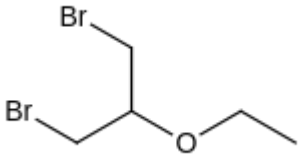
C. Dicarboxylic acid

D. Diol

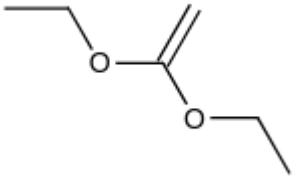
Question 261 View solution online

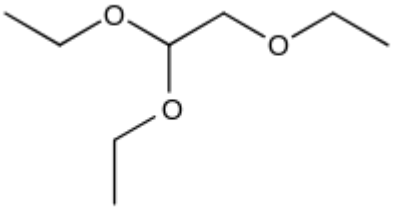


[where $\mathbf{Et} \Rightarrow -\mathbf{C_2H_5}$ $^t\mathbf{Bu} \Rightarrow \mathbf{(CH_3)_3C-}$] Consider the above reaction sequence, Product "A"and Product "B" formed respectively are :

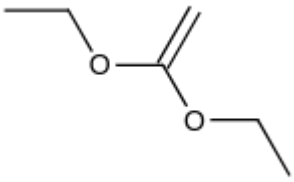


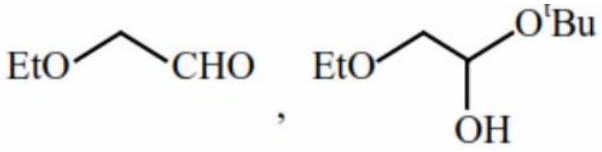
A. ,



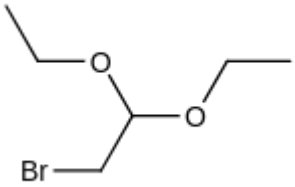


C. ,

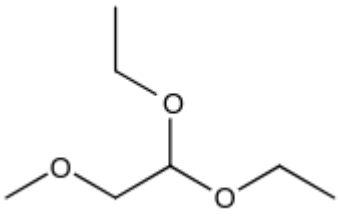




B. ,

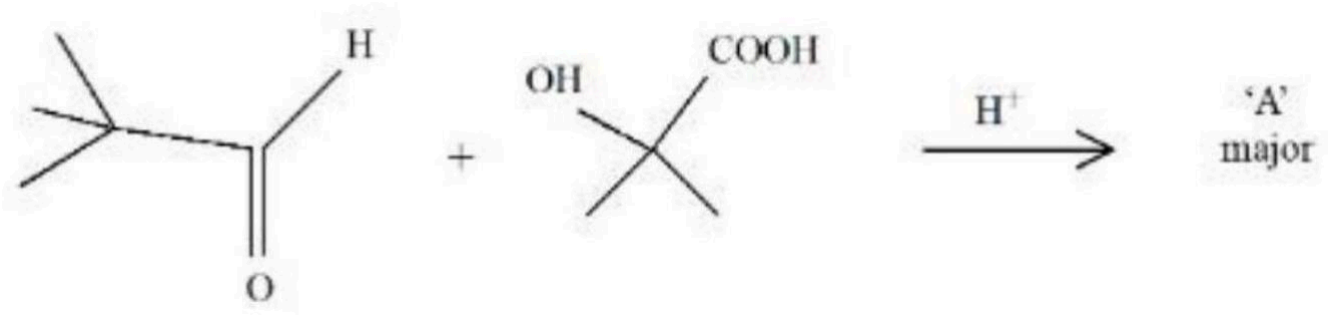


D. ,

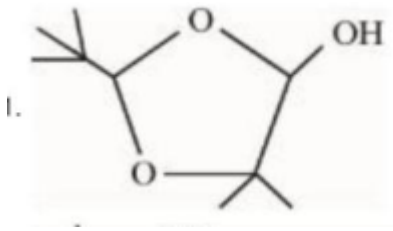


Question 262 View solution online

' A ' in the given reaction is



A.



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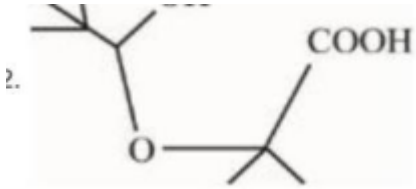

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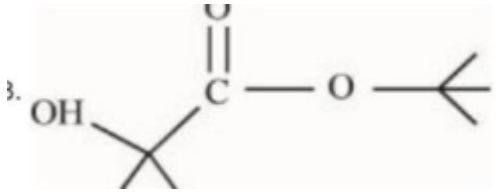

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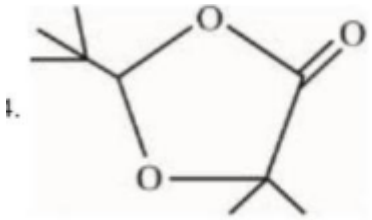
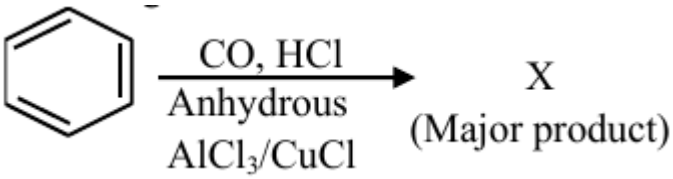
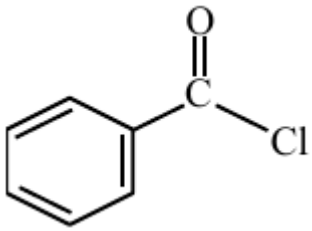
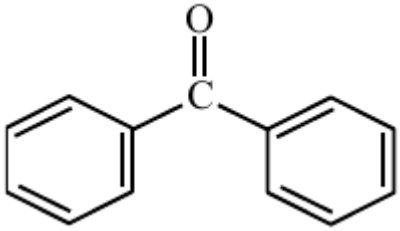


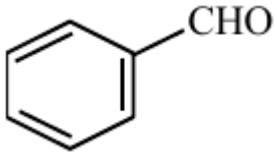
Question 263 View solution online

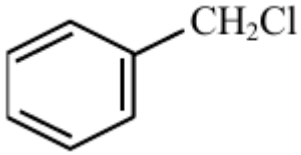
Identify the major product X in the following reaction:



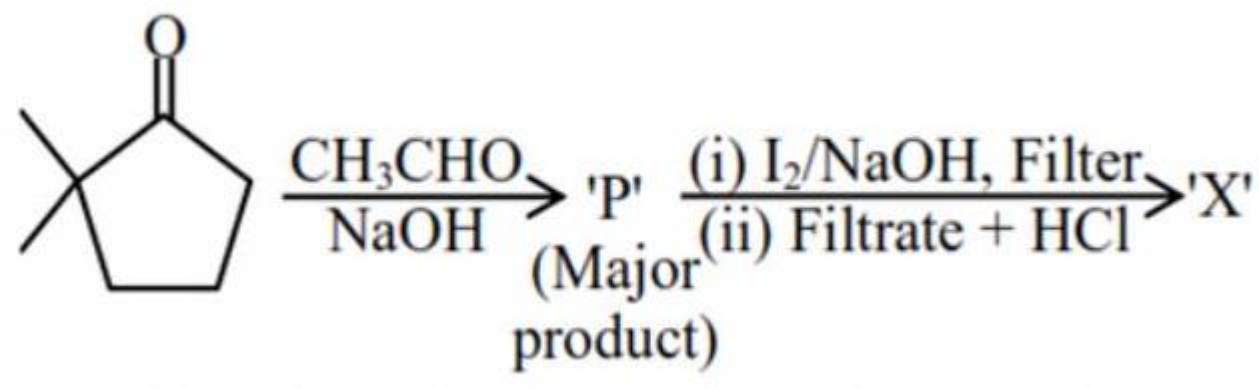
A. 

B. 

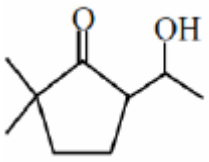
C. 

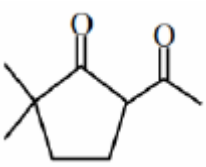
D. 

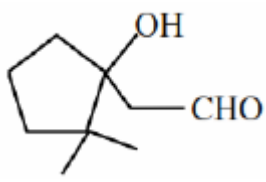
Question 264 View solution online

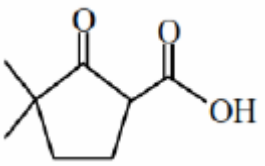


Consider the given reaction, the product ' X ' is:

A. 

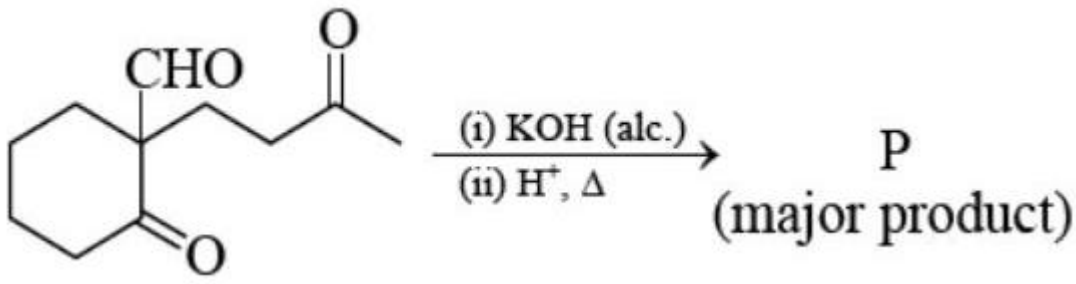
B. 

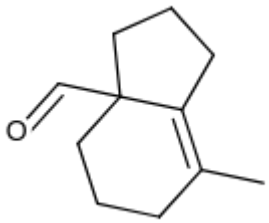
C. 

D. 

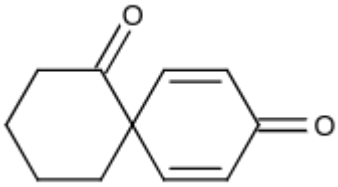
Question 265 View solution online

The major product (P) in the following reaction is

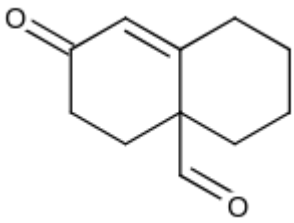




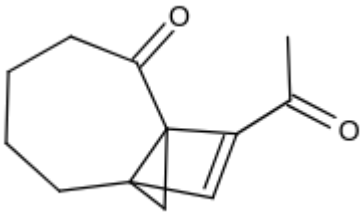
A.



B.

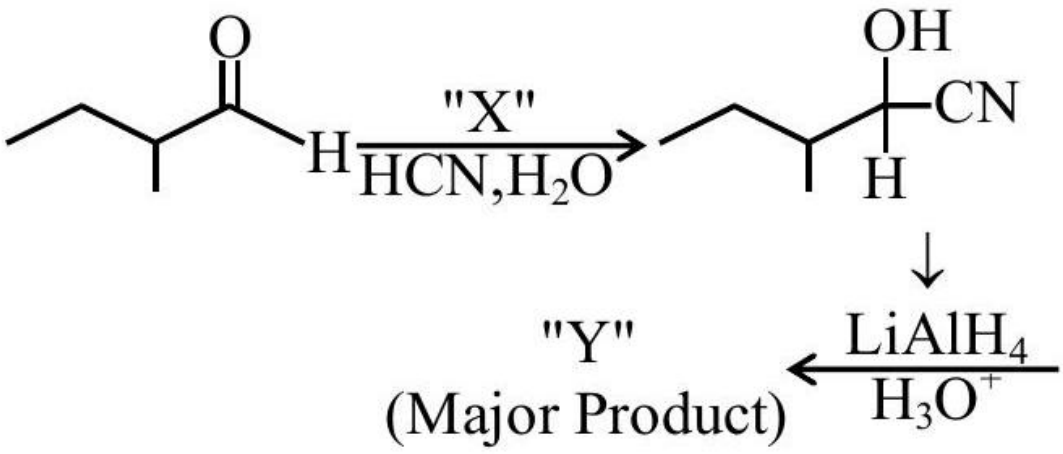


C.



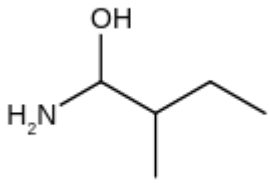
D.

Question 266 View solution online

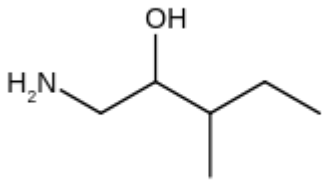


Consider the given reaction, Identify ' $\mathbf{X}$ ' and ' $\mathbf{Y}$ ' :

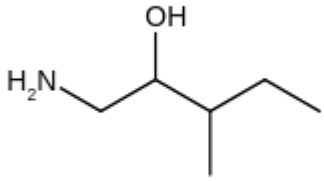
A. $\mathbf{X - NaOHY}$



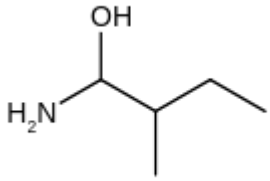
B. $\mathbf{X - HNO_3}$



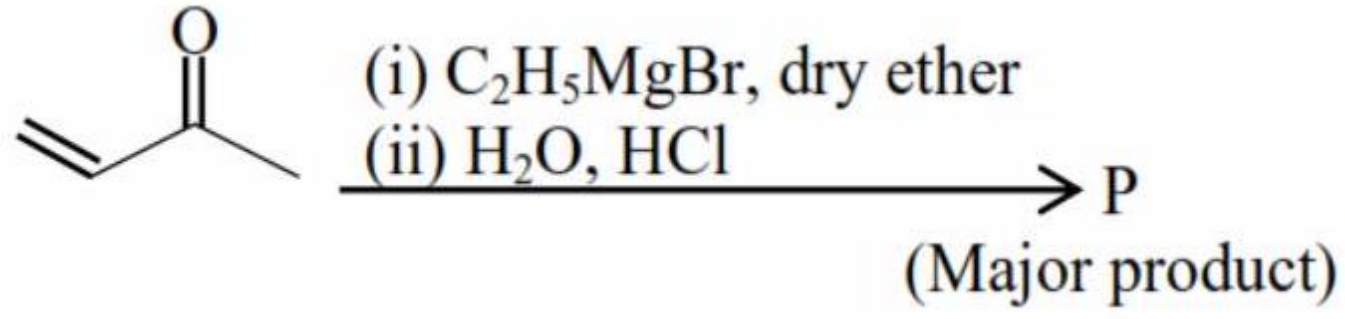
C. $X = NaOH; Y =$



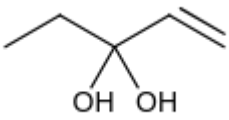
D. $\mathbf{X - HNO_3}$



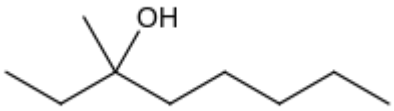
Question 267 View solution online



Consider the above reaction, the major product 'P' is:



A.



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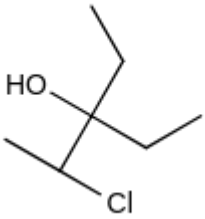

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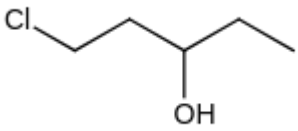

D.

Amines

Questions 268-277 / 10 selected / 3.3% practice weight / Next

Topics to prioritise in this collection

- Amines: 5 questions / 50.0% of this chapter
- Reactions of amines: 2 questions / 20.0% of this chapter
- Diazotisation and azo coupling: 1 question / 10.0% of this chapter
- Hofmann bromamide degradation: 1 question / 10.0% of this chapter
- Hofmann elimination: 1 question / 10.0% of this chapter

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Question 268

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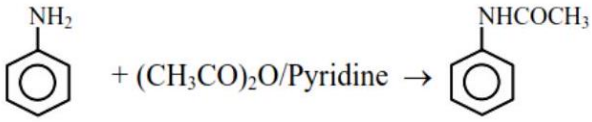
Which one of the following reactions does not occur?

A.



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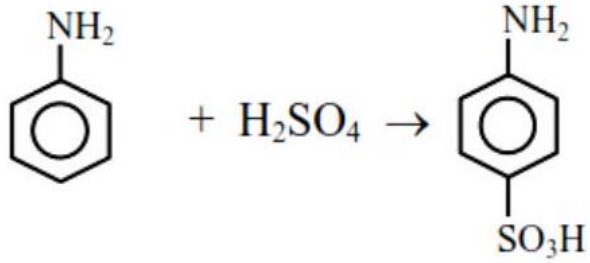

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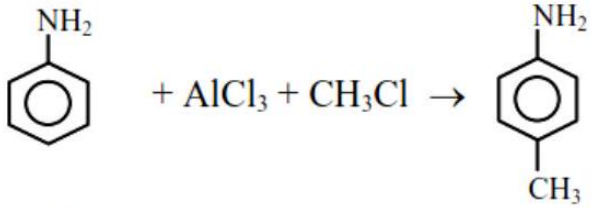
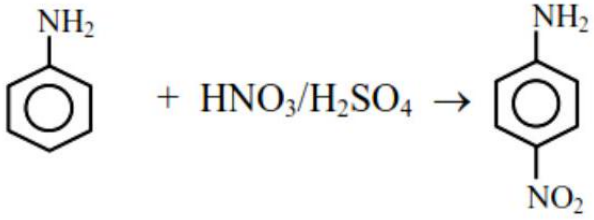


D.



Question 269 View solution online

Match List I with List II

List I	List II
A. Benzenesulphonyl chloride	I. Test for primary amines
B. Hoffmann bromamide reaction	II. Anti Saytzeff
C. Carbylamine reaction	III. Hinsberg reagent
D. Hoffmann orientation	IV. Known reaction of Isocyanates.

Choose the correct answer from the options given below:

A. A-IV, B -III, C-II, D-I

B. A-IV, B -II, C-I, D-III

C. (2) Hoffmann bromamide reaction $\rightarrow$ known reaction of isocynates

$$\mathbf{R-CO-NH_2 + X_2 + 4NaOH \rightarrow R-NH_2 + 2NaX + Na_2CO_3 + 2H_2O}$$

Intermediate : $\mathbf{R-N=C=O}$ (isocyanate)

D. (3) A-III, B -IV, C-I, D-II

Question 270 View solution online

Match List I with List II

LIST I (Amines)		LIST II pK_b)	
A.	Aniline	I.	3.25
B.	Ethanamine	II.	3.00
C.	N-Ethylethanamine	III	9.38
D.	N. N-Diethylethanamine	IV.	3.29

Choose the correct answer from the options given below:

A. A-III, B-IV, C-II, D-I

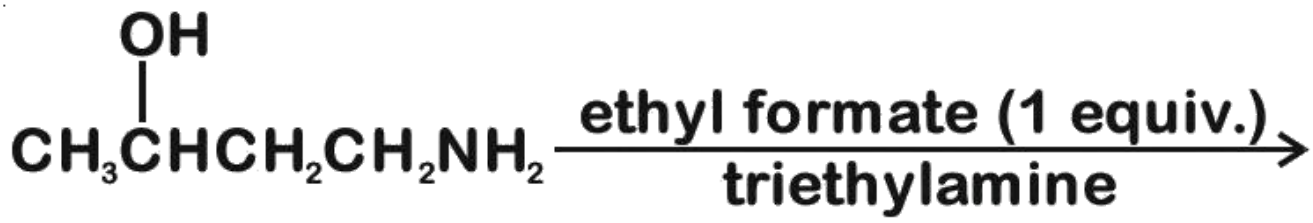
B. A-III, B-II, C-I, D-IV

C. A-I, B-IV, C-II, D-III

D. A-III, B-II, C-IV, D-I

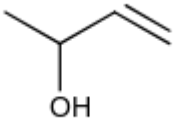
Question 271 View solution online

The major product of the following reaction is:

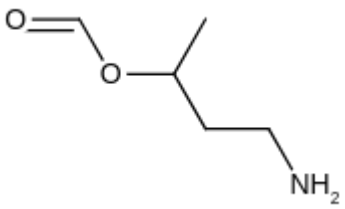


A. $CH_3CH = CH - CH_2NH_2$

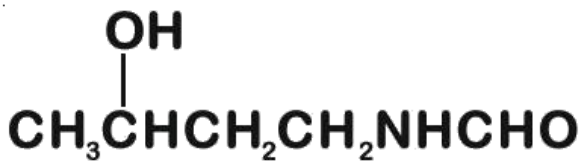
B.



C.

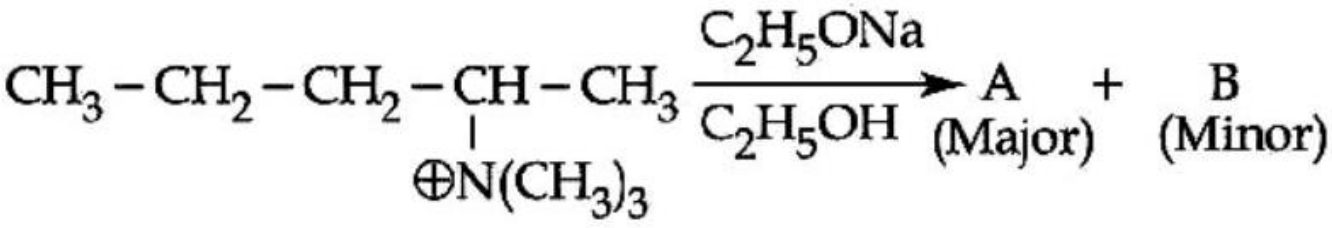


D.



Question 272 View solution online

Identify the correct statement for the below given transformation.



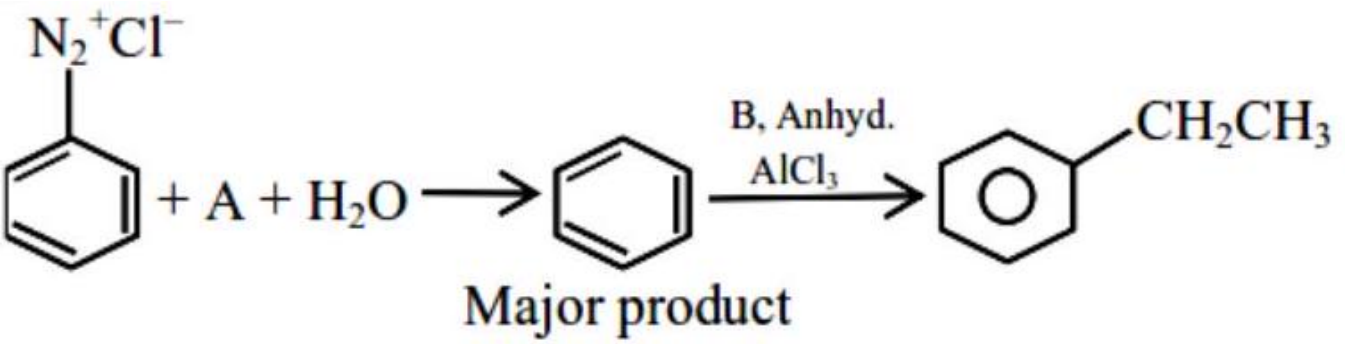
A. $A - CH_3CH_2CH = CH - CH_3$,
$B - CH_3CH_2CH_2CH = CH_2$,
Saytzeff products

B. $A - CH_3CH_2CH = CH - CH_3$,
$B - CH_3CH_2CH_2CH = CH_2$,
Hafmann products

C. $A - CH_3CH_2CH_2CH = CH_2$,
$B - CH_3CH_2CH = CHCH_3$,
Hofmann products

D. $A - CH_3CH_2CH_2CH = CH_2$,
$B - CH_3CH_2CH = CHCH_3$,
Saytzeff products

Question 273 View solution online



In the chemical reactions given above A and B respectively are :

A. H_3PO_2 and CH_3CH_2Cl

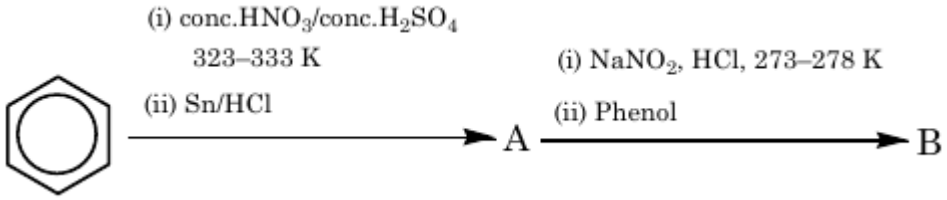
B. CH_3CH_2OH and H_3PO_2

C. H_3PO_2 and $CH_3CH_2PO_2$

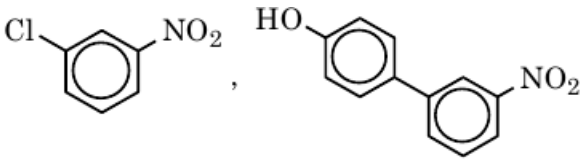
D. CH_3CH_2Cl and H_3PO_2

Question 274 View solution online

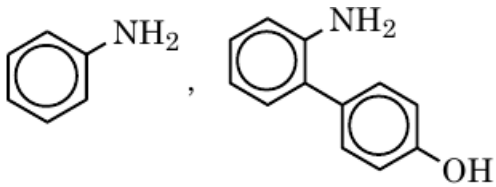
The products A and B formed in the following reaction scheme are respectively:



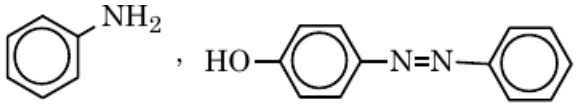
A.



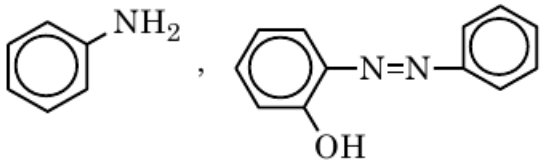
B.



C.

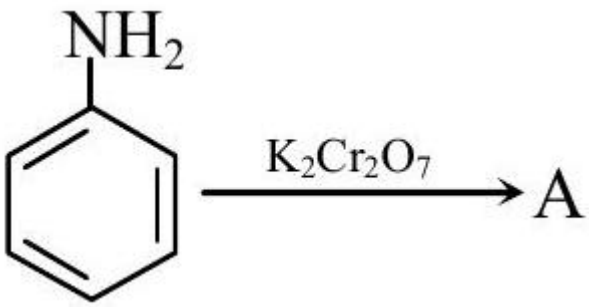


D.



Question 275 View solution online

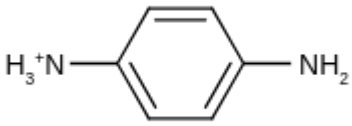
Identify A in the following reaction.



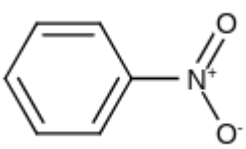
A.



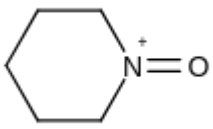
B.



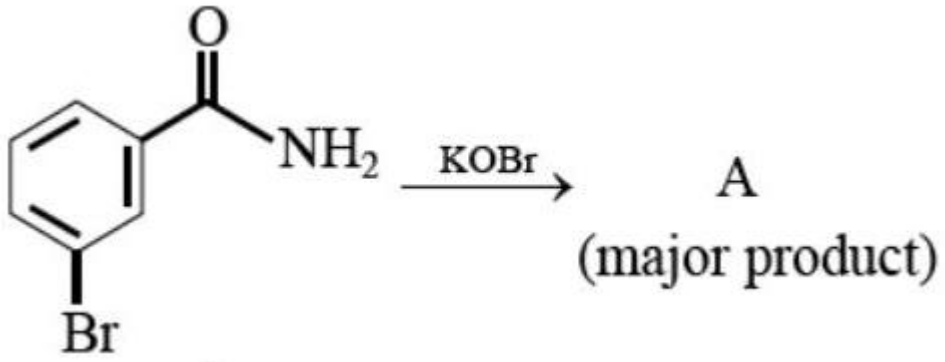
C.

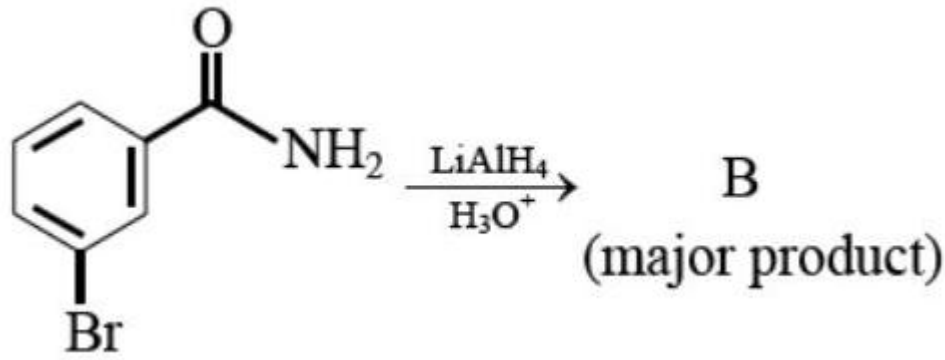


D.

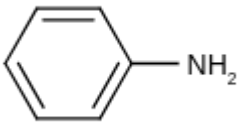


Question 276 View solution online

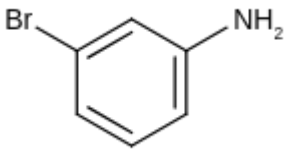




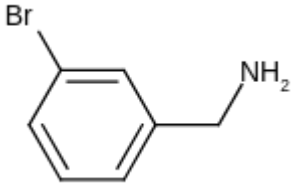
In the above reactions, product A and product B respectively are :

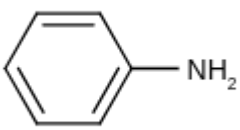


A. ,

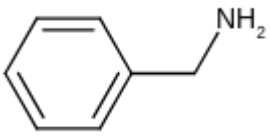


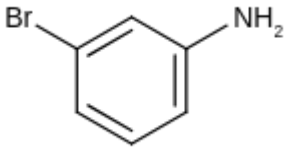
B. ,



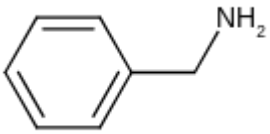


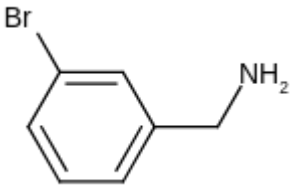
C. ,



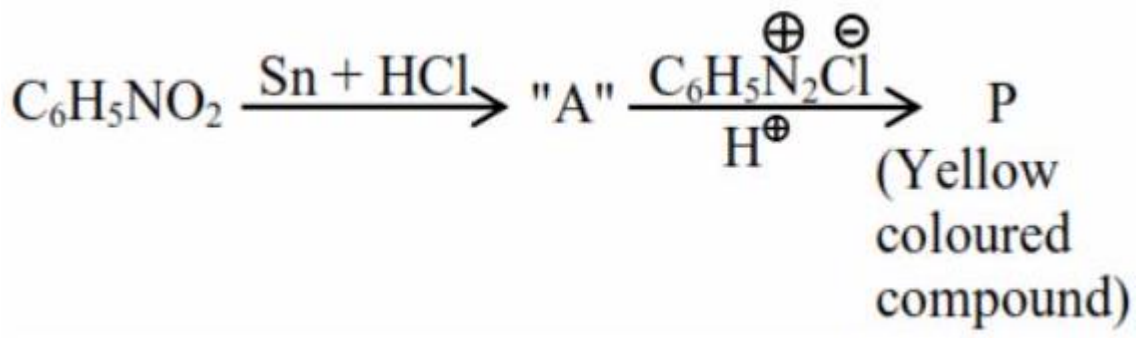


D. ,



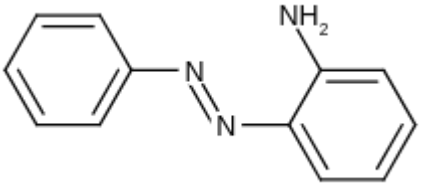


Question 277 View solution online

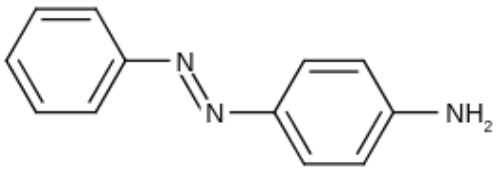


Consider the above reaction, the Product " P " is : []

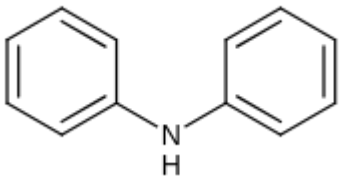
A.



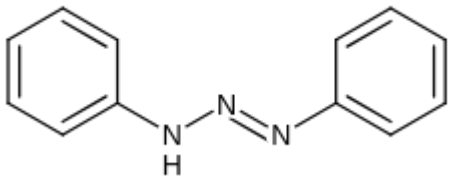
B.



C.



D.



Biomolecules

Questions 278-288 / 11 selected / 3.7% practice weight / Next

Topics to prioritise in this collection

- Carbohydrates: 8 questions / 72.7% of this chapter
- Biomolecules: 1 question / 9.1% of this chapter
- Structure and function of biomolecules: 1 question / 9.1% of this chapter
- Vitamins: 1 question / 9.1% of this chapter

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Question 278

View solution online

Match List-I with List-II.

	List-I Reaction		List-II Catalyst
(A)	$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$	(I)	NO(g)
(B)	$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	(II)	$H_2SO_4(l)$
(C)	$C_{12}H_{22}O_{11}(aq) + H_2O(l) \rightarrow C_6H_{12}O_6(\text{Glucose}) + C_6H_{12}O_6(\text{Fructose})$	(III)	Pt(s)
(D)	$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(IV)	Fe(s)

Choose the correct answer from the options given below:

A. - (II), (B) - (III), (C) - (I), (D) - (IV)

B. (A) - (III), (B) - (II), (C) - (I), (D) - (IV)

C. (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

D. (A) - (III), (B) - (II), (C) - (IV), (D) - (I)

Question 279 View solution online

Match List I with List II

LIST-I		LIST-II	
A.	Glucose/$NaHCO_3/\Delta$	I.	Gluconic acid
B.	Glucose/ HNO_3	II.	No reaction
C.	Glucose/HI/ Δ	III.	n-hexane
D.	Glucose/Bromine water]	IV.	Saccharic acid

Choose the correct answer from the options given below:

A. A-IV, B-I, C-III, D-II

B. A-II, B-IV, C-III, D-I

C. A-III, B-II, C-I, D-IV

D. A-I, B-IV, C-III, D-II

Question 280 View solution online

Match List I with List II

List I	List II
Test	Functional group / Class of Compound
(A) Molisch's Test	(I) Peptide
(B) Biuret Test	(II) Carbohydrate
(C) Carbylamine Test	(III) Primary amine
(D) Schiff's Test	(IV) Aldehyde

Choose the correct answer from the options given below:

A. (A) - III, (B) - IV, (C) - I, (D) - II

B. (A) -II, (B) - I, (C) - III, (D) - IV

C. (A) -III , (B) -IV , (C) -II , (D) -I

D. (A) -I , (B) -II , (C) -III , (D) -IV

Question 281 View solution online

Match List I with List II.

List I Enzyme	*c* Conversion of
A. Invertase	I. Starch into maltose
B. Zymase	II. Maltose into glucose
C. Diastase	III. Glucose into ethanol
D. Maltase	IV. Cane sugar into glucose

Choose the most appropriate answer from the options given below :

A. A-III, B-IV. C-II. D-I

B. A-III. B-II. C-I. D-IV

C. A-IV, B-IIL C-I. D-II

D. A-IV, B-II. C-III. D-I

Question 282 View solution online

Match List I with List II}

List I Enzymatic reaction		List II Enzyme	
A	Sucrose $\rightarrow$ Glucose and Fructose	I.	Zymase
B	Glucose $\rightarrow$ ethyl alcohol and CO_2	II.	Pepsin
C	Starch $\rightarrow$ Maltose	III.	Invertase
D	Proteins $\rightarrow$ Amino acids	IV.	Diastase

Choose the correct answer from the options given below:

A. A-III, B-I, C-II, D-IV

B. A-I, B-IV, C-III, D-II

C. A-III, B-I, C-IV, D-II

D. A-I, B-II, C-IV, D-III

Question 283 View solution online

Match List-I with List-II

	List-I (Disaccharide)		List-II (Constituent monosaccharides)
(a)	Sucrose	(i)	β-D-Galactose and β-D-Glucose
(b)	Lactose	(ii)	α-D-Glucose and β-D-Fructose
(c)	Maltose	(iii)	α-D-Glucose and α-D-Glucose

Choose the correct answer from the options given below.

A. (a)-(iii), (b)-(ii), (c)-(i)

B. (a)-(iii), (b)-(i), (c)-(ii)

C. (a)-(i), (b)-(iii), (c)-(ii)

D. (a)-(ii), (b)-(i), (c)-(iii)

Question 284 View solution online

Match List I with List II

List I Bio Polymer)		List II (Monomer)	
A.	Starch	I.	nucleotide
B.	Cellulose	II.	α-glucose
C.	Nucleic acid	III.	β-glucose
D.	Protein	IV.	α-amino acid

Choose the correct answer from the options given below :-

A. A-II, B-I, C-III, D-IV

B. A-IV, B-II, C-I, D-III

C. A-I, B-III, C-IV, D-II

D. A-II, B-III, C-I, D-IV

Question 285 View solution online

Match List-I with List-II.

List-I

List-II

(A) Adenine

(I)

(B) Cytosine

(II)

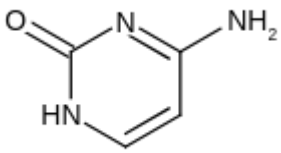
(C) Thymine

(III)

(D) Uracil

(IV)

Choose the correct answer from the options given below:



A. (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

B. (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

C. (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

D. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Question 286 View solution online

Match List - I with List - II.

List - I
(Carbohydrate)}
List - II
(Linkage}
Source)}
(A) Amylose
(B) Cellulose
(C) Glycogen
(D) Amylopectin
(I) $\beta - C_1 - C_4$, plant
(II) $\alpha - C_1 - C_4$, animal
(III) $\alpha - C_1 - C_4$,
$\alpha - C_1 - C_6$, plant
(IV) $\alpha - C_1 - C_4$, plant

Choose the correct answer form the options given below:

A. (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

B. (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

C. (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

D. (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

Question 287 View solution online

Match List-I with List-II

List-I}
(Saccharides)
(A) Sucrose
(B) Maltose
(C) Lactose
(D) Amylopectin

List_II
(Glycosidic-linkages found)
(I) α 1-4
(II) $\alpha 1-4$ and $\alpha 1-6$
(III) $\alpha 1-\beta 2$
(IV) $\beta 1-4$

Choose the correct answer from the options given below :

A. (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

B. (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

C. (A)-(II), (B)-(IV), (C)-(III), (D)-(I)

D. (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Question 288 View solution online

Match List I with List II

List I Vitamin		List II Deficiency disease	
A	Vitamin A	I.	Beri-Beri
B	Thiamine	II.	Cheilosis
C	Ascorbic acid	III.	Xeropthalmia
D	Riboflavin	IV.	Scurvy

Choose the correct answer from the options given below:

A. A-IV, B-II,C-III, D-I

B. A-III, B-II, C-IV, D-I

C. A-IV, B-I,C-III, D-II

D. A-III,B-I,C-IV, D-II

Practical Chemistry (NCERT Laboratory Manual)

Questions 289-289 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Qualitative chemical analysis: 1 question / 100.0% of this chapter

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Question 289 View solution online

For reaction: $\mathrm{SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)}$
$\mathrm{K_p = 2 \times 10^{12}}$ at $\mathrm{27^\circ C}$ and 1 atm pressure. The $\mathrm{K_c}$ for the same reaction is $\times \mathrm{10^{13}}$. (Nearest integer) (Given $\mathrm{R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}}$)

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

States of Matter

Questions 290-290 / 1 selected / 0.3% practice weight / Historical appendix

Topics to prioritise in this collection

- Gaseous and liquid states: 1 question / 100.0% of this chapter

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Question 290 View solution online

A homogeneous ideal gaseous reaction $\mathbf{AB_{2(g)} \rightleftharpoons A_{(g)} + 2\,B_{(g)}}$ is carried out in a 25 litre flask at $\mathbf{27^{\circ}C}$. The initial amount of $\mathbf{AB_2}$ was 1 mole and the equilibrium pressure was 1.9 atm .
The value of $\mathbf{K_p}$ is $\mathbf{x \times 10^{-2}}$. The value of x is .
$\left[\mathbf{R = 0.08206 dm^3\ atm\ K^{-1}\ mol^{-1}}\right]$

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Hydrogen

Questions 291-291 / 1 selected / 0.3% practice weight / Historical appendix

Topics to prioritise in this collection

- Hydrogen and water chemistry: 1 question / 100.0% of this chapter

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Question 291

View solution online

In basic medium, $\mathbf{H_2O_2}$ exhibits which of the following reactions ?
(A) $\mathbf{Mn^{2+} \rightarrow Mn^{4+}}$
(B) $\mathbf{I_2 \rightarrow I^-}$
(C) $\mathbf{PbS \rightarrow PbSO_4}$

Choose the most appropriate answer from the options given below :

A. , (C) only

B. (A) only

C. (B) only

D. (A), (B) only

The s-Block Elements

Questions 292-293 / 2 selected / 0.7% practice weight / Historical appendix

Topics to prioritise in this collection

- s-Block Elements: 1 question / 50.0% of this chapter
- Uses of alkali metals: 1 question / 50.0% of this chapter

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Question 292

View solution online

Match List-I with List-II :

List-I	List-II
A. K	I. Thermonuclear reactions
B. KCl	II. Fertilizer
C. KOH	III. Sodium potassium pump
D. Li	IV. Absorbent of CO_2

Choose the correct answer from the options given below :

A. A-III, B-II, C-IV, D-I

B. A-IV, B-I, C-III, D-II

C. A-IV, B-III, C-I, D-II

D. A-III, B-IV, C-II, D-I

Question 293 View solution online

Match List-I with List-II

	List-I (Elements)		List-II (Properties)
(a)	Ba	(i)	Organic solvent soluble compounds
(b)	Ca	(ii)	Outer electronic configuration $6\,s^2$
(c)	Li	(iii)	Oxalate insoluble in water
(d)	Na	(iv)	Formation of very strong monoacidic base

Choose the correct answer from the options given below :

A. (a)-(ii), (b)-(iii), (c)-(i) and (d)-(iv)

B. (a)-(iv), (b)-(i), (c)-(ii) and (d)-(iii)

C. (a)-(iii), (b)-(ii), (c)-(iv) and (d)-(i)

D. (a)-(i), (b)-(iv), (c)-(ii) and (d)-(iii)

The Solid State

Questions 294-295 / 2 selected / 0.7% practice weight / Historical appendix

Topics to prioritise in this collection

- Crystal structures and defects: 2 questions / 100.0% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

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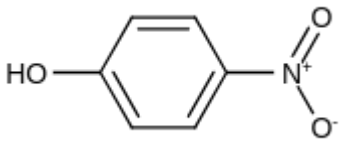
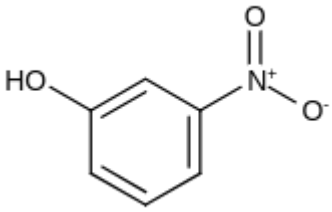
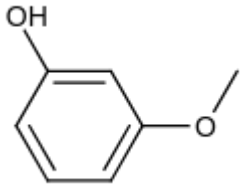
Question 294

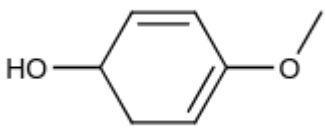
View solution online

Arrange the following in decreasing acidic strength.









(A)
(B)
(C)
(D)

A. $A > B > C > D$

B. $B > A > C > D$

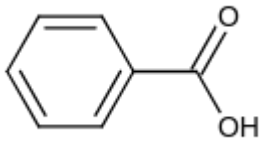
C. $D > C > A > B$

D. $D > C > B > A$

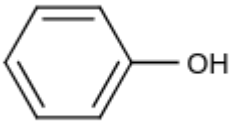
Question 295 View solution online

The compounds that produce CO_2 with aqueous $NaHCO_3$ solution are :

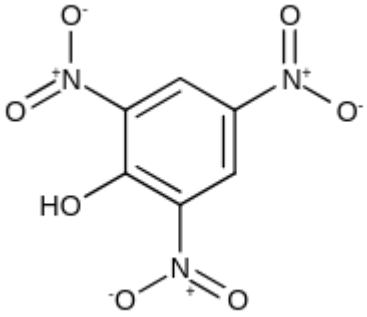
A.



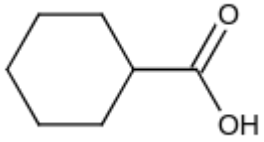
B.



C.



D.



E.



Choose the correct answer from the options given below:

A. A and C only

B. A, B and E only

C. A, C and D only

D. A and B only

Polymers

Questions 296-297 / 2 selected / 0.7% practice weight / Historical appendix

Topics to prioritise in this collection

- Polymer structure and preparation: 1 question / 50.0% of this chapter
- Polymers: 1 question / 50.0% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 296

View solution online

Match List I with List II

	LIST I		LIST II
A.	Weak intermolecular forces of attraction	I.	Hexamethylenedia mine + adipic acid
B.	Hydrogen bonding	II.	$AlEt_3 + TiCl_4$
C.	Heavily branched polymer	III.	2-chloro-1, 3-butadiene
D.	High density polymer	IV.	Phenol + formaldehyde

Choose the correct answer from the options given below:

A. A-II, B-IV, C-I, D-III

B. A-III, B-I, C-IV, D-II

C. A-IV, B-I, C-III, D-II

D. A-IV, B-II, C-III, D-I

Question 297 View solution online

Match List I with List II

LIST I (Examples)		LIST I (Examples)	
A.	2-Chloro-1, 3 - butadiene	I.	Biodegradable polymer
B.	Nylon 2-nylon 6	II.	Synthetic Rubber
C.	Polyacrylonitrile	III.	Polyester
D.	Dacron	IV.	Addition Polymer

Choose the correct answer from the options given below:

A. A-IV, B-I, C-III, D-II

B. A-IV, B-III, C-I, D-II

C. A-II, B-IV, C-I, D-III

D. A-II, B-I, C-IV, D-III

Environmental Chemistry

Questions 298-300 / 3 selected / 1.0% practice weight / Historical appendix

Topics to prioritise in this collection

- Water and atmospheric pollution: 2 questions / 66.7% of this chapter
- Environmental chemistry: 1 question / 33.3% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 298

View solution online

Match List - I with List - II :

List - I (compound)		List - II (effect/affected species)	
(a)	Carbon monoxide	(i)	Carcinogenic
(b)	Sulphur dioxide	(ii)	Metabolized by pyrus plants
(c)	Polychlorinated biphenyls	(iii)	Haemoglobin
(d)	Oxides of Nitrogen	(iv)	Stiffness of flower buds

Choose the correct answer from the options given below:

A. (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

B. (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

C. (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

D. (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

Question 299 View solution online

Match List-I with List-II

List-I
Industry
(A) Steel plants
(B) Thermal power plants
(C) Fertilizer industries
(D) Paper mils

List-II
Waste Generated
(I) Gypsum
(II) Fly ash
(III) Slag
(IV) Bio-degradable Wastes

Choose the correct answer from the options given below:

A. -(III), (B)-(II), (C)-(I), (D)-(IV)

B. (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

C. (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

D. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Question 300 View solution online

Match List I with List II

List I Pollutant	List II
Source	
A. Microorganisms	I. Strip mining
B. Plant nutrients	II. Domestic sewage
C. Toxic heavy metals	III. Chemical fertilizer
D. Sediment	IV. Chemical factory

Choose the correct answer from the options given below:

A. A-II, B-III, C-IV, D-I

B. A-II, B-I, C-IV, D-III

C. A-I, B-IV, C-II, D-III

D. A-I, B-IV, C-III, D-II

QUICK CHECK

Answer key

For numerical questions the stored answer value is shown. Follow the question's precision and units.

1. C	**2.** D	**3.** 100	**4.** 20	**5.** 5
6. D	**7.** 2	**8.** 6	**9.** 2	**10.** 6
11. 3	**12.** 6	**13.** 4	**14.** B	**15.** D
16. B	**17.** A	**18.** 6	**19.** 5	**20.** 6
21. C	**22.** 4	**23.** C	**24.** A	**25.** B
26. 5	**27.** 6	**28.** D	**29.** B	**30.** 962
31. 20	**32.** 3	**33.** 1	**34.** 44	**35.** 1380
36. D	**37.** B	**38.** B	**39.** C	**40.** B
41. 154	**42.** C	**43.** 171	**44.** B	**45.** 1
46. C	**47.** B	**48.** A	**49.** A	**50.** C
51. A	**52.** C	**53.** A	**54.** A	**55.** C
56. B	**57.** A	**58.** B	**59.** B	**60.** A
61. 14	**62.** 1	**63.** B	**64.** 8	**65.** B
66. 3	**67.** A	**68.** C	**69.** D	**70.** B
71. A	**72.** D	**73.** D	**74.** A	**75.** D
76. A	**77.** C	**78.** A	**79.** A	**80.** B
81. C	**82.** D	**83.** A	**84.** B	**85.** C
86. D	**87.** A	**88.** A	**89.** D	**90.** C
91. B	**92.** A	**93.** C	**94.** B	**95.** A
96. C	**97.** A	**98.** B	**99.** C	**100.** B
101. C	**102.** D	**103.** C	**104.** B	**105.** D
106. D	**107.** D	**108.** A	**109.** C	**110.** C
111. A	**112.** A	**113.** D	**114.** D	**115.** B
116. C	**117.** C	**118.** C	**119.** C	**120.** A
121. C	**122.** C	**123.** B	**124.** A	**125.** B
126. C	**127.** D	**128.** B	**129.** A	**130.** C
131. D	**132.** A	**133.** B	**134.** D	**135.** B
136. B	**137.** C	**138.** A	**139.** A	**140.** B
141. B	**142.** D	**143.** A	**144.** B	**145.** B
146. C	**147.** B	**148.** A	**149.** D	**150.** A

151. C **152.** B **153.** B **154.** A **155.** B

156. B **157.** B **158.** C **159.** A **160.** C

161. A **162.** B **163.** C **164.** D **165.** D

166. D **167.** D **168.** A **169.** A **170.** D

171. D **172.** C **173.** A **174.** C **175.** B

176. D **177.** D **178.** C **179.** B **180.** C

181. A **182.** D **183.** C **184.** C **185.** C

186. A **187.** A **188.** D **189.** C **190.** A

191. C **192.** D **193.** C **194.** 85 **195.** 372

196. A **197.** 0.18 **198.** 375 **199.** 3 **200.** C

201. A **202.** 1 **203.** D **204.** C **205.** A

206. A **207.** D **208.** A **209.** B **210.** A

211. C **212.** A **213.** C **214.** B **215.** B

216. B **217.** C **218.** D **219.** 0 **220.** B

221. D **222.** D **223.** C **224.** A **225.** A

226. B **227.** D **228.** C **229.** 2 **230.** A

231. C **232.** B **233.** C **234.** A **235.** A

236. B **237.** A **238.** D **239.** C **240.** D

241. D **242.** D **243.** B **244.** D **245.** B

246. D **247.** D **248.** B **249.** A **250.** B

251. B **252.** B **253.** B **254.** D **255.** C

256. C **257.** A **258.** C **259.** D **260.** C

261. A **262.** D **263.** C **264.** D **265.** B

266. C **267.** C **268.** C **269.** C **270.** A

271. D **272.** C **273.** A **274.** C **275.** A

276. D **277.** B **278.** C **279.** B **280.** B

281. C **282.** C **283.** D **284.** D **285.** A

286. B **287.** A **288.** D **289.** 1 **290.** 74

291. D **292.** A **293.** A **294.** A **295.** C

296. B **297.** D **298.** A **299.** A **300.** A

LEARNE2I / PRIORITY PRACTICE

JEE Main 2025 Session 2

Mathematics
Chapter-wise practice collection

300 questions / NCERT chapter navigation
Chapter and topic priority guide, followed by questions and an answer key.

Start with the priority guide, then practise chapter by chapter. Enter a numerical value where no options are given; follow the units and precision specified in the question.

Solutions on your phone

Scan to choose a chapter or question. You can also download all three solutions PDFs together.

learne2i.com/jee-main/revision-archive/2025-session-2/

Open the PDF bookmarks panel on the left to jump between chapters. The chapter links in the guide are clickable too.

YOUR PRACTICE ROADMAP

Chapter & topic priorities

For this Session 2 collection, begin with **Three Dimensional Geometry; Sequences and Series; Vector Algebra**. These chapters have the largest share of the selected questions.

Practice weight = questions selected from a chapter / 300. Topic percentages use that chapter's question count. These are practice priorities from the prediction output, not guaranteed exam marks or probabilities.

NCERT chapter / leading topics	Priority	Questions	Weight
Sets Sets: 1 (100.0%)	Consolidate	1-1 (1)	0.3%
Relations and Functions Properties of functions: 3 (75.0%) / Functions and relations: 1 (25.0%)	Consolidate	2-5 (4)	1.3%
Trigonometric Functions Trigonometric identities: 2 (50.0%) / Trigonometric equations: 1 (25.0%) / Trigonometric Functions: 1 (25.0%)	Consolidate	6-9 (4)	1.3%
Complex Numbers and Quadratic Equations Complex Numbers and Quadratic Equations: 2 (28.6%) / Quadratic equations and complex roots: 2 (28.6%) / Complex numbers and polynomial roots: 1 (14.3%) / More topics in chapter guide	Next	10-16 (7)	2.3%
Permutations and Combinations Counting arrangements and selections: 3 (27.3%) / Fundamental counting principle: 3 (27.3%) / Permutations and Combinations: 2 (18.2%) / More topics in chapter guide	Next	17-27 (11)	3.7%
Binomial Theorem Binomial expansion: 1 (33.3%) / Binomial Theorem: 1 (33.3%) / Middle term of a binomial expansion: 1 (33.3%)	Consolidate	28-30 (3)	1.0%
Sequences and Series Sequences and finite sums: 18 (50.0%) / Arithmetic progression: 6 (16.7%) / Geometric progression: 5 (13.9%) / More topics in chapter guide	Focus first	31-66 (36)	12.0%
Straight Lines Coordinate geometry of lines: 1 (33.3%) / Distance from a point to a line: 1 (33.3%) / Equation of a straight line: 1 (33.3%)	Consolidate	67-69 (3)	1.0%
Conic Sections Circle geometry: 8 (38.1%) / Conic geometry: 8 (38.1%) / Properties of conic sections: 3 (14.3%) / More topics in chapter guide	Next	70-90 (21)	7.0%
Introduction to Three Dimensional Geometry Coordinates in three dimensions: 2 (100.0%)	Consolidate	91-92 (2)	0.7%

NCERT chapter / leading topics	Priority	Questions	Weight
Limits and Derivatives Standard limits: 1 (100.0%)	Consolidate	93-93 (1)	0.3%
Statistics Variance and standard deviation: 6 (66.7%) / Measures of central tendency and dispersion: 2 (22.2%) / Mean, median and mode: 1 (11.1%)	Next	94-102 (9)	3.0%
Probability Addition and multiplication rules of probability: 1 (100.0%)	Consolidate	103-103 (1)	0.3%
Inverse Trigonometric Functions Inverse Trigonometric Functions: 1 (100.0%)	Consolidate	104-104 (1)	0.3%
Determinants Determinants: 1 (100.0%)	Consolidate	105-105 (1)	0.3%
Application of Derivatives Derivative-based curve analysis: 3 (42.9%) / Tangents and normals: 2 (28.6%) / Applications of derivatives: 1 (14.3%) / More topics in chapter guide	Next	106-112 (7)	2.3%
Integrals Integration: 1 (100.0%)	Consolidate	113-113 (1)	0.3%
Application of Integrals Application of Integrals: 2 (66.7%) / Area under a curve: 1 (33.3%)	Consolidate	114-116 (3)	1.0%
Vector Algebra Algebra of vectors: 11 (35.5%) / Scalar product: 6 (19.4%) / Vector operations: 5 (16.1%) / More topics in chapter guide	Focus first	117-147 (31)	10.3%
Three Dimensional Geometry Coordinates in three dimensions: 39 (26.7%) / Shortest distance between lines: 23 (15.8%) / Equation of a plane: 22 (15.1%) / More topics in chapter guide	Focus first	148-293 (146)	48.7%
Mathematical Reasoning Historical appendix / omitted source chapter Mathematical reasoning: 5 (71.4%) / Propositional equivalence: 1 (14.3%) / Translation of compound statements: 1 (14.3%)	Historical appendix	294-300 (7)	2.3%

How to use the priorities

1. Rank chapters by their selected question counts. Ties follow NCERT book order.
2. Focus first: chapters starting within the first 70% of selected, non-historical questions. Next: the following 20%. Consolidate: the remainder. A chapter crossing a threshold stays together.
3. Topic counts use the question's existing core concept, falling back to topic and then chapter. Each question is counted once. Full topic lists begin each chapter.
4. Historical/omitted chapters stay in a separate appendix. Their presence is not a recommendation that they are in the target examination syllabus.

Names follow NCERT Classes XI and XII. Practical chemistry is identified as a laboratory-manual section. Percentages are rounded and may not add to exactly 100.0%. Chapters with no selected questions are not listed; this does not mean they have

no exam importance.

Chapter naming references: NCERT textbooks.

Sets

Questions 1-1 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Sets: 1 question / 100.0% of this chapter

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Question 1 View solution online

In a survey of 220 students of a higher secondary school, it was found that at least 125 and at most 130 students studied Mathematics; at least 85 and at most 95 studied Physics; at least 75 and at most 90 studied Chemistry; 30 studied both Physics and Chemistry; 50 studied both Chemistry and Mathematics; 40 studied both Mathematics and Physics and 10 studied none of these subjects. Let m and n respectively be the least and the most number of students who studied all the three subjects. Then $\mathbf{m+n}$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

CHAPTER 02 / MATHEMATICS

Relations and Functions

Questions 2-5 / 4 selected / 1.3% practice weight / Consolidate

Topics to prioritise in this collection

- Properties of functions: 3 questions / 75.0% of this chapter
- Functions and relations: 1 question / 25.0% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 2 View solution online

Let $f : R \to R$ be a function defined by $f(x) = (2 + 3a)x^2 + \left(\frac{a+2}{a-1}\right)x + b, a \neq 1$. If $f(x + y) = f(x) + f(y) + 1 - \frac{2}{7}xy$, then the value of $28 \sum_{i=1}^{5} |f(i)|$ is:

A. 715

B. 735

C. 545

D. 675

Question 3 View solution online

Let $S = \{x : x \in \mathbb{R} \text{ and } (\sqrt{3} + \sqrt{2})^{x^2-4} + (\sqrt{3} - \sqrt{2})^{x^2-4} = 10\}$

Then $n(S)$ is equal to

A. 4

B. 0

C. 6

D. 2

Question 4 View solution online

Let $\mathbf{A}=\{1, \mathbf{a}_1, \mathbf{a}_2 \ldots \ldots \mathbf{a}_{18}, 77\}$ be a set of integers with $1<\mathbf{a}_1<\mathbf{a}_2<\ldots . .<\mathbf{a}_{18}<77$. Let the set $A+A=\{x+y: x, y \in A\}$ contain exactly 39 elements. Then, the value of $a_1+a_2+\ldots . .+a_{18}$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 5 View solution online

An organization awarded 48 medals in event 'A', 25 in event ' B ' and 18 in event ' C '. If these medals went to total 60 men and only five men got medals in all the three events, then, how many received medals in exactly two of three events?

A. 10

B. 9

C. 21

D. 15

Trigonometric Functions

Questions 6-9 / 4 selected / 1.3% practice weight / Consolidate

Topics to prioritise in this collection

- Trigonometric identities: 2 questions / 50.0% of this chapter
- Trigonometric equations: 1 question / 25.0% of this chapter
- Trigonometric Functions: 1 question / 25.0% of this chapter

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Question 6 View solution online

Let $S = \left\{\sin^2 2\theta : \left(\sin^4\theta + \cos^4\theta\right)x^2 + (\sin 2\theta)x + \left(\sin^6\theta + \cos^6\theta\right) = 0 \text{ has real roots }\right\}$. If α and β be the smallest and largest elements of the set S , respectively, then $3\left((\alpha-2)^2 + (\beta-1)^2\right)$ equals.....

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 7 View solution online

Question ID: 101787

Let $c, k \in R$. If $f(x) = (c+1)x^2 + \left(1-c^2\right)x + 2k$ and $f(x+y) = f(x) + f(y) - xy$, for all $x, y \in R$, then the value of $|2(f(1) + f(2) + f(3) + \ldots\ldots + f(20))|$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 8 View solution online

If for some $\alpha, \beta; \alpha \leq \beta, \alpha + \beta = 8$ and $\sec^2\left(\tan^{-1}\alpha\right) + \operatorname{cosec}^2\left(\cot^{-1}\beta\right) = 36$, then $\alpha^2 + \beta$ is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 9 View solution online

A value of $\theta \in (0, \pi/3)$, for which

$\begin{vmatrix} 1+\cos^2\theta & \sin^2\theta & 4\cos 6\theta\cos^2\theta \\ 1+\sin^2\theta & 4\cos 6\theta\cos^2\theta & \sin^2\theta \\ 1+4\cos 6\theta & \end{vmatrix} = 0$, is :

A. $\frac{\pi}{18}$

B. $\frac{7\pi}{36}$

C. $\frac{7\pi}{24}$

D. $\frac{\pi}{9}$

Complex Numbers and Quadratic Equations

Questions 10-16 / 7 selected / 2.3% practice weight / Next

Topics to prioritise in this collection

- Complex Numbers and Quadratic Equations: 2 questions / 28.6% of this chapter
- Quadratic equations and complex roots: 2 questions / 28.6% of this chapter
- Complex numbers and polynomial roots: 1 question / 14.3% of this chapter
- Nature of roots: 1 question / 14.3% of this chapter
- Quadratic equations: 1 question / 14.3% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

Question 10 View solution online

Let α_θ and β_θ be the distinct roots of $2x^2 + (\cos\theta)x - 1 = 0, \theta \in (0, 2\pi)$. If m and M are the minimum and the maximum values of $\alpha_\theta^4 + \beta_\theta^4$, then $16(M + m)$ equals :

A. 24

B. 25

C. 27

D. 17

Question 11 View solution online

If the sum of the squares of the reciprocals of the roots α and β of the equation $3x^2 + \lambda x - 1 = 0$ is 15 , then $6\left(\alpha^3 + \beta^3\right)^2$ is equal to :

A. 18

B. 24

C. 36

D. 96

Question 12 View solution online

If α satisfies the equation $x^2+x+1=0$ and $(1+\alpha)^7=\mathrm{A}+\mathrm{B}\alpha+\mathrm{C}\alpha^2,\ \mathrm{A},\ \mathrm{B},\mathrm{C}\geq 0$, then $5(3\,\mathrm{A}-2\,\mathrm{B}-\mathrm{C})$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 13 View solution online

Let $\lambda\neq 0$ be in $\mathbf{R}$. If α and β are the roots of the equation $\mathrm{x}^2-\mathrm{x}+2\lambda=0$, and α and γ are the roots of equation $3x^2-10x+27\lambda=0$, then $\frac{\beta\gamma}{\lambda}$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 14 View solution online

$x=(8\sqrt{3}+13)^{13}$ and $y=(7\sqrt{2}+9)^9$. If $[t]$ denotes the greatest integer $\leq t$, then

A. $[x]$ is odd but $[y]$ is even

B. $[x]+[y]$ is even

C. $[x]$ and $[y]$ are both odd

D. $[x]$ is even but $[y]$ is odd

Question 15 View solution online

Let $\Delta,\nabla\in\{\Lambda,\mathrm{V}\}$ be such that $(\mathrm{p}\rightarrow\mathrm{q})\Delta(\mathrm{p}\nabla\mathrm{q})$ is a tautology. Then

A. $\Delta=V,\nabla=V$

B. $\Delta=V,\nabla=\Lambda$

C. $\Delta=\Lambda,\nabla=V$

D. $\Delta=\Lambda,\nabla=\Lambda$

Question 16 View solution online

The remainder, when 7^{103} is divided by 23 , is equal to:

A. 14

B. 9

C. 17

D. 6

Permutations and Combinations

Questions 17-27 / 11 selected / 3.7% practice weight / Next

Topics to prioritise in this collection

- Counting arrangements and selections: 3 questions / 27.3% of this chapter
- Fundamental counting principle: 3 questions / 27.3% of this chapter
- Permutations and Combinations: 2 questions / 18.2% of this chapter
- Permutations with restrictions: 2 questions / 18.2% of this chapter
- Counting arrangements: 1 question / 9.1% of this chapter

Open this chapter's solutions on mobile / Back to chapter guide

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Question 17 View solution online

Let ${}^nC_{r-1} = 28, {}^nC_r = 56$ and ${}^nC_{r+1} = 70$. Let $\mathrm{A}(4\cos t, 4\sin t), \mathrm{B}(2\sin t, -2\cos t)$ and $\mathrm{C}\left(3\mathrm{r} - \mathrm{n}, \mathrm{r}^2 - \mathrm{n} - 1\right)$ be the vertices of a triangle ABC , where t is a parameter. If $(3\mathrm{x} - 1)^2 + (3\mathrm{y})^2 = \alpha$, is the locus of the centroid of triangle ABC , then α equals :

A. 20

B. 8

C. 6

D. 18

Question 18 View solution online

The coefficient of x^{70} in $\mathrm{x}^2(1+\mathrm{x})^{98} + \mathrm{x}^3(1+\mathrm{x})^{97} + \mathrm{x}^4(1+\mathrm{x})^{96} + \ldots\ldots\ldots + \mathrm{x}^{54}(1+\mathrm{x})^{46}$ is ${}^{99}\mathrm{C}_\mathrm{p} - {}^{46}\mathrm{C}_\mathrm{q}$. Then a possible value to $\mathrm{p} + \mathrm{q}$ is :

A. 55

B. 61

C. 68

D. 83

Question 19 View solution online

Total numbers of 3-digit numbers that are divisible by 6 and can be formed by using the digits $\mathbf{1, 2, 3}$, 4, 5 with repetition, is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 20 View solution online

The number of permutations, of the digits $\mathbf{1, 2, 3}$, ... 7 without repetition, which neither contain the string 153 nor the string 2467, is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 21 View solution online

The total number of three-digit numbers, divisible by 3 , which can be formed using the digits $\mathbf{1, 3, 5}$, 8, if repetition of digits is allowed, is:

A. 22

B. 18

C. 21

D. 20

Question 22 View solution online

The number of five digit numbers, greater than 40000 and divisible by 5, which can be formed using the digits $\mathbf{0, 1, 3, 5, 7}$ and 9 without repetition, is equal to

A. 120

B. 132

C. 72

D. 96

Question 23 View solution online

The number of 5-digit natural numbers, such that the product of their digits is 36 , is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 24 View solution online

If the sum and product of four positive consecutive terms of a G.P., are 126 and 1296 , respectively, then the sum of common ratios of all such GPs is

A. 7

B. 3

C. $\frac{9}{2}$

D. 14

Question 25 View solution online

If all the six digit numbers $x_1x_2x_3x_4x_5x_6$ with $0 < x_1 < x_2 < x_3 < x_4 < x_5 < x_6$ are arranged in the increasing order, then the sum of the digits in the 72th number is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 26 View solution online

The total number of six digit numbers, formed using the digits $4, 5, 9$ only and divisible by 6 , is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 27 View solution online

The remainder, when 7^{103} is divided by 17 is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Binomial Theorem

Questions 28-30 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Binomial expansion: 1 question / 33.3% of this chapter
- Binomial Theorem: 1 question / 33.3% of this chapter
- Middle term of a binomial expansion: 1 question / 33.3% of this chapter

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Question 28 View solution online

For the natural numbers m, n, if $(1-y)^m(1+y)^n = 1 + a_1y + a_2y_2 + \ldots. + a^{m+n}\, y^{m+n}$ and $a_1 = a_2 = 10$, then the value of $(m+n)$ is equal to :

A. 88

B. 64

C. 100

D. 80

Question 29 View solution online

Let the coefficients of three consecutive terms T_r, T_{r+1} and T_{r+2} in the binomial expansion of $(a+b)^{12}$ be in a G.P. and let p be the number of all possible values of r. Let q be the sum of all rational terms in the binomial expansion of $(\sqrt[4]{3} + \sqrt[3]{4})^{12}$. Then $p+q$ is equal to :

A. 283

B. 295

C. 287

D. 299

Question 30 View solution online

Let K be the sum of the coefficients of the odd powers of x in the expansion of $(1+x)^{99}$. Let a be the middle term in the expansion of $\left(2+\frac{1}{\sqrt{2}}\right)^{200}$. If $\frac{{}^{200}C_{99}K}{a}=\frac{2^l m}{n}$, where m and n are odd numbers, then the ordered pair (l, n) is equal to

A. $(50,51)$

B. $(50,101)$

C. $(51,99)$

D. $(51,101)$

Sequences and Series

Questions 31-66 / 36 selected / 12.0% practice weight / Focus first

Topics to prioritise in this collection

- Sequences and finite sums: 18 questions / 50.0% of this chapter
- Arithmetic progression: 6 questions / 16.7% of this chapter
- Geometric progression: 5 questions / 13.9% of this chapter
- Summation of series: 3 questions / 8.3% of this chapter
- Progressions: 2 questions / 5.6% of this chapter
- Sequences and Series: 1 question / 2.8% of this chapter
- Sequences and series: 1 question / 2.8% of this chapter

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Question 31 View solution online

If the domain of the function $\log_5\left(18x - x^2 - 77\right)$ is (α, β) and the domain of the function $\log_{(x-1)}\left(\frac{2x^2+3x-2}{x^2-3x-4}\right)$ is (γ, δ), then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :

A. 195

B. 174

C. 186

D. 179

Question 32 View solution online

Let the plane $x + 3y - 2z + 6 = 0$ meet the co-ordinate axes at the points $\mathrm{A}, \mathrm{B}, \mathrm{C}$. If the orthocentre of the triangle ABC is $\left(\alpha, \beta, \frac{6}{7}\right)$, then $98(\alpha + \beta)^2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 33 View solution online

A ray of light passing through the point $\mathbf{P(2,3)}$ reflects on the x -axis at point A and the reflected ray passes through the point $\mathbf{Q(5,4)}$. Let R be the point that divides the line segment AQ internally into the ratio $\mathbf{2:1}$. Let the co-ordinates of the foot of the perpendicular M from R on the bisector of the angle PAQ be (α, β). Then, the value of $7\alpha + 3\beta$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 34 View solution online

Let the image of the point $\mathbf{P(1,2,3)}$ in the line $\mathbf{L: \frac{x-6}{3} = \frac{y-1}{2} = \frac{z-2}{3}}$ be Q . let $\mathbf{R}(\alpha, \beta, \gamma)$ be a point that divides internally the line segment PQ in the ratio $\mathbf{1:3}$. Then the value of $22(\alpha + \beta + \gamma)$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 35 View solution online

Let a conic C pass through the point $(4, -2)$ and $\mathbf{P(x,y), x \geq 3}$, be any point on C . Let the slope of the line touching the conic C only at a single point $\boldsymbol{P}$ be half the slope of the line joining the points P and (3, -5). If the focal distance of the point (7, 1) on C is d , then 12 d equals .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 36 View solution online

A line passes through $\mathbf{A(4,-6,-2)}$ and $\mathbf{B(16,-2,4)}$. The point $\mathbf{P(a,b,c)}$ where $\mathbf{a, b, c}$ are non-negative integers, on the line AB lies at a distance of 21 units, from the point A . The distance between the points $\mathbf{P(a,b,c)}$ and $\mathbf{Q(4,-12,3)}$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 37 View solution online

Let $a_1, a_2, \ldots, a_{10}$ be an AP with common difference -3 and $b_1, b_2, \ldots, b_{10}$ be a GP with common ratio 2 . Let $c_k = a_k + b_k, k = 1, 2, \ldots, 10$. If $c_2 = 12$ and $c_3 = 13$, then $\sum_{k=1}^{10} c_k$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 38 View solution online

Points $\mathrm{P}(-3, 2), \mathrm{Q}(9, 10)$ and $(\mathrm{a}, 4)$ lie on a circle C with PR as its diameter, The tangents to C at the points Q and R intersect at the point S. If S lies on the line $2x - ky = 1$, then k is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 39 View solution online

Let $\mathrm{a}_1, \mathrm{a}_2, \ldots\ldots, \mathrm{a}_{21}$ be an AP such that $\sum_{\mathrm{n}=1}^{20} \frac{1}{\mathrm{a}_\mathrm{n}\mathrm{a}_{\mathrm{n}+1}} = \frac{4}{9}$. If the sum of this AP is 189, then $\mathrm{a}_6\mathrm{a}_{16}$ is equal to :

A. 57

B. 72

C. 48

D. 36

Question 40 View solution online

Let $\mathbf{f : N \to R}$ be a function such that $f(x+y) = 2f(x)f(y)$ for natural numbers x and y. If $f(1) = 2$, then the value of α for which

$$\sum_{k=1}^{10} f(\alpha + k) = \frac{512}{3}\left(2^{20} - 1\right)$$

holds, is

A. 2

B. 3

C. 4

D. 6

Question 41 View solution online

Let $A_1, A_2, A_3, \ldots\ldots$ be an increasing geometric progression of positive real numbers. If $A_1A_3A_5A_7 = \frac{1}{1296}$ and $A_2 + A_4 = \frac{7}{36}$, then, the value of $\mathbf{A_6 + A_8 + A_{10}}$ is equal to

A. 33

B. 37

C. 43

D. 47

Question 42 View solution online

The point of intersection C of the plane $8x + y + 2z = 0$ and the line joining the point $A(-3, -61)$ and $\mathbf{B(2, -4, -3)}$ divides the line segment AB internally in the ratio k :. If $\mathbf{a, b, c(|a|, |b|, |c|)}$ are coprime are the direction ratios of the perpendicular form the point C on the line $\frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3}$, then $|\ \mathbf{a + b +}$ c|is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 43 View solution online

If the first term of an A.P. is 3 and the sum of its first 25 terms is equal to the sum of its next 15 terms, then the common difference of this A.P. is:

A. 1/6

B. 1/5

C. 1/4

D. 1/7

Question 44 View solution online

Let $\vec{a}=\hat{i}+2\hat{j}+\lambda\hat{k}, \vec{b}=3\hat{i}-5\hat{j}-\lambda\hat{k}, \vec{a}\cdot\vec{c}=7, 2\vec{b}\cdot\vec{c}+43=0, \vec{a}\times\vec{c}=\vec{b}\times\vec{c}$. Then $|\vec{a}\cdot\vec{b}|$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 45 View solution online

If the sum of the second, third and fourth terms of a positive term G.P. is 3 and the sum of its sixth, saventh and eighth terms is 243, then the sum of the first 50 terms of this G.P. is:

A. $\frac{2}{13}\left(3^{50}-1\right)$

B. $\frac{1}{26}\left(3^{49}-1\right)$

C. $\frac{1}{13}\left(3^{50}-1\right)$

D. $\frac{1}{26}\left(3^{50}-1\right)$

Question 46 View solution online

The sum of the first three terms of a G.P. is S and their product is 27. Then all such S lie in :

A. $(-\infty,-9]\cup[3,\infty)$

B. $[-3,\infty)$

C. $(-\infty,9]$

D. $(-\infty,-3]\cup[9,\infty)$

Question 47 View solution online

Let $a_1, a_2, a_3 \ldots$. be a G.P. of increasing positive terms. If $a_1 a_5 = 28$ and $a_2 + a_4 = 29$, the a_6 is equal to

A. 628

B. 526

C. 784

D. 812

Question 48 View solution online

Let T_r be the rth term of an A.P. If for some m, $T_m = \frac{1}{25}$, $T_{25} = \frac{1}{20}$ and $20 \sum_{r=1}^{25} T_r = 13$, then $5\, m \sum_{r=m}^{2m} T_r$ is equal to :

A. 112

B. 126

C. 98

D. 142

Question 49 View solution online

If the first term of an A.P. is 3 and the sum of its first four terms is equal to one-fifth of the sum of the next four terms, then the sum of the first 20 terms is equal to

A. -1200

B. -1080

C. -1020

D. -120

Question 50 View solution online

Consider an A.P. of positive integers, whose sum of the first three terms is 54 and the sum of the first twenty terms lies between 1600 and 1800. Then its 11th term is :

A. 84

B. 122

C. 90

D. 108

Question 51 View solution online

Suppose that the number of terms in an A.P. is 2 k , $k \in N$. If the sum of all odd terms of the A.P. is 40 , the sum of all even terms is 55 and the last term of the A.P. exceeds the first term by 27 , then k is equal to

A. 5

B. 8

C. 6

D. 4

Question 52 View solution online

In an increasing geometric progression ol positive terms, the sum of the second and sixth terms is $\frac{70}{3}$ and the product of the third and fifth terms is 49. Then the sum of the $4^{th}, 6^{th}$ and 8th terms is :-

A. 96

B. 78

C. 91

D. 84

Question 53 View solution online

For positive integers n, if $4a_n = \left(n^2 + 5n + 6\right)$ and $S_n = \sum_{k=1}^{n} \left(\frac{1}{a_k}\right)$, then the value of $507\, S_{2025}$ is :

A. 540

B. 1350

C. 675

D. 135

Question 54 View solution online

Let p and q be two statements. Then $\sim (p \wedge (p \Rightarrow \sim q))$ is equivalent to

A. $p \vee (p \wedge q)$

B. $p \vee (p \wedge (\sim q))$

C. $(\sim p) \vee q$

D. $p \vee ((\sim p) \wedge q)$

Question 55 View solution online

If $\mathbf{p, q}$ and r three propositions, then which of the following combination of truth values of $\mathbf{p, q}$ and r makes the logical expression $\{(p \vee q) \wedge ((\sim p) \vee r)\} \rightarrow ((\sim q) \vee r)$ false?

A. $p = T, q = T, r = F$

B. $p = T, q = F, r = T$

C. $p = F, q = T, r = F$

D. $p = T, q = F, r = F$

Question 56 View solution online

Among the statements :
$\mathbf{(S1)((p \vee q) \Rightarrow r) \Leftrightarrow (p \Rightarrow r)}$
(S2) $((p \vee q) \Rightarrow r) \Leftrightarrow ((p \Rightarrow r) \vee (q \Rightarrow r))$

A. only (S2) is a tautology

B. only (S1) is a tautology

C. neither (S1) nor (S2) is a tautology

D. both (S1) and (S2) are tautologies

Question 57 View solution online

The sum of the common terms of the following three arithmetic progressions.

3, 7, 11, 15, ...,399
$\mathbf{2, 5, 8, 11, ... , 359}$ and
2, 7, 12, 17, ..., 197
is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 58 View solution online

The 4th term of GP is 500 and its common ratio is $\frac{1}{m}, m \in \mathbf{N}$. Let S_n denote the sum of the first n terms of this GP. If $S_6 > S_5 + 1$ and $S_7 < S_6 + \frac{1}{2}$, then the number of possible values of m is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 59 View solution online

Let the sixth term in the binomial expansion of $\left(\sqrt{\log_2(10-3^3)} + \sqrt[5]{2^{x\log_2 3}}\right)^m$, in the increasing powers of $2^{(x-2)\log_2 3}$, be 21 . If the binomial coefficients of the second, third and fourth terms in the expansion are respectively the first, third and fifth terms of A.P., then the sum of the squares of all possible values of x is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 60 View solution online

Let $a_1, a_2, a_3, \ldots$ be a GP of increasing positive numbers. If the product of fourth and sixth terms is 9 and the sum of fifth and seventh terms is 24 , then $a_1a_9 + a_2a_4a_9 + a_5 + a_7$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 61 View solution online

Let $a_1 = 8, a_2, a_3, \ldots, a_n$ be an A.P. If the sum of its first four terms is 50 and the sum of its last four terms is 170 , then the product of its middle two terms is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 62 View solution online

If $a_n = \frac{-2}{4n^2-16n+15}$, then $a_1 + a_2 + \ldots\ldots + a_{25}$ is equal to:

A. 52/147

B. 49/138

C. 50/141

D. 51/144

Question 63 View solution online

Let $a, b, c > 1, a^3, b^3$ and c^3 be in A.P., and $\log_a b, \log_c a$ and $\log_b c$ be in G.P. If the sum of first 20 terms of an A.P., whose first term is $\frac{a+4b+c}{3}$ and the common difference is $\frac{a-8b+c}{10}$ is -444 , then abc is equal to:

A. $\frac{125}{8}$

B. 216

C. 343

D. $\frac{343}{8}$

Question 64 View solution online

Let $a_1, a_2, \ldots, a_n$ be in A.P. If $a_5 = 2a_7$ and $a_{11} = 18$, then
$12\left(\frac{1}{\sqrt{a_{10}}+\sqrt{a_{11}}} + \frac{1}{\sqrt{a_{11}}+\sqrt{a_{12}}} + \cdots + \frac{1}{\sqrt{a_{17}}+\sqrt{a_{18}}}\right)$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 65 View solution online

The 8th common term of the series

$$S_1 = 3 + 7 + 11 + 15 + 19 + \cdots$$
$$S_2 = 1 + 6 + 11 + 16 + 21 + \cdots$$

is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 66 View solution online

If the circles $x^2 + y^2 + 6x + 8y + 16 = 0$ and $x^2 + y^2 + 2(3 - \sqrt{3})x + x + 2(4 - \sqrt{6})y = k + 6\sqrt{3} + 8\sqrt{6}, k > 0$, touch internally at the point $P(\alpha, \beta)$, then $(\alpha + \sqrt{3})^2 + (\beta + \sqrt{6})^2$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Straight Lines

Questions 67-69 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Coordinate geometry of lines: 1 question / 33.3% of this chapter
- Distance from a point to a line: 1 question / 33.3% of this chapter
- Equation of a straight line: 1 question / 33.3% of this chapter

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Question 67 View solution online

Let circle C be the image of $\mathbf{x^2 + y^2 - 2x + 4y - 4 = 0}$ in the line $2x - 3y + 5 = 0$ and A be the point on C such that OA is parallel to x -axis and A lies on the right hand side of the centre O of C . If $\mathbf{B(\alpha, \beta)}$, with $\beta < 4$, lies on C such that the length of the arc AB is $(1/6)^{\text{th}}$ of the perimeter of C , then $\beta - \sqrt{3}\alpha$ is equal to

A. 3

B. $3 + \sqrt{3}$

C. $4 - \sqrt{3}$

D. 4

Question 68 View solution online

Let the point $\mathbf{P(\alpha, \beta)}$ be at a unit distance from each of the two lines $\mathbf{L_1 : 3x - 4y + 12 = 0}$, and $\mathbf{L_2 : 8x + 6y + 11 = 0}$. If P lies below $\mathbf{L_1}$ and above L_2, then $100(\alpha + \beta)$ is equal to

A. -14

B. 42

C. -22

D. 14

Question 69 View solution online

If the orthocentre of the triangle formed by the lines $2x + 3y - 1 = 0, x + 2y - 1 = 0$ and $ax + by - 1 = 0$, is the centroid of another triangle, whose circumecentre and orthocentre respectively are $(3, 4)$ and $(-6, -8)$, then the value of $|a - b|$ is

.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Conic Sections

Questions 70-90 / 21 selected / 7.0% practice weight / Next

Topics to prioritise in this collection

- Circle geometry: 8 questions / 38.1% of this chapter
- Conic geometry: 8 questions / 38.1% of this chapter
- Properties of conic sections: 3 questions / 14.3% of this chapter
- Hyperbola tangency: 1 question / 4.8% of this chapter
- Tangent and normal to conics: 1 question / 4.8% of this chapter

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Question 70 View solution online

If the locus of the point, whose distances from the point $(2, 1)$ and $(1, 3)$ are in the ratio $5 : 4$, is $ax^2 + by^2 + cxy + dx + ey + 170 = 0$, then the value of $a^2 + 2b + 3c + 4d + e$ is equal to:

A. 5

B. -27

C. 37

D. 437

Question 71 View solution online

Let the circle C touch the line $\mathbf{x - y + 1 = 0}$, have the centre on the positive x-axis, and cut off a chord of length $\frac{4}{\sqrt{13}}$ along the line $-3x + 2y = 1$. Let H be the hyperbola $\frac{x^2}{\alpha^2} - \frac{y^2}{\beta^2} = 1$, whose one of the foci is the centre of C and the length of the transverse axis is the diameter of C . Then $2\alpha^2 + 3\beta^2$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 72 View solution online

The focus of the parabola $y^2 = 4x + 16$ is the centre of the circle C of radius 5 . If the values of λ, for which C passes through the point of intersection of the lines $3x - y = 0$ and $x + \lambda y = 4$, are λ_1 and $\lambda_2, \lambda_1 < \lambda_2$, then $12\lambda_1 + 29\lambda_2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 73 View solution online

Let A be a point on the x -axis. Common tangents are drawn from A to the curves $x^2 + y^2 = 8$ and $y^2 = 16x$. If one of these tangents touches the two curves at Q and R, then $(QR)^2$ is equal to

A. 81

B. 72

C. 76

D. 64

Question 74 View solution online

The plane $2x - y + z = 4$ intersects the line segment joining the points $A(a, -2, 4)$ and $B(2, b, -3)$ at the point C in the ratio $2 : 1$ and the distance of the point C from the origin is $\sqrt{5}$. If $ab < 0$ and P is the point $(a - b, b, 2b - a)$ then CP^2 is equal to

A. $\frac{97}{3}$

B. $\frac{17}{3}$

C. $\frac{16}{3}$

D. $\frac{73}{3}$

Question 75 View solution online

Let the abscissae of the two points P and Q on a circle be the roots of $x^2 - 4x - 6 = 0$ and the ordinates of P and Q be the roots of $y^2 + 2y - 7 = 0$. If PQ is a diameter of the circle $x^2 + y^2 + 2ax +$ 2by $+c = 0$, then the value of ($a + b - c$) is

A. 12

B. 13

C. 14

D. 16

Question 76 View solution online

Two circles each of radius 5 units touch each other at the point $(1, 2)$. If the equation of their common tangent is $4x + 3y = 10$, and $C_1(\alpha, \beta)$ and $C_2(\gamma, \delta)$, $C_1 \neq C_2$ are their centres, then $|(\alpha + \beta)(\gamma + \delta)|$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 77 View solution online

Let C be the circle of minimum area touching the parabola $y = 6 - x^2$ and the lines $y = \sqrt{3}|x|$. Then, which one of the following points lies on the circle C ?

A. $(2, 4)$

B. $(1, 2)$

C. $(2, 2)$

D. $(1, 1)$

Question 78 View solution online

If A and B are the points of intersection of the circle $x^2 + y^2 - 8x = 0$ and the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ and a point P moves on the line $2x - 3y + 4 = 0$, then the centroid of $\triangle PAB$ lies on the line :

A. $4x - 9y = 12$

B. $x + 9y = 36$

C. $9x - 9y = 32$

D. $6x - 9y = 20$

Question 79 View solution online

Let the line $\mathbf{L}: \sqrt{2}\mathbf{x}+\mathbf{y}=\boldsymbol{\alpha}$ pass through the point of the intersection P (in the first quadrant) of the circle $x^2+y^2=3$ and the parabola $x^2=2y$. Let the line L touch two circles $\mathbf{C_1}$ and $\mathbf{C_2}$ of equal radius $2\sqrt{3}$. If the centres $\mathbf{Q_1}$ and $\mathbf{Q_2}$ of the circles $\mathbf{C_1}$ and $\mathbf{C_2}$ lie on the y -axis, then the square of the area of the triangle $\mathbf{PQ_1Q_2}$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 80 View solution online

The length of the latus rectum and the directrices of a hyperbola with eccentricity e are 9 and $x=\pm 4/\sqrt{13}$, respectively. Let the line $y-\sqrt{3}x+\sqrt{3}=0$ touch this hyperbola at (x_0, y_0). If m is the product of the focal distances of (x_0, y_0), then $4e^2+m$ is equal to ___.

Numerical answer: _____

This question was incorrect in the original exam paper and ALLEN marked it BONUS. This corrected practice version uses the directrices x = +/-4/sqrt(13), explicitly corrected by ALLEN, instead of the printed +/-4/sqrt(3). Enter an integer (0 decimal places).

Question 81 View solution online

The foci of a hyperbola are $(\pm 2, 0)$ and its eccentricity is $\frac{3}{2}$. A tangent, perpendicular to the line $2x+3y=6$, is drawn at a point in the first quadrant on the hyperbola. If the intercepts made by the tangent on the x - and y -axes are a and b respectively, then $|6a|+|5b|$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 82 View solution online

Let a line perpendicular to the line $2x-y=10$ touch the parabola $y^2=4(x-9)$ at the point P. The distance of the point P from the centre of the circle $x^2+y^2-14x-8y+56=0$ is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 83 View solution online

Let $x^2+y^2+Ax+By+C=0$ be a circle passing through $(0,6)$ and touching the parabola $\mathbf{y=x^2}$ at $(2,4)$. Then $\mathbf{A+C}$ is equal to ..... .

A. 16

B. $88/5$

C. 72

D. -8

Question 84 View solution online

Let the circles $C_1:(x-\alpha)^2+(y-\beta)^2=r_1^2$ and $C_2:(x-8)^2+\left(y-\frac{15}{2}\right)^2=r_2^2$ touch each other externally at the point $(6,6)$. If the point $(6,6)$ divides the line segment joining the centres of the circles $\mathbf{C_1}$ and $\mathbf{C_2}$ internally in the ratio $\mathbf{2:1}$, then $(\alpha+\beta)+4\left(\mathbf{r_1^2+r_2^2}\right)$ equals

A. 110

B. 130

C. 125

D. 145

Question 85 View solution online

The circle passing through the intersection of the circles, $x^2+y^2-6x=0$ and $x^2+y^2-4y=0$, having its centre on the line, $2x-3y+12=0$, also passes through the point:

A. $(-1,3)$

B. $(1,-3)$

C. $(-3,6)$

D. (3)}

$\mathbf{S_1+\lambda\left(S_1-S_2\right)=0}$

$x^2+y^2-6x+\lambda(4y-6x)=0$

$x^2+y^2-6x(1+\lambda)+4\lambda y=0$

Centre ($3(1+\lambda),-2\lambda$) put in $2x-3y+12=0$

$6+6\lambda+6\lambda+12=0$

$12\lambda=-18$

$\lambda=-3/2$

$\therefore$ Circle is $\mathbf{x^2+y^2+3x-6y=0}$

Check options

Question 86 View solution online

Let the latus rectum of the parabola $y^2 = 4x$ be the common chord to the circles C_1 and C_2 each of them having radius $2\sqrt{5}$. Then, the distance between the centres of the circles C_1 and C_2 is:

A. 8

B. $8\sqrt{5}$

C. $4\sqrt{5}$

D. 12

Question 87 View solution online

Let a circle C of radius 5 lie below the x -axis. The line $\mathbf{L_1 = 4x + 3y - 2}$ passes through the centre P of the circle C and intersects the line $\mathbf{L_2 : 3x - 4y - 11 = 0}$ at Q . The line $\mathbf{L_2}$ touches C at the point Q . Then the distance of P from the line $5x - 12y + 51 = 0$ is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 88 View solution online

A circle of radius 2 unit passes through the vertex and the focus of the parabola $y^2 = 2x$ and touches the parabola $y = \left(x - \frac{1}{4}\right)^2 + \alpha$, where $\alpha > 0$. Then $(4\alpha - 8)^2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 89 View solution online

If $x^2 - y^2 + 2hxy + 2gx + 2fy + c = 0$ is the locus of a point, which moves such that it is always equidistant from the lines $x + 2y + 7 = 0$ and $2x - y + 8 = 0$, then the value of $\mathbf{g + c + h - f}$ equals

A. 14

B. 6

C. 8

D. 29

Question 90 View solution online

Let O be the origin and OP and OQ be the tangents to the circle $x^2 + y^2 - 6x + 4y + 8 = 0$ at the point P and Q on it. If the circumcircle of the triangle OPQ passes through the point $\left(\alpha, \frac{1}{2}\right)$, then a value of α is

A. $\frac{3}{2}$

B. $\frac{5}{2}$

C. 1

D. $-\frac{1}{2}$

Introduction to Three Dimensional Geometry

Questions 91-92 / 2 selected / 0.7% practice weight / Consolidate

Topics to prioritise in this collection

- Coordinates in three dimensions: 2 questions / 100.0% of this chapter

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Question 91 View solution online

If the four points, whose position vectors are $3\hat{i}-4\hat{j}+2\hat{k}, \hat{i}+2\hat{j}-\hat{k}, -2\hat{i}-\hat{j}+3\hat{k}$ and $5\hat{i}-2\alpha\hat{j}+4\hat{k}$ are coplanar, then α is equal to

A. $\frac{73}{17}$

B. $\frac{107}{17}$

C. $\frac{-73}{17}$

D. $\frac{-107}{17}$

Question 92 View solution online

The distance of the origin from the centroid of the triangle whose two sides have the equations $x-2y+1=0$ and $2x-y-1=0$ and whose orthocenter is $\left(\frac{7}{3}, \frac{7}{3}\right)$ is:

A. $\sqrt{2}$

B. 2

C. $2\sqrt{2}$

D. 4

Limits and Derivatives

Questions 93-93 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Standard limits: 1 question / 100.0% of this chapter

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Question 93

View solution online

If the domain of the function
$f(x) = \log_e\left(4x^2 + 11x + 6\right) + \sin^{-1}$
$(4x + 3) + \cos^{-1}\left(\frac{10x+6}{3}\right)$ is $(\alpha, \beta]$,
Then $36|\alpha + \beta|$ is equal to :

A. 63

B. 45

C. 72

D. 54

Statistics

Questions 94-102 / 9 selected / 3.0% practice weight / Next

Topics to prioritise in this collection

- Variance and standard deviation: 6 questions / 66.7% of this chapter
- Measures of central tendency and dispersion: 2 questions / 22.2% of this chapter
- Mean, median and mode: 1 question / 11.1% of this chapter

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Question 94 View solution online

Let the mean and the variance of 6 observation a, b, $68, 44, 48, 60$ be 55 and 194, respectively if $a > b$, then $a + 3b$ is

A. 200

B. 190

C. 180

D. 210

Question 95 View solution online

The mean and variance of a set of 15 numbers are 12 and 14 respectively. The mean and variance of another set of 15 numbers are 14 and σ^2 respectively. If the variance of all the 30 numbers in the two sets is 13 , then σ^2 is equal to

A. 9

B. 12

C. 11

D. 10

Question 96 View solution online

The mean and standard deviation of the marks of 10 students were found to be 50 and 12 respectively. Later, it was observed that two marks 20 and 25 were wrongly read as 45 and 50 respectively. Then the correct variance is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 97 View solution online

Let the six numbers $a_1, a_2, a_3, a_4, a_5, a_6$, be in A.P. and $a_1 + a_3 = 10$. If the mean of these six numbers is $\frac{19}{2}$ and their variance is σ^2, then $8\sigma^2$ is equal to :

A. 210

B. 220

C. 200

D. 105

Question 98 View solution online

Let $9 = x_1 < x_2 < \ldots\ldots < x_7 \ldots\ldots, x_7$ be in an A.P. with common difference d . If the standard deviation of $x_1 \cdot x_2 \ldots., x_7$ is 4 and mean is $\overline{x}$, then $\overline{x} + x_6$ is equal to :

A. $2\left(9 + \frac{8}{\sqrt{7}}\right)$

B. $18\left(1 + \frac{1}{\sqrt{3}}\right)$

C. 25

D. 34

Question 99 View solution online

Let S be the set of all values of a_1 for which the mean deviation about the mean of 100 consecutive positive integers $a_1, a_2, a_3, \ldots. a_{100}$ is 25 . Then S is

A. N

B. ϕ

C. $\{99\}$

D. $\{9\}$

Question 100 View solution online

The mean and variance of 7 observations are 8 and 16 respectively. If one observation 14 is omitted and a and b are respectively mean and variance of remaining 6 observation, then $a + 3b - 5$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 101 View solution online

The mean and the variance of five observation are 4 and 5.20, respectively. If three of the observations are 3,4 and 4 ; then then absolute value of the difference of the other two observations, is :

A. 1

B. 3

C. 7

D. 5

Question 102 View solution online

The mean of five observations is 5 and their variance is 9.20 . If three of the given five observations are 1,3 and 8 , then a ratio of other two observations is :

A. $4:9$

B. $6:7$

C. $5:8$

D. $10:3$

Probability

Questions 103-103 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Addition and multiplication rules of probability: 1 question / 100.0% of this chapter

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Question 103

View solution online

Let Ω be the sample space and $A \subseteq \Omega$ be an event.

Given below are two statements :
(S1) : If $\mathbf{P(A) = 0}$, then $\mathbf{A = \varnothing}$
(S2): If $P(A) = 1$, then $A = \Omega$
Then

A. both (S1) and (S2) are true

B. only (S1) is true

C. only (S2) is true

D. both (S1) and (S2) are false

Inverse Trigonometric Functions

Questions 104-104 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Inverse Trigonometric Functions: 1 question / 100.0% of this chapter

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Question 104 View solution online

The number of values of $r \in \{p, q, \sim p, \sim q\}$ for which $((p \wedge q) \Rightarrow (r \vee q)) \wedge ((p \wedge r) \Rightarrow q)$ is a tautology, is:

A. 3

B. 4

C. 1

D. 2

Determinants

Questions 105-105 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Determinants: 1 question / 100.0% of this chapter

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Question 105

View solution online

Let $\mathbf{A} = \{a_{ij}\}$ be a 3×3 matrix, where

$$a_{ij} = \begin{cases} (-1)^{j-i} & \text{if} \quad i < j \\ 2 & \text{if} \quad i = j \\ (-1)^{i+j} & \text{if} \quad i > j \end{cases}$$

then $\det\left(3\,\text{Adj}\left(2\,\mathbf{A}^{-1}\right)\right)$ is equal to ___.

Numerical answer: _____

Enter the requested integer (0 decimal places).

Application of Derivatives

Questions 106-112 / 7 selected / 2.3% practice weight / Next

Topics to prioritise in this collection

- Derivative-based curve analysis: 3 questions / 42.9% of this chapter
- Tangents and normals: 2 questions / 28.6% of this chapter
- Applications of derivatives: 1 question / 14.3% of this chapter
- Stationary points: 1 question / 14.3% of this chapter

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Question 106 View solution online

Let $y = f(x)$ be a thrice differentiable function in $(-5, 5)$. Let the tangents to the curve $\mathbf{y = f(x)}$ at $\mathbf{(1, f(1))}$ and $\mathbf{(3, f(3))}$ make angles $\frac{\pi}{6}$ and $\frac{\pi}{4}$, respectively with positive x -axis. If $27\int_1^3 \left((f'(t))^2 + 1\right) f''(t)dt = \alpha + \beta\sqrt{3}$ where α, β are integers, then the value of $\alpha + \beta$ equals

A. -14

B. 26

C. -16

D. 36

Question 107 View solution online

Let $\alpha = \max_{x \in \mathbf{R}} \left\{8^{2\sin 3x} \cdot 4^{4\cos 3x}\right\}$ and $\beta = \min_{x \in \mathbf{R}} \left\{8^{2\sin 3x} \cdot 4^{4\cos 3x}\right\}$. If $8x^2 + bx + c = 0$ is a quadratic equation whose roots are $\alpha^{1/5}$ and $\beta^{1/5}$, then the value of $c - b$ is equal to :

A. 42

B. 47

C. 43

D. 50

Question 108 View solution online

Let the set of all values of p, for which
$f(x) = \left(p^2 - 6p + 8\right)\left(\sin^2 2x - \cos^2 2x\right) + 2(2-p)x + 7$ does not have any critical point, be the interval (a, b). Then 16 ab is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 109 View solution online

A line is a common tangent to the circle $(x-3)^2 + y^2 = 9$ and the parabola $y^2 = 4x$. If the two points of contact (a, b) and (c, d) are distinct and lie in the first quadrant, then $2(a+c)$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 110 View solution online

Let the plane $P: 8x + \alpha_1 y + \alpha_2 z + 12 = 0$ be parallel to the line $L: \frac{x+2}{2} = \frac{y-3}{3} = \frac{z+4}{5}$. If the intercept of P on the y-axis is 1 , then the distance between P and L is :

A. $\sqrt{\frac{7}{2}}$

B. $\sqrt{\frac{2}{7}}$

C. $\frac{6}{\sqrt{14}}$

D. $\sqrt{14}$

Question 111 View solution online

A person forgets his 4-digit ATM pin code. But he remembers that in the code all the digits are different, the greatest digit is 7 and the sum of the first two digits is equal to the sum of the last two digits. Then the maximum number of trials necessary to obtain the correct code is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 112 View solution online

Let the triangle PQR be the image of the triangle with vertices $(1,3),(3,1)$ and $(2,4)$ in the line $x+2y=2$. If the centroid of $\triangle PQR$ is the point (α,β), then $15(\alpha-\beta)$ is equal to :

A. 24

B. 19

C. 21

D. 22

Integrals

Questions 113-113 / 1 selected / 0.3% practice weight / Consolidate

Topics to prioritise in this collection

- Integration: 1 question / 100.0% of this chapter

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Question 113 View solution online

If the variable line $3x + 4y = \alpha$ lies between the two $\mathbf{circles}(x-1)^2 + (y-1)^2 = 1$ and $(x-9)^2 + (y-1)^2 = 4$, without intercepting a chord on either circle, then the sum of all the integral values of α is

.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Application of Integrals

Questions 114-116 / 3 selected / 1.0% practice weight / Consolidate

Topics to prioritise in this collection

- Application of Integrals: 2 questions / 66.7% of this chapter
- Area under a curve: 1 question / 33.3% of this chapter

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Question 114 View solution online

Let the area of the region $\{(x, y) : |2x - 1| \leq y \leq |x^2 - x|, 0 \leq x \leq 1\}$ be A . Then $(6\,A + 11)^2$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 115 View solution online

Let B be the centre of the circle $x^2 + y^2 - 2x + 4y + 1 = 0$.

Let the tangents at two points P and Q on the circle intersect at the point $A(3, 1)$. Then $8.\left(\frac{\text{area } \triangle APQ}{\text{area } \triangle BPQ}\right)$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 116 View solution online

Consider a hyperbola $H : x^2 - 2y^2 = 4$. Let the tangent at a point $P(4, \sqrt{6})$ meet the x -axis at Q and latus rectum at $R(x_1, y_1), x_1 > 0$. If F is a focus of H which is nearer to the point P , then the area of $\triangle QFR$ is equal to

A. $4\sqrt{6}$

B. $\sqrt{6} - 1$

C. $\frac{7}{\sqrt{6}} - 2$

D. $4\sqrt{6} - 1$

Vector Algebra

Questions 117-147 / 31 selected / 10.3% practice weight / Focus first

Topics to prioritise in this collection

- Algebra of vectors: 11 questions / 35.5% of this chapter
- Scalar product: 6 questions / 19.4% of this chapter
- Vector operations: 5 questions / 16.1% of this chapter
- Vector projection: 5 questions / 16.1% of this chapter
- Vector Algebra: 2 questions / 6.5% of this chapter
- Vector projections: 2 questions / 6.5% of this chapter

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Question 117 View solution online

If the equation of the plane containing the line $x+2y+3z-4=0=2x+y-z+5$ and perpendicular to the plane $\vec{r}=(\hat{i}-\hat{j})+\lambda(\hat{i}+\hat{j}+\hat{k})+\mu(\hat{i}-2\hat{j}+3k)$ is $ax+by+cz=4$, then $(a-b+c)$ is equal to

A. 20

B. 24

C. 22

D. 18

Question 118 View solution online

Let a line l pass through the origin and be perpendicular to the lines
$l_1 : \overrightarrow{r}=(\hat{i}-11\hat{j}-7\hat{k})+\lambda(\hat{i}+2\hat{j}+3\hat{k}), \lambda \in \mathbb{R}$
and $l_2 : \overrightarrow{r}=(-\hat{i}+\hat{k})+\mu(2\hat{i}+2\hat{j}+\hat{k}), \mu \in \mathbb{R}$.

If P is the point of intersection of l and l_1, and $Q(\alpha, \beta, \gamma)$ is the foot of perpendicular from P on l_2, then $9(\alpha+\beta+\gamma)$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 119 View solution online

If the vectors $\vec{a} = \lambda\hat{i} + \mu\hat{j} + 4\hat{k}, \vec{b} = 2\hat{i} + 4\hat{j} - 2\hat{k}$ and $\vec{c} = 2\hat{i} + 3\hat{j} + \hat{k}$ are coplanar and the projection of $\vec{a}$ on the vector $\vec{b}$ is $\sqrt{54}$ units, then the sum of all possible values of $\lambda + \mu$ is equal to

A. 0

B. 24

C. 6

D. 18

Question 120 View solution online

Let $\vec{a} = 4\hat{i} + 3\hat{j}$ and $\vec{b} = 3\hat{i} - 4\hat{j} + 5\hat{k}$. If $\vec{c}$ is a vector such that $\vec{c} \cdot (\vec{a} \times \vec{b}) + 25 = 0, \vec{c} \cdot (\hat{i} + \hat{j} + \hat{k}) = 4$, and projection of $\vec{c}$ on $\vec{a}$ is 1 , then the projection of $\vec{c}$ on $\vec{b}$ equals

A. $\frac{1}{5}$

B. $\frac{5}{\sqrt{2}}$

C. $\frac{3}{\sqrt{2}}$

D. $\frac{1}{\sqrt{2}}$

Question 121 View solution online

Let $\mathbf{A}, \mathbf{B}, \mathbf{C}$ be three points whose position vectors respectively are:
$\vec{\mathbf{a}} = \hat{\mathbf{i}} + 4\hat{\mathbf{j}} + 3\hat{\mathbf{k}}$
$\vec{b} = 2\hat{i} + \alpha\hat{j} + 4\hat{k}, \alpha \in \mathbb{R}$
$\vec{c} = 3\hat{i} - 2\hat{j} + 5\hat{k}$
If α is the smallest positive integer for which $\rightarrow\rightarrow\rightarrow \mathbf{a}, \mathbf{b}, \mathbf{c}$ are non-collinear, then the length of the median, in $\triangle\mathbf{ABC}$, through A is:

A. $\frac{\sqrt{82}}{2}$

B. $\frac{\sqrt{62}}{2}$

C. $\frac{\sqrt{69}}{2}$

D. $\frac{\sqrt{66}}{2}$

Question 122 View solution online

Let $\vec{a} = 4\hat{i} + 3\hat{j} + 5\hat{k}$ and $\vec{\beta} = \hat{i} + 2\hat{j} - 4\hat{k}$. Let $\vec{\beta}_1$ be parallel to $\vec{a}$ and $\vec{\beta}_2$ be perpendicular to $\vec{a}$. If $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$, then the value of $5\vec{\beta}_2 \cdot (\hat{i} + \hat{j} + \hat{k})$ is

A. 7

B. 9

C. 6

D. 11

Question 123 View solution online

If the components of $\overrightarrow{\mathbf{a}} = \alpha\hat{\mathbf{i}} + \beta\hat{\mathbf{j}} + \gamma\hat{\mathbf{k}}$ along and perpendicular to $\vec{b} = 3\hat{i} + \hat{j} - \hat{k}$ respectively, are $\frac{16}{11}(3\hat{i} + \hat{j} - \hat{k})$ and $\frac{1}{11}(-4\hat{i} - 5\hat{j} - 17\hat{k})$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :

A. 23

B. 18

C. 16

D. 26

Question 124 View solution online

Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three non-zero vectors such that $\vec{b}$ and $\vec{c}$ are non-collinear if $\vec{a} + 5\vec{b}$ is collinear with $\vec{c}, \vec{b} + 6\vec{c}$ is collinear with $\vec{a}$ and $\vec{a} + \alpha\vec{b} + \beta\vec{c} = \overrightarrow{0}$, then $\alpha + \beta$ is equal to

A. 35

B. 30

C. -30

D. -25

Question 125 View solution online

Let $\vec{a} = \hat{i} + 5\hat{j} + \alpha\hat{k}, \vec{b} = \hat{i} + 3\hat{j} + \beta\hat{k}$ and $\overrightarrow{\mathbf{c}} = -\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}}$ be three vectors such that, $|\vec{b} \times \vec{c}| = 5\sqrt{3}$ and $\vec{a}$ is perpendicular to $\vec{b}$. Then the greatest amongst the values of $|\vec{a}|^2$ is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 126 View solution online

Let $\vec{a} = 3\hat{i} + 2\hat{j} + \hat{k}, \vec{b} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{c}$ be a vector such that $(\vec{a} + \vec{b}) \times \vec{c} = 2(\vec{a} \times \vec{b}) + 24\hat{j} - 6\hat{k}$ and $(\vec{a} - \vec{b} + \hat{i}) \cdot \vec{c} = -3$. Then $|\vec{c}|^2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 127 View solution online

Let three vectors $\vec{a} = \alpha\hat{i} + 4\hat{j} + 2\hat{k}, \overrightarrow{b} = 5\hat{i} + 3\hat{j} + 4\hat{k}, \overrightarrow{c} = x\hat{i} + y\hat{j} + z\hat{k}$ from a triangle such that $\vec{c} = \vec{a} - \vec{b}$ and the area of the triangle is $5\sqrt{6}$. if α is a positive real number, then $|\vec{c}|^2$ is :

A. 16

B. 14

C. 12

D. 10

Question 128 View solution online

Let $\vec{a} = \alpha\hat{i} + 3\hat{j} - \hat{k}, \vec{b} = 3\hat{i} - \beta\hat{j} + 4\hat{k}$ and $\overrightarrow{c} = \hat{i} + 2\hat{j} - 2\hat{k}$ where $\alpha, \beta \in \mathbf{R}$, be three vectors. If the projection of $\vec{a}$ on $\vec{c}$ is $\frac{10}{3}$ and $\vec{b} \times \vec{c} = -6\hat{i} + 10\hat{j} + 7\hat{k}$, then the value of $\alpha + \beta$ equal to:

A. 3

B. 4

C. 5

D. 6

Question 129 View solution online

Let the position vectors of three vertices of a triangle be $4\vec{p} + \vec{q} - 3\vec{r}, -5\vec{p} + \vec{q} + 2\vec{r}$ and $2\vec{p} - \vec{q} + 2\vec{r}$. If the position vectors of the orthocenter and the circumcenter of the triangle are $\frac{\vec{p}+\vec{q}+\vec{r}}{4}$ and $\alpha\overrightarrow{p} + \beta\overrightarrow{q} + \gamma\overrightarrow{r}$ respectively, then $\alpha + 2\beta + 5\gamma$ is equal to:

A. 3

B. 1

C. 6

D. 4

Question 130 View solution online

Let $\vec{x}$ be a vector in the plane containing vectors $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$. If the vector $\vec{x}$ is perpendicular to $(3\hat{i} + 2\hat{j} - \hat{k})$ and its projection on $\vec{a}$ is $\frac{17\sqrt{6}}{2}$, then the value of $|\vec{x}|^2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 131 View solution online

Let $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}, \vec{b} = 3\hat{i} - 5\hat{j} + \hat{k}$ and $\vec{c}$ be a vector such that $\vec{a} \times \vec{c} = \vec{c} \times \vec{b}$ and $(\vec{a} + \vec{c}) \cdot (\vec{b} + \vec{c}) = 168$. Then the maximum value of $|\vec{c}|^2$ is :

A. 77

B. 462

C. 308

D. 154

Question 132 View solution online

Let $\vec{a} = 3\hat{i} - \hat{j} + 2\hat{k}, \vec{b} = \vec{a} \times (\hat{i} - 2\hat{k})$ and $\vec{c} = \vec{b} \times \hat{k}$. Then the projection of $\vec{c} - 2\hat{j}$ on $\vec{a}$ is:

A. $3\sqrt{7}$

B. $\sqrt{14}$

C. $2\sqrt{14}$

D. $2\sqrt{7}$

Question 133 View solution online

Let $\vec{a} = 2\hat{i} + \lambda_1\hat{j} + 3\hat{k}, \vec{b} = 4\hat{i} + (3 - \lambda_2)\hat{j} + 6\hat{k}$ and $\vec{c} = 3\hat{i} + 6\hat{j} + (\lambda_3 - 1)\hat{k}$ be three vectors such that $\vec{b} = 2\vec{a}$ and $\vec{a}$ is perpendicular to $\vec{c}$. Then a possible value of ($\lambda_1, \lambda_2, \lambda_3$) is :-

A. $\left(\frac{1}{2}, 4, -2\right)$

B. $\left(-\frac{1}{2}, 4, 0\right)$

C. $(1, 3, 1)$

D. $(1, 5, 1)$

Question 134 View solution online

Let $\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{c} = 2\hat{i} - 3\hat{j} + 2\hat{k}$. Then the number of vectors $\vec{b}$ such that $\vec{b} \times \vec{c} = \vec{a}$ and $|\vec{b}| \in \{1, 2, \ldots\ldots, 10\}$ is :

A. 0

B. 1

C. 2

D. 3

Question 135 View solution online

The shortest distance between the lines $\frac{x-3}{2} = \frac{y-2}{3} = \frac{z-1}{-1}$ and $\frac{x+3}{2} = \frac{y-6}{1} = \frac{z-5}{3}$ is :

A. $\frac{18}{\sqrt{5}}$

B. $\frac{22}{3\sqrt{5}}$

C. $\frac{46}{3\sqrt{5}}$

D. $6\sqrt{3}$

Question 136 View solution online

Let the line of the shortest distance between the lines
$\mathbf{L_1 : \overrightarrow{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})}$ and
$\mathbf{L_2 : \overrightarrow{r} = (4\hat{i} + 5\hat{j} + 6\hat{k}) + \mu(\hat{i} + \hat{j} - \hat{k})}$
intersect $\mathbf{L_1}$ and $\mathbf{L_2}$ at P and Q respectively. If (α, β, γ) is the midpoint of the line segment PQ , then $2(\alpha + \beta + \gamma)$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 137 View solution online

Let $\vec{\alpha} = 3\hat{i} + \hat{j}$ and $\vec{\beta} = 2\hat{i} - \hat{j} + 3\hat{k}$. If $\vec{\beta} = \vec{\beta}_1 - \vec{\beta}_2$, where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$, then $\vec{\beta}_1 \times \vec{\beta}_2$ is equal to:

A. $\frac{1}{2}(3\hat{i} - 9\hat{j} + 5\hat{k})$

B. $\frac{1}{2}(-3\hat{i} + 9\hat{j} + 5\hat{k})$

C. $-3\hat{i} + 9\hat{j} + 5\hat{k}$

D. $3\hat{i} - 9\hat{j} - 5\hat{k}$

Question 138 View solution online

Let $\vec{a}=2\hat{i}+3\hat{j}+4\hat{k}, \vec{b}=2\hat{i}-2\hat{j}-2\hat{k}$ and $\vec{c}=-\hat{i}+4\hat{j}+3\hat{k}$. If $\vec{d}$ is a vector perpendicular to both $\vec{b}$ and $\vec{c}$ and $\vec{a}\cdot\vec{d}=18$, Then $|\vec{a}\times\vec{d}|^2$ is equal to

A. 640

B. 760

C. 680

D. 720

Question 139 View solution online

Let $\vec{a}=\hat{i}+\hat{j}+\hat{k}, \vec{b}$ and $\vec{c}=\hat{j}-\hat{k}$ be three vectors such that $\vec{a}\times\vec{b}=\vec{c}$ and $\vec{a}.\vec{b}=1$. If the length of projection vector of the vector $\vec{b}$ on the vector $\vec{a}\times\vec{c}$ is l, then the value of $3l^2$ is equal to ___.

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 140 View solution online

Let P be a plane passing through the points (1, 0, 1), (1, -2, 1) and (0, 1, -2). let a vector $\vec{a}=\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}$ be such that $\vec{a}$ is parallel to the plane P , perpendicular to $(\hat{i}+2\hat{j}+3\hat{k})$ and $\vec{a}(\hat{i}+\hat{j}+2\hat{k})=2$, then $(\alpha-\beta+\gamma)^2$ equals ___.

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 141 View solution online

Let $\vec{\alpha}=(\lambda-2)\vec{a}+\vec{b}$ and $\vec{\beta}=(4\lambda-2)\vec{a}+3\vec{b}$ be two given vectors where vectors $\vec{a}$ and $\vec{b}$ are non-collinear. The value of λ for which vectors $\vec{\alpha}$ and $\vec{\beta}$ are collinear, is :

A. -3

B. 4

C. 3

D. -4

Question 142 View solution online

Let $\hat{a}, \hat{b}$ be unit vectors. If $\vec{c}$ be a vector such that the angle between $\hat{a}$ and $\vec{c}$ is $\frac{\pi}{12}$, and $\hat{b} = \vec{c} + 2(\vec{c} \times \hat{a})$, then $|\vec{6c}|^2$ is equal to

A. $6(3 - \sqrt{3})$

B. $3 + \sqrt{3}$

C. $6(3 + \sqrt{3})$

D. $6(\sqrt{3} + 1)$

Question 143 View solution online

Let $\vec{a} = 6\hat{i} + 9\hat{j} + 12\hat{k}, \vec{b} = \alpha\hat{i} + 11\hat{j} - 2\hat{k}$ and $\vec{c}$ be vectors such that $\vec{a} \times \vec{c} = \vec{a} \times \vec{b}$. If $\vec{a}.\vec{c} = -12$, $\vec{c} \cdot (\hat{i} - 2\hat{j} + \hat{k}) = 5$, then $\vec{c} \cdot (\hat{i} + \hat{j} + \hat{k})$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 144 View solution online

Let $\vec{a}$ be a vector which is perpendicular to the vector $3\hat{i} + \frac{1}{2}\hat{j} + 2\hat{k}$. If $\vec{a} \times (2\hat{i} + \hat{k}) = 2\hat{i} - 13\hat{j} - 4\hat{k}$, then the projection of the vector $\vec{a}$ on the vector $2\hat{i} + 2\hat{j} + \hat{k}$ is

A. $\frac{1}{3}$

B. 1

C. $\frac{5}{3}$

D. $\frac{7}{3}$

Question 145 View solution online

Let $\vec{a} = 2\hat{i} + \alpha\hat{j} + \hat{k}, \quad \vec{b} = -\hat{i} + \hat{k}, \quad \vec{c} = \beta\hat{j} - \hat{k}$, where α and β are integers and $\alpha\beta = -6$. Let the values of the ordered pair (α, β) for which the area of the parallelogram of diagonals $\vec{a} + \vec{b}$ and $\vec{b} + \vec{c}$ is $\frac{\sqrt{21}}{2}$, be (α_1, β_1) and (α_2, β_2).
Then $\alpha_1^2 + \beta_1^2 - \alpha_2\beta_2$ is equal to

A. 17

B. 24

C. 21

D. 19

Question 146 View solution online

Let $\overrightarrow{c}$ be the projection vector of $\overrightarrow{b} = \lambda\hat{i} + 4\hat{k}, \lambda > 0$, on the vector $\vec{a} = \hat{i} + 2\hat{j} + 2\hat{k}$. If $|\vec{a} + \vec{c}| = 7$, then the area of the parallelogram formed by the vectors $\vec{b}$ and $\vec{c}$ is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 147 View solution online

Let $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ and $\overrightarrow{c} = 3\hat{i} - \hat{j} + \lambda\hat{k}$ be three vectors. Let $\overrightarrow{r}$ be a unit vector along $\vec{b} + \vec{c}$. If $\vec{r}.\vec{a} = 3$, then 3λ is equal to :

A. 27

B. 25

C. 25

D. 21

Three Dimensional Geometry

Questions 148-293 / 146 selected / 48.7% practice weight / Focus first

Topics to prioritise in this collection

- Coordinates in three dimensions: 39 questions / 26.7% of this chapter
- Shortest distance between lines: 23 questions / 15.8% of this chapter
- Equation of a plane: 22 questions / 15.1% of this chapter
- Lines and planes in space: 22 questions / 15.1% of this chapter
- Introduction to 3D Geometry: 21 questions / 14.4% of this chapter
- Three Dimensional Geometry: 11 questions / 7.5% of this chapter
- Equation of a line in space: 4 questions / 2.7% of this chapter
- Direction cosines and direction ratios: 1 question / 0.7% of this chapter
- Intersecting spatial lines: 1 question / 0.7% of this chapter
- Plane containing lines: 1 question / 0.7% of this chapter
- Section formula in three dimensions: 1 question / 0.7% of this chapter

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Question 148 View solution online

Let the line $\ell : x = \frac{1-y}{-2} = \frac{z-3}{\lambda}, \lambda \in \mathbb{R}$ meet the plane $\mathrm{P} : \mathrm{x} + 2\mathrm{y} + 3\mathrm{z} = 4$ at the point (α, β, γ). If the angle between the line ℓ and the plane P is $\cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then $\alpha + 2\beta + 6\gamma$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 149 View solution online

Let the image of the point $\left(\frac{5}{3}, \frac{5}{3}, \frac{8}{3}\right)$ in the plane $x - 2y + z - 2 = 0$ be P. If the distance of the point $\mathrm{Q}(6, -2, \alpha), \alpha > 0$, from P is 13 , then α is equal to

.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 150 View solution online

Let the lines $l_1 : \frac{x+5}{3} = \frac{y+4}{1} = \frac{z-\alpha}{-2}$ and $l_2 : 3x+2y+z-2=0=x-3y+2z-13$ be coplanar. If the point $P(a,b,c)$ on l_1 is nearest to the point $Q(-4,-3,2)$, then $|a|+|b|+|c|$ is equal to

A. 12

B. 14

C. 10

D. 8

Question 151 View solution online

Let the equation of plane passing through the line of intersection of the planes $x+2y+az=2$ and $x-y+z=3$ be $5x-11y+bz=6a-1$. For $c \in \mathbb{Z}$, if the distance of this plane from the point $(a,-c,c)$ is $\frac{2}{\sqrt{a}}$, then $\frac{a+b}{c}$ is equal to

A. -2

B. 2

C. -4

D. 4

Question 152 View solution online

If the equation of the plane passing through the line of intersection of the planes $2x-y+z=3, 4x-3y+5z+9=0$ and parallel to the line $\frac{x+1}{-2} = \frac{y+3}{4} = \frac{z-2}{5}$ is $ax+by+cz+6=0$. then a $+b+c$ is equal to

A. 14

B. 12

C. 13

D. 15

Question 153 View solution online

Let P be the point of intersection of the line $\frac{x+3}{3} = \frac{y+2}{1} = \frac{1-z}{2}$ and the plane $x + y + z = 2$.
If the distance of the point P from the plane $3x - 4y + 12z = 32$ is q, then q and $2q$ are the roots of the equation

A. $x^2 - 18x - 72 = 0$

B. $x^2 + 18x + 72 = 0$

C. $x^2 - 18x + 72 = 0$

D. $x^2 + 18x - 72 = 0$

Question 154 View solution online

Let the lines $l_1 : \frac{x+5}{3} = \frac{y+4}{1} = \frac{z-\alpha}{-2}$ and $l_2 : 3x + 2y + z - 2 = 0 = x - 3y + 2z - 13$ be coplanar. If the point $P(a, b, c)$ on l_1 is nearest to the point $Q(-4, -3, 2)$, then $|a| + |b| + |c|$ is equal to

A. 12

B. 14

C. 10

D. 8

Question 155 View solution online

If the line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$ intersects the plane $2x + 3y - z + 13 = 0$ at a point P and the plane $3x + y + 4z = 16$ at a point Q, then PQ is equal to:

A. $2\sqrt{14}$

B. 14

C. $2\sqrt{7}$

D. $\sqrt{14}$

Question 156 View solution online

Let the plane P contain the line $2x + y - z - 3 = 0 = 5x - 3y + 4z + 9$ and be parallel to the line $\frac{x+2}{2} = \frac{3-y}{-4} = \frac{z-7}{5}$. Then the distance of the point $A(8, -1, -19)$ from the plane P measured parallel to the line $\frac{x}{-3} = \frac{y-5}{4} = \frac{2-z}{-12}$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 157 View solution online

Let P be the point of intersection of the line

$$\frac{x+3}{3}=\frac{y+2}{1}=\frac{1-z}{2}$$

and the plane

$$x+y+z=2.$$

If the distance of the point P from the plane

$$3x-4y+12z=32$$

is q, then q and $2q$ are the roots of the equation.

A. $x^2-18x-72=0$

B. $x^2+18x+72=0$

C. $x^2-18x+72=0$

D. $x^2+18x-72=0$

Question 158 View solution online

Let the line passing through the points, $\mathrm{P}(2,-1,2)$ and $\mathrm{Q}(5,3,4)$ meet the plane $\mathrm{x}-\mathrm{y}+\mathrm{z}=4$ at the point R . Then the distance of the point R from the plane $x+2y+3z+2=0$ measured parallel to the line $\frac{x-7}{2}=\frac{y+3}{2}=\frac{z-2}{1}$ is equal to

A. $\sqrt{31}$

B. $\sqrt{189}$

C. $\sqrt{61}$

D. 3

Question 159 View solution online

If the line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{-1}$ intersects the plane $2x + 3y - z + 13 = 0$ at a point P and the plane $3x + y + 4z = 16$ at a point Q, then PQ is equal to:

A. $2\sqrt{14}$

B. 14

C. $2\sqrt{7}$

D. $\sqrt{14}$

Question 160 View solution online

Let P_1 be the plane $3x - y - 7z = 11$ and P_2 be the plane passing through the points $(2, -1, 0)$, $(2, 0, -1)$, and $(5, 1, 1)$. If the foot of the perpendicular drawn from the point (7, 4, -1)on the line of intersection of the planes $\mathbf{P_1}$ and $\mathbf{P_2}$ is (α, β, γ), then $\alpha + \beta + \gamma$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 161 View solution online

Let P be the plane passing through the points $(5, 3, 0)$, $(13, 3, -2)$ and $(1, 6, 2)$. For $\alpha \in \mathbb{N}$, if the distances of the points $\mathbf{A}(3, 4, \alpha)$ and $\mathbf{B}(2, \alpha, a)$ from the plane P are 2 and 3 respectively, then the positive value of a is

A. 6

B. 4

C. 3

D. 5

Question 162 View solution online

Let the line passing through the points, $\mathrm{P}(2,-1,2)$ and $\mathrm{Q}(5,3,4)$ meet the plane $\mathrm{x}-\mathrm{y}+\mathrm{z}=4$ at the point R. Then the distance of the point R from the plane $x+2y+3z+2=0$ measured parallel to the line $\frac{x-7}{2}=\frac{y+3}{2}=\frac{z-2}{1}$ is equal to

A. $\sqrt{31}$

B. $\sqrt{189}$

C. $\sqrt{61}$

D. 3

Question 163 View solution online

If equation of the plane that contains the point ($-2,3,5$) and is perpendicular to each of the planes $2x+4y+5z=8$ and $3x-2y+3z=5$ is
$\alpha\mathrm{x}+\beta\mathrm{y}+\gamma\mathrm{z}+97=0$ then $\alpha+\beta+\gamma=$

A. 18

B. 17

C. 16

D. 15

Question 164 View solution online

Let the equation of plane passing through the line of intersection of the planes $x+2y+az=2$ and $x-y+z=3$ be $5x-11y+bz=6a-1$. For $c \in \mathbb{Z}$, if the distance of this plane from the point $(a,-c,c)$ is $\frac{2}{\sqrt{a}}$, then $\frac{a+b}{c}$ is equal to

A. -2

B. 2

C. -4

D. 4

Question 165 View solution online

Let (α, β, γ) be the image of the point $\mathbf{P}(2, 3, 5)$ in the plane $2x + y - 3z = 6$. Then $\alpha + \beta + \gamma$ is equal to

A. 10

B. 5

C. 12

D. 9

Question 166 View solution online

The length of the perpendicular from the point $(2, -1, 4)$ on the straight line,

$$\frac{x+3}{10} = \frac{y-2}{-7} = \frac{z}{1}$$

is :

A. Greater than 3 but less than 4

B. Greater than 2 but less than 3

C. Greater than 4

D. Less than 2

Question 167 View solution online

Let the point, on the line passing through the points $P(1, -2, 3)$ and $Q(5, -4, 7)$, farther from the origin and at a distance of 9 units from the point P, be (α, β, γ). Then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :

A. 155

B. 150

C. 160

D. 165

Question 168 View solution online

Let $\mathbf{P}(\alpha, \beta, \gamma)$ be the image of the point $\mathbf{Q}(3, -3, 1)$ in the line $\frac{x-0}{1} = \frac{y-3}{1} = \frac{z-1}{-1}$ and R be the point ($2, 5, -1$). If the area of the triangle PQR is λ and $\lambda^2 = 14\,\mathbf{K}$, then K is equal to:

A. 36

B. 72

C. 18

D. 81

Question 169 View solution online

Let $\mathbf{P}(\alpha, \beta, \gamma)$ be the image of the point $\mathbf{Q}(3, -3, 1)$ in the line $\frac{x-0}{1} = \frac{y-3}{1} = \frac{z-1}{-1}$ and R be the point $(2, 5, -1)$. If the area of the triangle PQR is λ and $\lambda^2 = 14\,\mathbf{K}$, then K is equal to:

A. 36

B. 72

C. 18

D. 81

Question 170 View solution online

Let the point, on the line passing through the points $\mathbf{P}(1, -2, 3)$ and $\mathbf{Q}(5, -4, 7)$, farther from the origin and at a distance of 9 units from the point P , be (α, β, γ). Then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :

A. 155

B. 150

C. 160

D. 165

Question 171 View solution online

Let (α, β, γ) be the point $(8, 5, 7)$ in the line

$$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{5}.$$

Then $\alpha + \beta + \gamma$ is equal to

A. 16

B. 18

C. 14

D. 20

Question 172 View solution online

For real numbers α and $\beta \neq 0$, if the point of intersection of the straight lines $\frac{x-\alpha}{1} = \frac{y-1}{2} = \frac{z-1}{3}$ and $\frac{x-4}{\beta} = \frac{y-6}{3} = \frac{z-7}{3}$, lies on the plane $x + 2y - z = 8$, then $\alpha - \beta$ is equal to :

A. 5

B. 9

C. 3

D. 7

Question 173 View solution online

If the line $\frac{2-x}{3} = \frac{3y-2}{4\lambda+1} = 4 - z$ makes a right angle with the line $\frac{x+3}{3\mu} = \frac{1-2y}{6} = \frac{5-z}{7}$, then $4\lambda + 9\mu$ is equal to :

A. 13

B. 4

C. 5

D. 6

Question 174 View solution online

Let $\mathbf{P}(\alpha, \beta, \gamma)$ be the image of the point $\mathbf{Q}(1, 6, 4)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Then $2\alpha + \beta + \gamma$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 175 View solution online

Let the mirror image of the point ($\mathbf{a}, \mathbf{b}, \mathbf{c}$) with respect to the plane $3x - 4y + 12z + 19 = 0$ be ($\mathbf{a} - 6, \beta, \gamma$). If $\mathbf{a} + \mathbf{b} + \mathbf{c} = 5$, then $7\beta - 9\gamma$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 176 View solution online

Let (α, β, γ) be the point $(8, 5, 7)$ in the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{5}$. Then $\alpha + \beta + \gamma$ is equal to

A. 16

B. 18

C. 14

D. 20

Question 177 View solution online

Let d be the distance of the point of intersection of the lines $\frac{x+6}{3} = \frac{y}{2} = \frac{z+1}{1}$ and $\frac{x-7}{4} = \frac{y-9}{3} = \frac{z-4}{2}$ from the point $(7, 8, 9)$. Then $\mathbf{d}^2 + 6$ is equal to :

A. 72

B. 69

C. 75

D. 78

Question 178 View solution online

The distance of the point $\mathbf{P(3,4,4)}$ from the point of intersection of the line joining the points. $\mathbf{Q(3,-4,-5)}$ and $\mathbf{R(2,-3,1)}$ and the plane $\mathbf{2x+y+z=7}$, is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 179 View solution online

Let $\boldsymbol{L_1 : \frac{x-1}{3} = \frac{y-1}{-1} = \frac{z+1}{0}}$ and
$\mathbf{L_2 : \frac{x-2}{2} = \frac{y}{0} = \frac{z+4}{\alpha}, \alpha \in \mathbb{R}}$, be two lines, which intersect at the point B . If P is the foot of perpendicular from the point $\mathbf{A(1,1,-1)}$ on $\mathbf{L_2}$, then the value of $\mathbf{26\alpha(PB)^2}$ is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 180 View solution online

The lines $\frac{x-2}{2} = \frac{y}{-2} = \frac{z-7}{16}$ and $\frac{x+3}{4} = \frac{y+2}{3} = \frac{z+2}{1}$ intersect at the point P. If the distance of P from the line $\frac{x+1}{2} = \frac{y-1}{3} = \frac{z-1}{1}$ is l, then $14l^2$ is equal to.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 181 View solution online

If the mirror image of the point $P(3,4,9)$ in the line $\frac{x-1}{3} = \frac{y+1}{2} = \frac{z-2}{1}$ is (α,β,γ), then $14(\alpha+\beta+\gamma)$ is :

A. 102

B. 138

C. 108

D. 132

Question 182 View solution online

Let P and Q be the points on the line

$$\frac{x+3}{8} = \frac{y-4}{2} = \frac{z+1}{2}$$

which are at a distance of 6 units from the point $\mathbf{R(1,2,3)}$. If the centroid of the triangle PQR is (α, β, γ), then $\alpha^2 + \beta^2 + \gamma^2$ is:

A. 26

B. 36

C. 18

D. 24

Question 183 View solution online

Let P be the image of the point $\mathbf{Q(7,-2,5)}$ in the line $\mathbf{L}: \frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$ and $\mathbf{R(5,p,q)}$ be a point on L. Then the square of the area of $\triangle \mathbf{PQR}$ is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 184 View solution online

Let (α, β, γ) be mirror image of the point $(2,3,5)$ in the line $\frac{x-1}{2} - \frac{y-2}{3} - \frac{z-3}{4}$.
Then $2\alpha + 3\beta + 4\gamma$ is equal to

A. 32

B. 33

C. 31

D. 34

Question 185 View solution online

If the mirror image of the point $\mathrm{P}(3,4,9)$ in the line $\frac{x-1}{3}=\frac{y+1}{2}=\frac{z-2}{1}$ is (α,β,γ), then $14(\alpha+\beta+\gamma)$ is :

A. 102

B. 138

C. 108

D. 132

Question 186 View solution online

If $\alpha=1+\sum_{r=1}^{6}(-3)^{r-1}{}^{12}C_{2r-1}$, then the distance of the point (12, $\sqrt{3}$) form the line $\alpha x-\sqrt{3}y+1=0$ is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 187 View solution online

Let the line L be the projection of the line

$$\frac{x-1}{2}=\frac{y-3}{1}=\frac{z-4}{2}$$

in the plane $x-2y-z=3$. If d is the distance of the point $(0,0,6)$ from L , then d^2 is equal to

.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 188 View solution online

Let L be a line obtained from the intersection of two planes $x + 2y + z = 6$ and $y + 2z = 4$. If point $P(\alpha, \beta, \gamma)$ is the foot of perpendicular from $(3, 2, 1)$ on L, then the value of $21(\alpha + \beta + \gamma)$ equals :

A. 142

B. 68

C. 136

D. 102

Question 189 View solution online

Let P and Q be the points on the line $\frac{x+3}{8} = \frac{y-4}{2} = \frac{z+1}{2}$ which are at a distance of 6 units from the point $R(1, 2, 3)$. If the centroid of the triangle PQR is (α, β, γ), then $\alpha^2 + \beta^2 + \gamma^2$ is:

A. 26

B. 36

C. 18

D. 24

Question 190 View solution online

$\beta\gamma$ be the foot of perpendicular from the point $(1, 2, 3)$ on the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$. then $19(\alpha + \beta + \gamma)$ is equal to :

A. 102

B. 101

C. 99

D. 100

Question 191 View solution online

Let $(\lambda, 2, 1)$ be a point on the plane which passes through the point $(4, -2, 2)$. If the plane is perpendicular to the line joining the point $(-2, -21, 29)$ and $(-1, -16, 23)$, then $\left(\frac{\lambda}{11}\right)^2 - \frac{4\lambda}{11} - 4$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 192 View solution online

If the image of the point $(4,4,3)$ in the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-1}{3}$ is (α,β,γ), then $\alpha+\beta+\gamma$ is equal to

A. 9

B. 12

C. 8

D. 7

Question 193 View solution online

A circle with centre $(2,3)$ and radius 4 intersects the line $x+y=3$ at the points P and Q. If the tangents at P and Q intersect at the point $S(\alpha,\beta)$, then $4\alpha-7\beta$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 194 View solution online

If $Q\equiv\left(\frac{5}{3},\frac{7}{3},\frac{17}{3}\right)$ is foot of perpendicular drawn from $P(1,0,3)$ onto a line L and line L is passing through $(\alpha,7,1)$, then value of α is .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 195 View solution online

Let the plane P pass through the intersection of the planes $2x+3y-z=2$ and $x+2y+3z=6$ and be perpendicular to the plane $2x+y-z=0$. If d is the distance of P form the point ($-7,1,1$,) then d^2 is equal to :

A. $\frac{250}{83}$

B. $\frac{250}{82}$

C. $\frac{15}{53}$

D. $\frac{25}{83}$

Question 196 View solution online

Let a line L pass through the point $P(2,3,1)$ and be parallel to the line $x+3y-2z-2=0=x-y+2\,\mathrm{z}$. If the distance of L from the point $(5,3,8)$ is α, then $3\alpha^2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 197 View solution online

Let the equation of the plane P containing the line $x+10=\frac{8-y}{2}=z$ be $ax+by+3z=2(a+b)$ and the distance of the plane P from the point $(1,27,7)$ be c. Then $a^2+b^2+c^2$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 198 View solution online

Let the line $L:\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z-3}{1}$ intersect the plane $2x+y+3z=16$ at the point P. Let the point Q be the foot of perpendicular from the point $R(1,-1,-3)$ on the line L. If α is the area of triangle PQR, then α^2 is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 199 View solution online

Let the plane P pass through the intersection of the planes $2x+3y-z=2$ and $x+2y+3z=6$ and be perpendicular to the plane $2x+y-z=0$. If d is the distance of P from the point $(-7,1,1)$, then d^2 is equal to:

A. $\frac{250}{83}$

B. $\frac{250}{82}$

C. $\frac{15}{53}$

D. $\frac{25}{83}$

Question 200 View solution online

Let P be a plane containing the line $\frac{x-1}{3} = \frac{y+6}{4} = \frac{z+5}{2}$ and parallel to the line $\frac{x-3}{4} = \frac{y-2}{-3} = \frac{z+5}{7}$. If the point $(1, -1, \alpha)$ lies on the plane P , then the value of $|5\alpha|$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 201 View solution online

If a point $\mathbf{P}(\alpha, \beta, \gamma)$ satisfying

$(\alpha\beta\gamma)\,(2 \quad 10 \quad 89 \quad 3 \quad 88 \quad 4 \quad 8) = (000)$

lies on the plane $2x + 4y + 3z = 5$, then $6\alpha + 9\beta + 7\gamma$ is equal to :

A. -1

B. $\frac{11}{5}$

C. $\frac{5}{4}$

D. 11

Question 202 View solution online

If (x, y, z) be an arbitrary point lying on a plane P which passes through the point $(42, 0, 0)$, $(0, 42, 0)$ and $(0, 0, 42)$, then the value of expression

$$3 + \frac{x-11}{(y-19)^2(z-12)^2} + \frac{y-19}{(x-11)^2(z-12)^2} + \frac{z-12}{(x-11)^2(y-19)^2} - \frac{x+y+z}{14(x-11)(y-19)(z-12)}$$

A. 0

B. 3

C. 39

D. -45

Official Answer by NTA (2)

Question 203 View solution online

If (x, y, z) be an arbitrary point lying on a plane P which passes through the point $(42, 0, 0)$, $(0, 42, 0)$ and $(0, 0, 42)$, then the value of expression

$3 + \frac{x-11}{(y-19)^2(z-12)^2} + \frac{y-19}{(x-11)^2(z-12)^2}$
$+ \frac{z-12}{(x-11)^2(y-19)^2} - \frac{x+y+z}{14(x-11)(y-19)(z-12)}$

A. 0

B. 3

C. 39

D. -45

Official Answer by NTA (2)

Question 204 View solution online

If the shortest distance between the line joining the points $(1, 2, 3)$ and $(2, 3, 4)$, and the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z-2}{0}$ is a, then $28a^2$ is equal to

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 205 View solution online

The distance of the point $(7, -3, -4)$ from the plane passing through $(2, -3, 1)$, $(-1, 1, -2)$ and $(3, -4, 2)$ is:

A. 5

B. 4

C. $5\sqrt{2}$

D. $4\sqrt{2}$

Question 206 View solution online

The distance of the point $P(4, 6, -2)$ from the line passing through the point $(-3, 2, 3)$ and parallel to a line with direction ratios $3, 3, -1$ is equal to :

A. $\sqrt{14}$

B. 3

C. $\sqrt{6}$

D. $2\sqrt{3}$

Question 207 View solution online

The distance of the point $P(4, 6, -2)$ from the line passing through the point $(-3, 2, 3)$ and parallel to a line with direction ratios $3, 3, -1$ is equal to :

A. $\sqrt{14}$

B. 3

C. $\sqrt{6}$

D. $2\sqrt{3}$

Question 208 View solution online

Let P be a plane $lx + my + nz = 0$ containing the line, $\frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3}$. If plane P divides the line segment AB joining points $A(-3, -6, 1)$ and $B(2, 4, -3)$ in ratio $k : 1$ then the value of k is equal to :

A. 1.5

B. 3

C. 2

D. 4

Question 209 View solution online

Let P be the plane containing the straight line

$$\frac{x-3}{9}=\frac{y+4}{-1}=\frac{z-7}{-5}$$

and perpendicular to the plane containing the straight lines

$$\frac{x}{2}=\frac{y}{3}=\frac{z}{5}$$

and

$$\frac{x}{3}=\frac{y}{7}=\frac{z}{8}.$$

If d is the distance of P from the point $(2,-5,11)$, then d^2 is equal to :

A. $\frac{147}{2}$

B. 96

C. $\frac{32}{3}$

D. 54

Question 210 View solution online

If the four points, whose position vectors are $3\hat{i}-4\hat{j}+2\hat{k}, \hat{i}+2\hat{j}-\hat{k}, -2\hat{i}-\hat{j}+3\hat{k}$ and $5\hat{i}-2\alpha\hat{j}+4\hat{k}$ are coplanar, then α is equal to

A. $\frac{73}{17}$

B. $\frac{107}{17}$

C. $\frac{-73}{17}$

D. $\frac{-107}{17}$

Question 211 View solution online

Let P be the plane containing the straight line $\frac{x-3}{9}=\frac{y+4}{-1}=\frac{z-7}{-5}$ and perpendicular to the plane containing the straight lines $\frac{x}{2}=\frac{y}{3}=\frac{z}{5}$ and $\frac{x}{3}=\frac{y}{7}=\frac{z}{8}$. If d is the distance of P from the point $(2,-5,11)$, then d^2 is equal to :

A. $\frac{147}{2}$

B. 96

C. $\frac{32}{3}$

D. 54

Question 212 View solution online

If the length of the perpendicular drawn from the point $P(a,4,2), a>0$ on the line $\frac{x+1}{2}=\frac{y-3}{3}=\frac{z-1}{-1}$ is $2\sqrt{6}$ units and $Q(\alpha_1,\alpha_2,\alpha_3)$ is the image of the point P in this line, then $a+\sum_{i=1}^{3}\alpha_i$ is equal to :

A. 7

B. 8

C. 12

D. 14

Question 213 View solution online

The equation of the line passing through $(-4,3,1)$, parallel to the plane $x+2y-z-5=0$ and intersecting the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z-2}{-1}$ is:

A. $\frac{x+4}{-1}=\frac{y-3}{1}=\frac{z-1}{1}$

B. $\frac{x+4}{3}=\frac{y-3}{-1}=\frac{z-1}{1}$

C. $\frac{x+4}{1}=\frac{y-3}{1}=\frac{z-1}{3}$

D. $\frac{x-4}{2}=\frac{y+3}{1}=\frac{z+1}{4}$

Question 214 View solution online

The equation of the line passing through $(-4, 3, 1)$, parallel to the plane $x + 2y - z - 5 = 0$ and intersecting the line

$$\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z-2}{-1}$$

is:

A. $\frac{x+4}{-1} = \frac{y-3}{1} = \frac{z-1}{1}$

B. $\frac{x+4}{3} = \frac{y-3}{-1} = \frac{z-1}{1}$

C. $\frac{x+4}{1} = \frac{y-3}{1} = \frac{z-1}{3}$

D. $\frac{x-4}{2} = \frac{y+3}{1} = \frac{z+1}{4}$

Question 215 View solution online

The plane containing the line $\frac{x-3}{2} = \frac{y+2}{-1} = \frac{z-1}{3}$ and also containing its projection on the plane $2x + 3y - z = 5$, contains which one of the following points ?

A. $(2, 0, -2)$

B. (-2, 2, 2)

C. $(0, -2, 2)$

D. $(2, 2, 0)$

Question 216 View solution online

On which of the following lines lies the point of intersection of the line, $\frac{x-4}{2} = \frac{y-5}{2} = \frac{z-3}{1}$ and the plane, $\mathrm{x + y + z = 2}$?

A. $\frac{\mathrm{x}-2}{2} = \frac{\mathrm{y}-3}{2} = \frac{\mathrm{z}+3}{3}$

B. $\frac{x-4}{1} = \frac{y-5}{1} = \frac{z-5}{-1}$

C. $\frac{x-1}{1} = \frac{y-3}{2} = \frac{z+4}{-5}$

D. $\frac{\mathrm{x}+3}{3} = \frac{4-\mathrm{y}}{3} = \frac{\mathrm{z}+1}{-2}$

Question 217 View solution online

The plane passing through the point $(4, -1, 2)$ and parallel to the lines

$$\frac{x+2}{3} = \frac{y-2}{-1} = \frac{z+1}{2}$$

and

$$\frac{x-2}{1} = \frac{y-3}{2} = \frac{z-4}{3}$$

also passes through the point:

A. $(-1, -1, -1)$

B. $(-1, -1, 1)$

C. $(1, 1, -1)$

D. $(1, 1, 1)$

Question 218 View solution online

The plane containing the line

$$\frac{x-3}{2} = \frac{y+2}{-1} = \frac{z-1}{3}$$

and also containing its projection on the plane

$$2x + 3y - z = 5,$$

contains which one of the following points?

A. $(2, 0, -2)$

B. (-2, 2, 2)

C. $(0, -2, 2)$

D. $(2, 2, 0)$

Question 219 View solution online

The plane passing through the point $(4,-1,2)$ and parallel to the lines $\frac{x+2}{3}=\frac{y-2}{-1}=\frac{z+1}{2}$ and $\frac{x-2}{1}=\frac{y-3}{2}=\frac{z-4}{3}$ also passes through the point :

A. $(-1,-1,-1)$

B. $(-1,-1,1)$

C. $(1,1,-1)$

D. $(1,1,1)$

Question 220 View solution online

If the point $(2,\alpha,\beta)$ lies on the plane which passes through the points $(3,4,2)$ and $(7,0,6)$ and is perpendicular to the plane $2x-5y=15$, then $2\alpha-3\beta$ is equal to :-

A. 5

B. 17

C. 12

D. 7

Question 221 View solution online

If the point $(2,\alpha,\beta)$ lies on the plane which passes through the points $(3,4,2)$ and $(7,0,6)$ and is perpendicular to the plane $2x-5y=15$, then $2\alpha-3\beta$ is equal to :-

A. 5

B. 17

C. 12

D. 7

Question 222 View solution online

The plane through the intersection of the planes $x+y+z=1$ and $2x+3y-z+4=0$ and parallel to y-axis also passes through the point :

A. $(-3,0,-1)$

B. $(3,3,-1)$

C. $(3,2,1)$

D. $(-3,1,1)$

Question 223 View solution online

The perpendicular distance from the origin to the plane containing the two lines,

$$\frac{x+2}{3}=\frac{y-2}{5}=\frac{z+5}{7}$$

and

$$\frac{x-1}{1}=\frac{y-4}{4}=\frac{z+4}{7},$$

is:

A. $11/\sqrt{6}$

B. $6\sqrt{11}$

C. 11

D. $11\sqrt{6}$

Question 224 View solution online

The plane through the intersection of the planes $x+y+z=1$ and $2x+3y-z+4=0$ and parallel to the y-axis also passes through the point:

A. $(-3,0,-1)$

B. $(3,3,-1)$

C. $(3,2,1)$

D. $(-3,1,1)$

Question 225 View solution online

Two lines $\frac{x-3}{1}=\frac{y+1}{3}=\frac{z-6}{-1}$ and $\frac{x+5}{7}=\frac{y-2}{-6}=\frac{z-3}{4}$ intersect at the point R. The reflection of R in the xy-plane has coordinates :-

A. $(2,4,7)$

B. $(-2,4,7)$

C. $(2,-4,-7)$

D. $(2,-4,7)$

Question 226 View solution online

the perpendicular distance from the origin to the plane containing the two lines, $\frac{x+2}{3} = \frac{y-2}{5} = \frac{z+5}{7}$ and $\frac{x-1}{1} = \frac{y-4}{4} = \frac{z+4}{7}$, is:

A. $11/\sqrt{6}$

B. $6\sqrt{11}$

C. 11

D. $11\sqrt{6}$

Question 227 View solution online

Let $A(a, b), B(3, 4)$ and $(-6, -8)$ respectively denote the centroid, circumcentre and orthocentre of a triangle. Then, the distance of the point $\mathbf{P(2a + 3, 7\,b + 5)}$ from the line $\mathbf{2x + 3y - 4 = 0}$ measured parallel to the line $x - 2y - 1 = 0$ is

A. $\frac{15\sqrt{5}}{7}$

B. $\frac{17\sqrt{5}}{6}$

C. $\frac{17\sqrt{5}}{7}$

D. $\frac{\sqrt{5}}{17}$

Question 228 View solution online

The shortest distance between the lines $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-6}{2}$ and $\frac{x-6}{3} = \frac{1-y}{2} = \frac{z+8}{0}$ is _____.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 229 View solution online

If the foot of the perpendicular from point $(4, 3, 8)$ on the line $\mathbf{L_1 : \frac{x-a}{l} = \frac{y-2}{3} = \frac{z-b}{4}}, l \neq 0$ is $(3, 5, 7)$, then the shortest distance between the line $\mathbf{L_1}$ and line $\mathbf{L_2 : \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}}$ is equal to :

A. $\frac{1}{2}$

B. $\frac{1}{\sqrt{6}}$

C. $\sqrt{\frac{2}{3}}$

D. $\frac{1}{\sqrt{3}}$

Official Answer by NTA (2)}

Question 230 View solution online

The shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-6}{-3}$ and $\frac{x-1}{2}=\frac{y+8}{-7}=\frac{z-4}{5}$

A. $5\sqrt{3}$

B. $2\sqrt{3}$

C. $3\sqrt{3}$

D. $4\sqrt{3}$

Question 231 View solution online

The distance of line $3y-2z-1=0=3x-z+4$ from the point (2, -1, 6) is :

A. $\sqrt{26}$

B. $2\sqrt{5}$

C. $2\sqrt{6}$

D. $4\sqrt{2}$

Question 232 View solution online

The shortest distance between lines L_1 and L_2, where $L_1: \frac{x-1}{2}=\frac{y+1}{-3}=\frac{z+4}{2}$ and L_2 is the line passing through the points $A(-4,4,3) \cdot B(-1,6,3)$ and perpendicular to the line $\frac{x-3}{-2}=\frac{y}{3}=\frac{z-1}{1}$, is

A. $\frac{121}{\sqrt{221}}$

B. $\frac{24}{\sqrt{117}}$

C. $\frac{141}{\sqrt{221}}$

D. $\frac{42}{\sqrt{117}}$

Question 233 View solution online

Let P be the foot of the perpendicular from the point $Q(10, -3, -1)$ on the line

$$\frac{x-3}{7} = \frac{y-2}{-1} = \frac{z+1}{-2}.$$

Then the area of the right angled triangle PQR, where R is the point $(3, -2, 1)$, is

A. $9\sqrt{15}$

B. $\sqrt{30}$

C. $8\sqrt{15}$

D. $3\sqrt{30}$

Question 234 View solution online

Let d be the distance of the point of intersection of the lines

$$\frac{x+6}{3} = \frac{y}{2} = \frac{z+1}{1}$$

and

$$\frac{x-7}{4} = \frac{y-9}{3} = \frac{z-4}{2}$$

from the point $(7, 8, 9)$. Then $d^2 + 6$ is equal to :

A. (4) 78

B. (3) 75

C. (2) 69

D. (1) 72

Question 235 View solution online

The square of the distance of the image of the point $(6, 1, 5)$ in the line $\frac{x-1}{3} = \frac{y}{2} = \frac{z-2}{4}$, from the origin is

.

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 236 View solution online

The distance of the point having position vector $-\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 6\hat{\mathbf{k}}$ from the straight line passing through the point $(2, 3, -4)$ and parallel to the vector, $6\hat{i} + 3\hat{j} - 4\hat{k}$ is :

A. 7

B. $4\sqrt{3}$

C. 6

D. $2\sqrt{13}$

Question 237 View solution online

Let the line $\frac{x}{1} = \frac{6-y}{2} = \frac{z+8}{5}$ intersect the lines $\frac{x-5}{4} = \frac{y-7}{3} = \frac{z+2}{1}$ and $\frac{x+3}{6} = \frac{3-y}{3} = \frac{z-6}{1}$ at the points A and B respectively. Then the distance of the mid-point of the line segment AB from the plane $2x - 2y + z = 14$ is

A. 4

B. $\frac{10}{3}$

C. 3

D. $\frac{11}{3}$

Question 238 View solution online

Let $\mathbf{L_1 : \frac{x-1}{1} = \frac{y-2}{-1} = \frac{z-1}{2}}$ and $\mathbf{L_2 : \frac{x+1}{-1} = \frac{y-2}{2} = \frac{z}{1}}$ be two lines.

Let $\mathbf{L_3}$ be a line passing through the point (α, β, γ) and be perpendicular to both $\mathbf{L_1}$ and $\mathbf{L_2}$. If $\mathbf{L_3}$ intersects $\mathbf{L_1}$, then $|5\alpha - 11\beta - 8\gamma|$ equals :

A. 18

B. 16

C. 25

D. 20

Question 239 View solution online

The line $\mathbf{l_1}$ passes through the point $\mathbf{(2, 6, 2)}$ and is perpendicular to the plane $\mathbf{2x + y - 2z = 10}$. Then the shortest distance between the line $\boldsymbol{l_1}$ and the line $\frac{x+1}{2} = \frac{y+4}{-3} = \frac{z}{2}$ is :

A. $\frac{13}{3}$

B. $\frac{19}{3}$

C. 7

D. 9

Question 240 View solution online

Let for a triangle ABC,

$$\overrightarrow{AB} = -2\hat{i} + \hat{j} + 3\hat{k}$$

$$\overrightarrow{CB} = \alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$$

$$\overrightarrow{CA} = 4\hat{i} + 3\hat{j} + \delta\hat{k}$$

If $\delta > 0$ and the area of the triangle ABC is $5\sqrt{6}$, then $\overrightarrow{CB} \cdot \overrightarrow{CA}$ is equal to

A. 60

B. 120

C. 108

D. 54

Official Answer. By NTA (1)

Question 241 View solution online

Let the shortest distance between the lines $L : \frac{x-5}{-2} = \frac{y-\lambda}{0} = \frac{z+\lambda}{1}, \lambda \geq 0$ and $L_1 : x + 1 = y - 1 = 4 - z$ be $2\sqrt{6}$. If (α, β, γ) lies on L , then which of the following is NOT possible?

A. $\alpha - 2\gamma = 19$

B. $2\alpha + \gamma = 7$

C. $2\alpha - \gamma = 9$

D. $\alpha + 2\gamma = 24$

Question 242 View solution online

Consider the line L passing through the points $(1,2,3)$ and $(2,3,5)$. The distance of the point $\left(\frac{11}{3},\frac{11}{3},\frac{19}{3}\right)$ from the line L along the line $\frac{3x-11}{2}=\frac{3y-11}{1}=\frac{3z-19}{2}$ is equal to :

A. 3

B. 5

C. 4

D. 6

Question 243 View solution online

The distance of the point having position vector $-\hat{\mathbf{i}}+2\hat{\mathbf{j}}+6\hat{\mathbf{k}}$ from the straight line passing through the point $(2,3,-4)$ and parallel to the vector $6\hat{\mathbf{i}}+3\hat{\mathbf{j}}-4\hat{\mathbf{k}}$ is :

A. 7

B. $4\sqrt{3}$

C. 6

D. $2\sqrt{13}$

Question 244 View solution online

The distance of the point $\mathbf{Q}(0,2,-2)$ form the line passing through the point $\mathbf{P}(5,-4,3)$ and perpendicular to the lines $\vec{\mathbf{r}}=(-3\hat{\mathbf{i}}+2\hat{\mathbf{k}})+\lambda(2\hat{\mathbf{i}}+3\hat{\mathbf{j}}+5\hat{\mathbf{k}}),\quad \lambda\in\mathbb{R}$ and $\vec{\mathbf{r}}=(\hat{\mathbf{i}}-2\hat{\mathbf{j}}+\hat{\mathbf{k}})+\mu(-\hat{i}+3\hat{j}+2\hat{k}),\mu\in\mathbb{R}$ is

A. $\sqrt{86}$

B. $\sqrt{20}$

C. $\sqrt{54}$

D. $\sqrt{74}$

Question 245 View solution online

If the shortest distance between the lines $\frac{x-\lambda}{2}=\frac{y-4}{3}=\frac{z-3}{4}$ and $\frac{x-2}{4}=\frac{y-4}{6}=\frac{z-7}{8}$ is $\frac{13}{\sqrt{29}}$, then a value of λ is :

A. $-\frac{13}{25}$

B. $\frac{13}{25}$

C. 1

D. -1

Question 246 View solution online

Let the point $(-1, \alpha, \beta)$ lie on the line of the shortest distance between the lines $\frac{x+2}{-3} = \frac{y-2}{4} = \frac{z-5}{2}$ and $\frac{x+2}{-1} = \frac{y+6}{2} = \frac{z-1}{0}$.
Then $(\alpha - \beta)^2$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 247 View solution online

Let $L_1 : \frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $L_2 : \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$ be two lines. Then which of the following points lies on the line of the shortest distance between L_1 and L_2?

A. $\left(-\frac{5}{3}, -7, 1\right)$

B. $\left(2, 3, \frac{1}{3}\right)$

C. $\left(\frac{8}{3}, -1, \frac{1}{3}\right)$

D. $\left(\frac{14}{3}, -3, \frac{22}{3}\right)$

Question 248 View solution online

The shortest distance between the line $\frac{x-3}{4} = \frac{y+7}{-11} = \frac{z-1}{5}$ and $\frac{x-5}{3} = \frac{y-9}{-6} = \frac{z+2}{1}$ is :

A. $\frac{187}{\sqrt{563}}$

B. $\frac{178}{\sqrt{563}}$

C. $\frac{185}{\sqrt{563}}$

D. $\frac{179}{\sqrt{563}}$

Question 249 View solution online

Let Q be the foot of the perpendicular from the point $\mathbf{P}(7, -2, 13)$ on the plane containing the lines $\frac{x+1}{6} = \frac{y-1}{7} = \frac{z-3}{8}$ and $\frac{x-1}{3} = \frac{y-2}{5} = \frac{z-3}{7}$. Then $(\mathbf{PQ})^2$, is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 250 View solution online

Shortest distance between the lines $\frac{x-3}{1}=\frac{y-8}{4}=\frac{z-3}{22}, \frac{x+3}{1}=\frac{y+7}{1}=\frac{z-6}{7}$ is

A. $3\sqrt{30}$

B. $\sqrt{30}$

C. $2\sqrt{30}$

D. $4\sqrt{30}$

Question 251 View solution online

Let P be the foot of the perpendicular from the point $\mathbf{Q}(10,-3,-1)$ on the line $\frac{\mathrm{x}-3}{7}=\frac{\mathrm{y}-2}{-1}=\frac{\mathrm{z}+1}{-2}$. Then the area of the right angled triangle PQR , where R is the point $(3,-2,1)$, is

A. $9\sqrt{15}$

B. $\sqrt{30}$

C. $8\sqrt{15}$

D. $3\sqrt{30}$

Question 252 View solution online

The distance of the line

$$\frac{x-2}{2}=\frac{y-6}{3}=\frac{z-3}{4}$$

from the point $(1,4,0)$ along the line

$$\frac{x}{1}=\frac{y-2}{2}=\frac{z+3}{3}$$

is :

A. $\sqrt{17}$

B. $\sqrt{14}$

C. $\sqrt{15}$

D. $\sqrt{13}$

Question 253 View solution online

If the shortest distance between the lines $\frac{x+\sqrt{6}}{2}=\frac{y-\sqrt{6}}{3}=\frac{z-\sqrt{6}}{4}$ and $\frac{x-\lambda}{3}=\frac{y-2\sqrt{6}}{4}=\frac{z+2\sqrt{6}}{5}$ is 6 , then the square of sum of all possible values of λ is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 254 View solution online

The distance of the line $\frac{x-2}{2}=\frac{y-6}{3}=\frac{z-3}{4}$ from the point $(1,4,0)$ along the line $\frac{x}{1}=\frac{y-2}{2}=\frac{z+3}{3}$ is :

A. $\sqrt{17}$

B. $\sqrt{14}$

C. $\sqrt{15}$

D. $\sqrt{13}$

Question 255 View solution online

If d_1 is the shortest distance between the lines $x+1=2y=-12z, x=y+2=6z-6$ and d_2 is the shortest distance between the lines $\frac{x-1}{2}=\frac{y+8}{-7}=\frac{z-4}{5}, \frac{x-1}{2}=\frac{y-2}{1}=\frac{z-6}{-3}$, then the value of $\frac{32\sqrt{3}\,\mathrm{d}_1}{\mathrm{d}_2}$ is :

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 256 View solution online

The shortest distance between the lines $x+1=2y=-12z$ and $x=y+2=6z-6$ is

A. $\frac{3}{2}$

B. 2

C. $\frac{5}{2}$

D. 3

Question 257 View solution online

The shortest distance between the lines $x+1=2y=-12z$ and $x=y+2=6z-6$ is

A. $\frac{3}{2}$

B. 2

C. $\frac{5}{2}$

D. 3

Question 258 View solution online

If the shortest distance between the lines

$$\overrightarrow{r_1}=\alpha\hat{i}+2\hat{j}+2\hat{k}+\lambda(\hat{i}-2\hat{j}+2\hat{k}), \lambda \in \mathbf{R}, \alpha>0$$

and $\overrightarrow{\mathbf{r}_2}=-4\hat{\mathbf{i}}-\hat{\mathbf{k}}+\mu(3\hat{\mathbf{i}}-2\hat{\mathbf{j}}-2\hat{\mathbf{k}}), \mu \in \mathbf{R}$ is 9 , then α is equal to ___。

Numerical answer: _____

Enter the requested integer (0 decimal places).

Question 259 View solution online

Let the line passing through the points $(-1,2,1)$ and parallel to the line

$$\frac{x-1}{2}=\frac{y+1}{3}=\frac{z}{4}$$

intersect the line

$$\frac{x+2}{3}=\frac{y-3}{2}=\frac{z-4}{1}$$

at the point P. Then the distance of P from the point $\mathrm{Q}(4,-5,1)$ is :

A. 5

B. 10

C. $5\sqrt{6}$

D. $5\sqrt{5}$

Question 260 View solution online

If the shortest distance between the lines

$$\frac{x-\lambda}{2}=\frac{y-4}{3}=\frac{z-3}{4}$$

and

$$\frac{x-2}{4}=\frac{y-4}{6}=\frac{z-7}{8}$$

is

$$\frac{13}{\sqrt{29}},$$

then a value of λ is :

A. $-\frac{13}{25}$

B. $\frac{13}{25}$

C. 1

D. -1

Question 261 View solution online

If the square of the shortest distance between the lines $\frac{x-2}{1}=\frac{y-1}{2}=\frac{z+3}{-3}$ and $\frac{x+1}{2}=\frac{y+3}{4}=\frac{z+5}{-5}$ is $\frac{m}{n}$, where m, n are coprime numbers, then $m+n$ is equal to:

A. 6

B. 9

C. 21

D. 14

Question 262 View solution online

Let PQR be a triangle with $R(-1,4,2)$. Suppose $\mathbf{M(2,1,2)}$ is the mid point of PQ . The distance of the centroid of $\triangle\mathbf{PQR}$ from the point of intersection of the line $\frac{x-2}{0}=\frac{y}{2}=\frac{z+3}{-1}$ and $\frac{x-1}{1}=\frac{y+3}{-3}=\frac{z+1}{1}$ is

A. 69

B. 9

C. $\sqrt{69}$

D. $\sqrt{99}$

Question 263 View solution online

Let a line pass through two distinct points $\mathbf{P(-2,-1,3)}$ and Q , and be parallel to the vector $\mathbf{3\hat{i}+2\hat{j}+2\hat{k}}$. If the distance of the point Q from the point $\mathbf{R(1,3,3)}$ is 5 , then the square of the area of $\triangle\mathbf{PQR}$ is equal to:

A. 136

B. 140

C. 144

D. 148

Question 264 View solution online

Let P be the plane passing through the line $\frac{x-1}{1}=\frac{y-2}{-3}=\frac{z+5}{7}$ and the point $(2,4,-3)$. If the image of the point $(-1,3,4)$ in the plane P is (α,β,γ), then $\alpha+\beta+\gamma$ is equal to

A. 12

B. 11

C. 9

D. 10

Question 265 View solution online

The perpendicular distance, of the line

$$\frac{x-1}{2}=\frac{y+2}{-1}=\frac{z+3}{2}$$

from the point $P(2,-10,1)$, is:

A. 6

B. $5\sqrt{2}$

C. $3\sqrt{5}$

D. $4\sqrt{3}$

Question 266 View solution online

Let $L_1: \frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\mathrm{L}_2: \frac{\mathrm{x}-2}{3}=\frac{\mathrm{y}-4}{4}=\frac{\mathrm{z}-5}{5}$ be two lines. Then which of the following points lies on the line of the shortest distance between L_1 and L_2 ?

A. $\left(-\frac{5}{3},-7,1\right)$

B. $\left(2,3,\frac{1}{3}\right)$

C. $\left(\frac{8}{3},-1,\frac{1}{3}\right)$

D. $\left(\frac{14}{3},-3,\frac{22}{3}\right)$

Question 267 View solution online

Let a line having direction ratio $1,-4,2$ intersect the lines $\frac{x-7}{3}=\frac{y-1}{-1}=\frac{z+2}{1}$ and $\frac{x}{2}=\frac{y-7}{3}=\frac{z}{1}$ at the point A and B . Then $(\mathrm{AB})^2$ is equal to .

Numerical answer: _____

Enter the requested value or coefficient rounded to the nearest integer (0 decimal places).

Question 268 View solution online

Consider the line L passing through the points $(1, 2, 3)$ and $(2, 3, 5)$. The distance of the point $\left(\frac{11}{3}, \frac{11}{3}, \frac{19}{3}\right)$ from the line L along the line $\frac{3x-11}{2} = \frac{3y-11}{1} = \frac{3z-19}{2}$ is equal to :

A. 3

B. 5

C. 4

D. 6

Question 269 View solution online

Let P be the point $(10, -2, -1)$ and Q be the foot of the perpendicular drawn from the point $\mathbf{R}(1, 7, 6)$ on the line passing through the points $(2, -5, 11)$ and $(-6, 7, -5)$. Then the length of the line segment PQ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 270 View solution online

Let in a $\triangle\mathbf{ABC}$, the length of the side AC be 6 , the vertex B be $(1, 2, 3)$ and the vertices $\mathbf{A}, \mathbf{C}$ lie on the line $\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}$. Then the area (in sq. units) of $\triangle\mathbf{ABC}$ is

A. 42

B. 21

C. 56

D. 17

Question 271 View solution online

If the shortest distance between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{\lambda}$ and $\frac{x-2}{1} = \frac{y-4}{4} = \frac{z-5}{5}$ is $\frac{1}{\sqrt{3}}$, then the sum of all possible values of $\boldsymbol{\lambda}$ is :

A. 16

B. (1) is correct option.

C. (2) 6

D. (3) 12

Question 272 View solution online

The shortest distance between the line

$$\frac{x-3}{4}=\frac{y+7}{-11}=\frac{z-1}{5}$$

and

$$\frac{x-5}{3}=\frac{y-9}{-6}=\frac{z+2}{1}$$

is :

A. $\frac{187}{\sqrt{563}}$

B. $\frac{178}{\sqrt{563}}$

C. $\frac{185}{\sqrt{563}}$

D. $\frac{179}{\sqrt{563}}$

Question 273 View solution online

Let λ be an integer. If the shortest distance between the lines $x-\lambda=2y-1=-2z$ and $x=y+2\lambda=z-\lambda$ is $\frac{\sqrt{7}}{2\sqrt{2}}$, then the value of $|\lambda|$ is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 274 View solution online

Let P the point of intersection of the lines $\frac{x-2}{1}=\frac{y-4}{5}=\frac{z-2}{1}$ and $\frac{x-3}{2}=\frac{y-2}{3}=\frac{z-3}{2}$.

Then, the shortest distance of P from the line $4x=2y=z$ is

A. $\frac{5\sqrt{14}}{7}$

B. $\frac{\sqrt{14}}{7}$

C. $\frac{3\sqrt{14}}{7}$

D. $\frac{6\sqrt{14}}{7}$

Question 275 View solution online

Let a line pass through two distinct points $\mathbf{P(-2,-1,3)}$ and $\mathbf{Q}$, and be parallel to the vector $\mathbf{3\hat{i}+2\hat{j}+2\hat{k}}$. If the distance of the point $\mathbf{Q}$ from the point $\mathbf{R(1,3,3)}$ is 5, then the square of the area of $\mathbf{\triangle PQR}$ is equal to:

A. 136

B. 140

C. 144

D. 148

Question 276 View solution online

The shortest distance between the lines $\frac{x-4}{4}=\frac{y+2}{5}=\frac{z+3}{3}$ and $\frac{x-1}{3}=\frac{y-3}{4}=\frac{z-4}{2}$ is

A. $3\sqrt{6}$

B. $6\sqrt{3}$

C. $6\sqrt{2}$

D. $2\sqrt{6}$

Question 277 View solution online

The shortest distance between the lines $\frac{x+7}{-6}=\frac{y-6}{7}=z$ and $\frac{7-x}{2}=y-2=z-6$ is

A. $2\sqrt{29}$

B. 1

C. $\sqrt{\frac{37}{29}}$

D. $\frac{\sqrt{29}}{2}$

Question 278 View solution online

The shortest distance between the lines
$\frac{x-3}{2}=\frac{y+15}{-7}=\frac{z-9}{5}$ and $\frac{x+1}{2}=\frac{y-1}{1}=\frac{z-9}{-3}$ is

A. $6\sqrt{3}$

B. $4\sqrt{3}$

C. $5\sqrt{3}$

D. $8\sqrt{3}$

Question 279 View solution online

Let the image of the point $\mathbf{P(1,2,6)}$ in the plane passing through the points $\mathbf{A(1,2,0), B(1,4,1)}$ and $\mathbf{C(0,5,1)}$ be $\mathbf{Q(\alpha,\beta,\gamma)}$. Then $\left(\alpha^2+\beta^2+\gamma^2\right)$ is equal to :

A. 65

B. 70

C. 76

D. 62

Question 280 View solution online

Let the line $\frac{x}{1}=\frac{6-y}{2}=\frac{z+8}{5}$ intersect the lines $\frac{x-5}{4}=\frac{y-7}{3}=\frac{z+2}{1}$ and $\frac{x+3}{6}=\frac{3-y}{3}=\frac{z-6}{1}$ at the points A and B respectively. Then the distance of the mid-point of the line segment AB from the plane $2x-2y+z=14$ is

A. 4

B. $\frac{10}{3}$

C. 3

D. $\frac{11}{3}$

Question 281 View solution online

If the foot of the perpendicular drawn from $(1,9,7)$ to the line passing through the point $(3,2,1)$ and parallel to the planes $x+2y+z=0$ and $3y-z=3$ is (α,β,γ), then $\alpha+\beta+\gamma$ is equal to

A. 3

B. 1

C. -1

D. 5

Question 282 View solution online

If the shortest distance between the lines $\frac{x-\lambda}{3}=\frac{y-2}{-1}=\frac{z-1}{1}$ and $\frac{x+2}{-3}=\frac{y+5}{2}=\frac{z-4}{4}$ is $\frac{44}{\sqrt{30}}$, then the largest possible value of $|\lambda|$ is equal to .

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 283 View solution online

If the line, $2x - y + 3 = 0$ is at a distance $\frac{1}{\sqrt{5}}$ and $\frac{2}{\sqrt{5}}$ from the lines $4x - 2y + \alpha = 0$ and $6x - 3y + \beta = 0$, respectively, then the sum of all possible values of α and β is

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 284 View solution online

If the shortest distance between the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{\lambda}$$

and

$$\frac{x-2}{1} = \frac{y-4}{4} = \frac{z-5}{5}$$

is $\frac{1}{\sqrt{3}}$, then the sum of all possible values of λ is :

A. 16

B. 6

C. 12

D. 10

Question 285 View solution online

The shortest distance between the lines $\frac{x+2}{1} = \frac{y}{-2} = \frac{z-5}{2}$ and $\frac{x-4}{1} = \frac{y-1}{2} = \frac{z+3}{0}$ is

A. 6

B. 9

C. 7

D. 8

Question 286 View solution online

Let the line passing through the points $(-1, 2, 1)$ and parallel to the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$ intersect the line $\frac{x+2}{3} = \frac{y-3}{2} = \frac{z-4}{1}$ at the point P. Then the distance of P from the point $Q(4, -5, 1)$ is :

A. 5

B. 4

C. (2) 10

D. (3) $5\sqrt{6}$

Question 287 View solution online

Let two vertices of triangle ABC be $(2, 4, 6)$ and $(0, -2, -5)$, and its centroid be $(2, 1, -1)$. If the image of third vertex in the plane $x + 2y + 4z = 11$ is (α, β, γ), then $\alpha\beta + \beta\gamma + \gamma\alpha$ is equal to

A. 72

B. 74

C. 76

D. 70

Question 288 View solution online

If the square of the shortest distance between the lines

$$\frac{x-2}{1} = \frac{y-1}{2} = \frac{z+3}{-3}$$

and

$$\frac{x+1}{2} = \frac{y+3}{4} = \frac{z+5}{-5}$$

is $\frac{m}{n}$, where m, n are coprime numbers, then $m + n$ is equal to:

A. 6

B. 9

C. 21

D. 14

Question 289 View solution online

If the foot of the perpendicular drawn from $(1, 9, 7)$ to the line passing through the point $(3, 2, 1)$ and parallel to the planes $\mathbf{x} + 2\mathbf{y} + \mathbf{z} = 0$ and $3\mathbf{y} - \mathbf{z} = 3$ is (α, β, γ), then $\alpha + \beta + \gamma$ is equal to

A. 3

B. 1

C. -1

D. 5

Question 290 View solution online

Let the line L pass through the point $(0, 1, 2)$, intersect the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and be parallel to the plane $2x + y - 3z = 4$. Then the distance of the point $P(1, -9, 2)$ from the line L is

A. 9

B. $\sqrt{54}$

C. $\sqrt{69}$

D. $\sqrt{74}$

Question 291 View solution online

Consider a line L passing through the points $\mathbf{P(1, 2, 1)}$ and $\mathbf{Q(2, 1, -1)}$. If the mirror image of the point $\mathbf{A(2, 2, 2)}$ in the line L is (α, β, γ), then $\alpha + \beta + 6\gamma$ is equal to .....

Numerical answer: _____

Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Question 292 View solution online

Let the line $\frac{x-3}{7} = \frac{y-2}{-1} = \frac{z-3}{-4}$ intersect the plane containing the lines $\frac{x-4}{1} = \frac{y+1}{-2} = \frac{z}{1}$ and $4ax - y + 5z - 7a = 0 = 2\mathbf{x} - 5\mathbf{y} - \mathbf{z} - 3, a \in \mathbb{R}$ at the point $P(\alpha, \beta, \gamma)$. Then the value of $\alpha + \beta + \gamma$ equals .

Numerical answer: _____

Enter the requested value or coefficient rounded to the nearest integer (0 decimal places).

Question 293 View solution online

Let in a $\triangle ABC$, the length of the side AC be 6, the vertex B be $(1, 2, 3)$ and the vertices A, C lie on the line

$$\frac{x-6}{3} = \frac{y-7}{2} = \frac{z-7}{-2}.$$

Then the area (in sq. units) of $\triangle ABC$ is

A. 42

B. 21

C. 56

D. 17

Mathematical Reasoning

Questions 294-300 / 7 selected / 2.3% practice weight / Historical appendix

Topics to prioritise in this collection

- Mathematical reasoning: 5 questions / 71.4% of this chapter
- Propositional equivalence: 1 question / 14.3% of this chapter
- Translation of compound statements: 1 question / 14.3% of this chapter

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Question 294 View solution online

The compound statement $(\sim (P \wedge Q)) \vee ((\sim P) \wedge Q) \Rightarrow ((\sim P) \wedge (\sim Q))$ is equivalent to

A. $(\sim Q) \vee P$

B. $((\sim P) \vee Q) \wedge (\sim Q)$

C. $(\sim P) \vee Q$

D. $((\sim P) \vee Q) \wedge ((\sim Q) \vee P)$

Question 295 View solution online

The statement $(p \wedge (\sim q)) \Rightarrow (p \Rightarrow (\sim q))$ is

A. a tautology

B. a contradiction

C. equivalent to $p \vee q$

D. equivalent to $(\sim p) \vee (\sim q)$

Question 296 View solution online

(S1) $(p \Rightarrow q) \vee (p \wedge (\sim q))$ is a tautology
(S2) $((\sim p) \Rightarrow (\sim q)) \wedge ((\sim p) \vee q)$ is a contradiction.
Then

A. both (S1) and (S2) are correct

B. only (S1) is correct

C. only (S2) is correct

D. both (S1) and (S2) are wrong

Question 297 View solution online

The negation of the expression $q \vee ((\sim q) \wedge p)$ is equivalent to

A. $(\sim p) \vee (\sim q)$

B. $p \wedge (\sim q)$

C. $(\sim p) \vee q$

D. $(\sim p) \wedge (\sim q)$

Question 298 View solution online

The statement $B \Rightarrow ((\sim A) \vee B)$ is equivalent to :

A. $A \Rightarrow (A \Leftrightarrow B)$

B. $A \Rightarrow ((\sim A) \Rightarrow B)$

C. $A \wedge B$

D. $A \vee B$

The original exam question has multiple correct choices and a conflicting printed ALLEN answer label. Independent truth-table verification establishes that original options 2, 3 and 4 are equivalent. In this corrected single-answer practice version, original options 1 and 2 are preserved; options 3 and 4 are replaced by A AND B and A OR B. Only option 2 is correct. The original defective choices remain in the review evidence.

Question 299 View solution online

Which of the following statements is a tautology ?

A. $p \vee (p \wedge q)$

B. $(\mathrm{p} \wedge (\mathrm{p} \rightarrow \mathrm{q})) \rightarrow \sim \mathrm{q}$

C. $(\mathrm{p} \wedge \mathrm{q}) \rightarrow (\sim (\mathrm{p}) \rightarrow \mathrm{q})$

D. $\mathrm{p} \rightarrow (\mathrm{p} \wedge (\mathrm{p} \rightarrow \mathrm{q}))$

Question 300 View solution online

Consider the following statements:

P : I have fever
Q: I will not take medicine
R : I will take rest.
The statement "If I have fever, then I will take medicine and I will take rest" is equivalent to:

A. $((\sim \mathbf{P}) \vee \sim \mathbf{Q}) \wedge ((\sim \mathbf{P}) \vee \mathbf{R})$

B. $(\mathbf{P} \vee \mathbf{Q}) \wedge ((\sim \mathbf{P}) \vee \mathbf{R})$

C. $((\sim \mathbf{P}) \vee \sim \mathbf{Q}) \wedge ((\sim \mathbf{P}) \vee \sim \mathbf{R})$

D. $(\mathbf{P} \vee \sim \mathbf{Q}) \wedge (\mathbf{P} \vee \sim \mathbf{R})$

QUICK CHECK

Answer key

For numerical questions the stored answer value is shown. Follow the question's precision and units.

1. 45	**2.** D	**3.** A	**4.** 702	**5.** C
6. 4	**7.** 3395	**8.** 14	**9.** D	**10.** B
11. B	**12.** 5	**13.** 18	**14.** B	**15.** A
16. A	**17.** A	**18.** D	**19.** 16	**20.** 4898
21. A	**22.** A	**23.** 180	**24.** A	**25.** 32
26. 81	**27.** 12	**28.** D	**29.** A	**30.** B
31. C	**32.** 288	**33.** 31	**34.** 125	**35.** 75
36. 22	**37.** 2021	**38.** 3	**39.** B	**40.** C
41. C	**42.** 10	**43.** A	**44.** 8	**45.** D
46. D	**47.** C	**48.** B	**49.** B	**50.** C
51. A	**52.** C	**53.** C	**54.** C	**55.** C
56. C	**57.** 321	**58.** 12	**59.** 4	**60.** 60
61. 754	**62.** C	**63.** B	**64.** 8	**65.** 151
66. 25	**67.** D	**68.** D	**69.** 16	**70.** C
71. 19	**72.** 15	**73.** B	**74.** B	**75.** A
76. 40	**77.** A	**78.** D	**79.** 72	**80.** 61
81. 12	**82.** 10	**83.** A	**84.** B	**85.** C
86. A	**87.** 11	**88.** 63	**89.** A	**90.** B
91. A	**92.** C	**93.** B	**94.** C	**95.** D
96. 269	**97.** A	**98.** D	**99.** A	**100.** 37
101. C	**102.** A	**103.** D	**104.** D	**105.** 108
106. B	**107.** A	**108.** 252	**109.** 9	**110.** D
111. 72	**112.** D	**113.** 165	**114.** 125	**115.** 18
116. C	**117.** C	**118.** 5	**119.** B	**120.** B
121. A	**122.** A	**123.** D	**124.** A	**125.** 90
126. 38	**127.** B	**128.** A	**129.** A	**130.** 486
131. C	**132.** C	**133.** B	**134.** A	**135.** A
136. 21	**137.** B	**138.** D	**139.** 2	**140.** 81
141. D	**142.** C	**143.** 11	**144.** C	**145.** D
146. 16	**147.** B	**148.** 11	**149.** 15	**150.** C
151. C	**152.** A	**153.** C	**154.** C	**155.** A

156. 26 **157.** C **158.** D **159.** A **160.** 11

161. B **162.** D **163.** D **164.** C **165.** A

166. A **167.** A **168.** D **169.** D **170.** A

171. B **172.** D **173.** D **174.** 11 **175.** 137

176. C **177.** C **178.** 7 **179.** 216 **180.** 108

181. C **182.** C **183.** 957 **184.** B **185.** C

186. 5 **187.** 26 **188.** D **189.** C **190.** B

191. 8 **192.** A **193.** 11 **194.** 4 **195.** A

196. 158 **197.** 355 **198.** 180 **199.** A **200.** 38

201. D **202.** B **203.** B **204.** 18 **205.** C

206. A **207.** A **208.** C **209.** C **210.** A

211. D **212.** B **213.** B **214.** B **215.** A

216. C **217.** C **218.** A **219.** D **220.** D

221. B **222.** C **223.** A **224.** C **225.** C

226. A **227.** C **228.** 14 **229.** B **230.** B

231. C **232.** C **233.** D **234.** A **235.** 62

236. A **237.** A **238.** C **239.** A **240.** A

241. D **242.** A **243.** A **244.** D **245.** C

246. 25 **247.** D **248.** A **249.** 96 **250.** A

251. D **252.** B **253.** 384 **254.** B **255.** 16

256. B **257.** B **258.** 6 **259.** D **260.** C

261. B **262.** C **263.** A **264.** D **265.** C

266. D **267.** 84 **268.** A **269.** 13 **270.** B

271. A **272.** A **273.** 1 **274.** C **275.** A

276. A **277.** A **278.** B **279.** A **280.** A

281. D **282.** 43 **283.** 30 **284.** A **285.** B

286. D **287.** B **288.** B **289.** D **290.** D

291. 6 **292.** 12 **293.** B **294.** D **295.** A

296. B **297.** D **298.** B **299.** C **300.** A