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JEE Main 2025 Session 2

Chemistry
Solutions companion

300 questions / NCERT chapter navigation
Answers and available source solutions, in paper order.

Use the question numbers from the companion question paper. Brief source answers are identified wherever a detailed solution is unavailable.

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 **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

Question 1

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. $C_4H_8O_2$

Correct answer: C

Source solution

Sol. $C \quad : H \quad : O$

$\frac{54.2}{12} \quad : \quad 9.2 \quad : \quad \frac{36.6}{16}$

$4.516 : 9.2 : 2.287$

$\frac{4.516}{2.287} : \frac{9.2}{2.287} : \frac{2.287}{2.287}$

$1.97 : 4.02 : 1$

$C_2H_4O \Rightarrow$ Empirical formula

E.F. mass $= 24 + 4 + 16 = 44$

and molar mass $= 132$

Hence molecular formula $= (C_2H_4O)_3$

$$= C_6H_{12}O_3$$

Correct Option (3)

Question 2

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

Correct answer: D

Source solution

Correct answer
A-III, B-IV, C-I, D-II

Question 3

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 $\mathbf{gmol^{-1}}$. (Nearest integer)
Given, water boils at $\mathbf{373\ K,\ K_b}$ for water $= \mathbf{0.52\ K\ kg\ mol^{-1}}$

Numerical answer: _____

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

Correct answer: 100

Source solution

100
$\mathbf{\Delta T_b = 373.52 - 373 = 0.52}$
$\mathbf{\Delta T_b = iK_b m \quad i = 1}$
$\mathbf{0.52 = 0.52 \times \frac{2/x}{20} \times 1000}$
$\mathbf{x = 100 gm/mol}$

Question 4

The molarity of the solution prepared by dissolving 6.3 g of oxalic acid $\mathbf{(H_2C_2O_4 \cdot 2H_2O)}$ in 250 mL of water in $\mathbf{molL^{-1}}$ is $\mathbf{x \times 10^{-2}}$. The value of x is
. (Nearest integer)
[Atomic mass : $\mathbf{H : 1.0, C : 12.0, O : 16.0}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Correct answer: 20

Source solution

$\mathbf{[H_2C_2O_4 \cdot 2H_2O] = \frac{weight\ /M_w}{V(L)}}$
$\mathbf{\Rightarrow x \times 10^{-2} = \frac{6.3/126}{250/1000}}$
$\mathbf{x = 20}$

Question 5

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.

Correct answer: 5

Source solution

$$Cl_2 \rightleftarrows 2Cl^-$$

Lets mole of eq.

$x \quad x$

P.P. at eq. $\frac{x}{2x} \times 1 \quad \frac{x}{2x} \times 1$

$\frac{1}{2} \quad \frac{1}{2}$

$K_p = \frac{[P_{Cl}]^2}{[P_{Cl_2}]} = \frac{\left[\frac{1}{2}\right]^2}{\frac{1}{2}} = \frac{1}{2} = 0.5 = 5 \times 10^{-1}$

$x = 5$.

Question 6

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

Correct answer: D

Source solution

Molecule
IF_7
\href{http://l.pe}{l.pe} $^-$of C.M.
ICl_4^-
0
XeF_6
2
XeF_2
1
3

Question 7

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.

Correct answer: 2

Source solution

C_2

$(12e^-) : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2 \left[\pi 2p_x^2 = \pi 2p_y^2\right]$

B.O. $= \frac{8-4}{2} = 2$

O_2

$(16e^-) : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2pz^2$

$\left[\pi 2p_x^2 = \pi 2p_y^2\right] \left[\pi * 2p_x^1 = \pi^* 2p_y^1\right]$

B.O. $= \frac{10-6}{2} = 2$

Be_2

$(8e^-)$: $\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2$

B.O. $= \frac{4-4}{2} = 0$

Li_2

$(6e^-) : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2$

B.O. $= \frac{4-2}{2} = 1$

Ne_2

$(20e^-) : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2pz^2$

$\left[\pi 2p_x^2 = \pi 2p_y^2\right] \left[\pi * 2p_x^2 = \pi^* 2p_y^2\right] \sigma^* 2p_z^2$

B.O. $= \frac{10-10}{2} = 0$

N_2

$(14e^-) : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2 \left[\pi 2p_x^2 = \pi 2p_y^2\right] \sigma 2p_z^2$

B.O. $= \frac{10-4}{2} = 6$

He_2

$(4e^-) : \sigma 1s^2, \sigma^* 1s^2$

B.O. $\frac{2-2}{2} = 0$

Question 8

Number of molecules from the following which are exceptions to octet rule is .

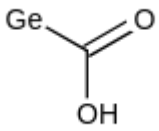
$CO_2, NO_2, H_2SO_4, BF_3, CH_4, SiF_4, ClO_2, PCl_5, BeF_2, C_2H_6, CHCl_3, CBr_4$

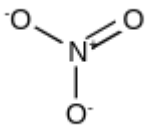
Numerical answer: _____

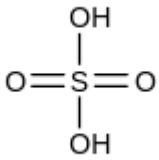
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Correct answer: 6

Source solution

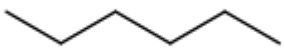




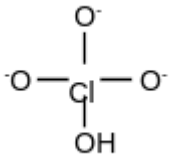


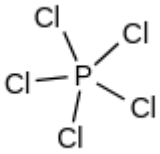


exception to octet rule



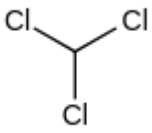




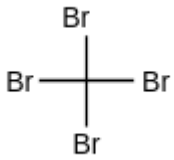


exception exception to $\mathbf{F-Be-F}$ to octet rule octet rule
exception to octet rule

complete octet



complete octet



complete octet

Question 9

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.

Correct answer: 2

Source solution

According to M.O.T.

$O_2 \rightarrow$ no. of unpaired electrons $= 2$

$O_2^- \rightarrow$ no. of unpaired electron $= 1$

$NO \rightarrow$ no. of unpaired electron $= 1$

$CN^- \rightarrow$ no. of unpaired electron $= 0$

$O_2^{2-} \rightarrow$ no. of unpaired electron $= 0$

Question 10

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.

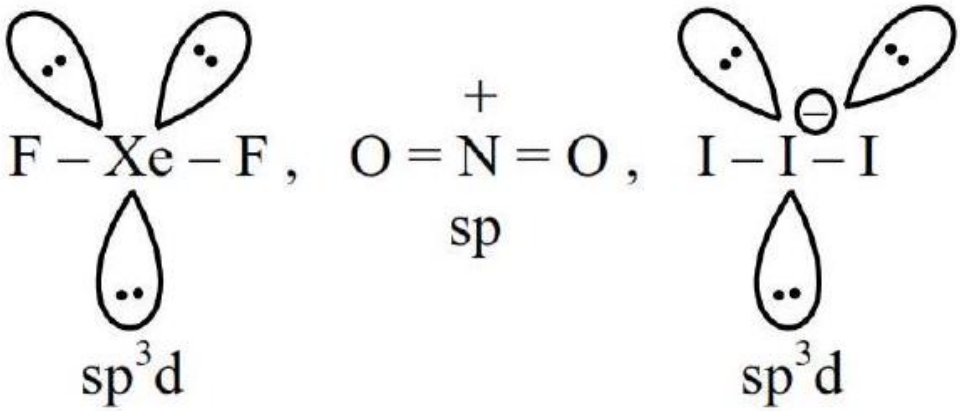
Correct answer: 6

Source solution

Linear species are

$$Cl - Be - Cl, \quad O = C = O, \quad N^- = N^+ = N^-$$

(sp)
(sp)
(sp)



Question 11

The number of molecules or ions from the following, which do not have odd number of electrons are

(A) $\mathbf{NO_2}$

(B) $\mathbf{ICl_4^-}$

(C) $\mathbf{BrF_3}$

(D) $\mathbf{ClO_2}$

(E) $\mathbf{NO_2^+}$

(F) NO

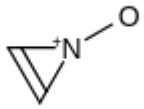
Numerical answer: _____

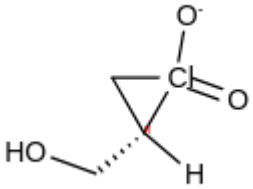
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Correct answer: 3

Source solution

odd $\mathbf{e^-}$

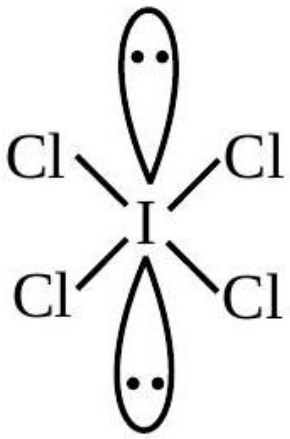


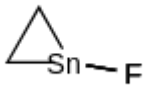


$\mathbf{ICl_4^-}, \mathbf{BrF_3}$ and $\mathbf{NO_2^+}$ do not have odd number of electron.

$\mathbf{N} \overset{\frac{1/2\pi}{\therefore\sigma}}{\underset{\pi}{\overset{\pi}{}}} \mathbf{O}$

Odd e- absent





$O = \overset{+}{N} = O$

Question 12

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.

Correct answer: 6

Source solution

$O_2 \rightarrow 2$ unpaired electrons according to MOT $O_2^+ \rightarrow 1$ unpaired electrons according to MOT $O_2^- \rightarrow 1$ unpaired electrons according to MOT $NO \rightarrow$ odd electron species $NO_2 \rightarrow$ odd electron species
$K_2[NiCl_4] \rightarrow Ni^{2+} \Rightarrow 3d^8$ weak Ligand, C.N. $= 4 \Rightarrow$ Tetrahedral, Paramagnetic with 2 unpaired electrons

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Question 13

The number of molecules from the following which contain only two lone pair of electrons is

$\mathbf{H_2O, N_2, CO, XeF_4, NH_3, NO, CO_2,\ F_2}$

Numerical answer: _____

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

Correct answer: 4

Source solution

$\mathbf{H_2O, CO, N_2, NO}$, has two lone pair of electrons.

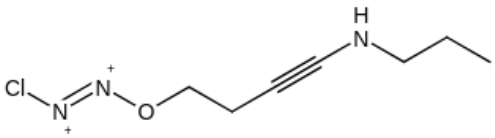
Classification of Elements and Periodicity in Properties

Questions 14-15 / 2 selected / 0.7% practice weight / Consolidate

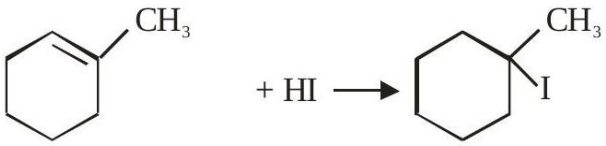
Question 14

Which of the following reaction is correct ?

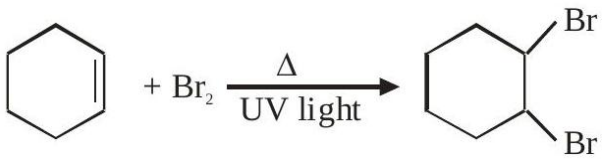
A.



B.



C.

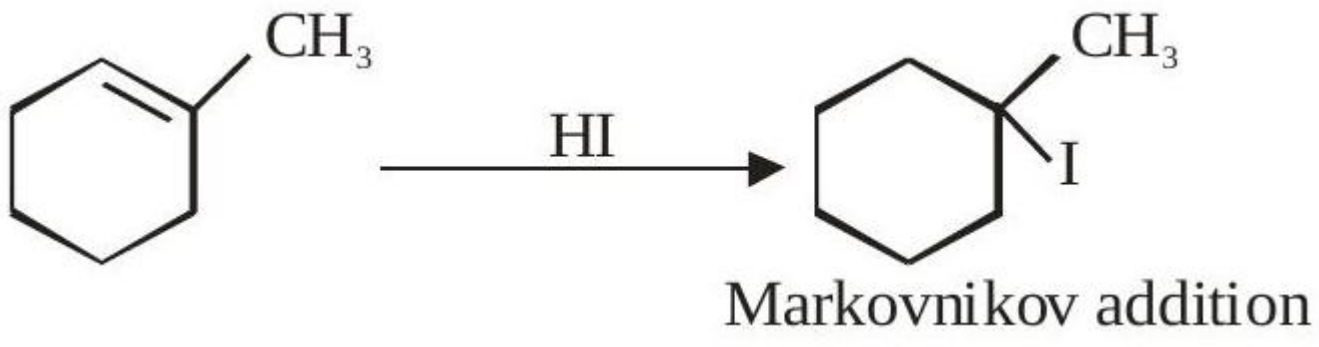


D.

$$C_2H_5CONH_2 + Br_2 + NaOH \rightarrow C_2H_5CH_2NH_2 + Na_2CO_3 + NaBr + H_2O$$

Correct answer: B

Source solution



Question 15

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. $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

Correct answer: D

Source solution

$4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

Chemical Bonding and Molecular Structure

Question 16

Which of the following is least ionic ?

A. $\mathbf{BaCl_2}$

B. AgCl

C. KCl

D. $\mathbf{CoCl_2}$

Correct answer: B

Source solution

Sol:- $\mathbf{AgCl < CoCl_2 < BaCl_2 < KCl}$ (ionic character)
Reason : $\mathbf{Ag^+}$has pseudo inert gas configuration.

Question 17

An element ' E ' has the ionisation enthalpy value of $374\ \text{kJ mol}^{-1}$. 'E' reacts with elements A, B, C and D with electron gain enthalpy values of $-328, -349$, -325 and $-295\ \text{kJ mol}^{-1}$, respectively.

The correct order of the products EA, EB, EC and ED in terms of ionic character is :

A. $\text{EB} > \text{EA} > \text{EC} > \text{ED}$

B. $\text{ED} > \text{EC} > \text{EA} > \text{EB}$

C. $\text{EA} > \text{EB} > \text{EC} > \text{ED}$

D. $\text{ED} > \text{EC} > \text{EB} > \text{EA}$

Correct answer: A

Source solution

Solution

Ionisation enthalpy of $E = 374\ \text{kJ mol}^{-1}$

Electron gain enthalpies are

$$A = -328, \quad B = -349$$

$$C = -325, \quad D = -295$$

kJ mol^{-1}

Greater the difference between

I.E. of cation-forming atom

and E.G.E. of anion-forming atom,

greater is the ionic character.

$$\Delta_A = 374 - 328 = 46$$

$$\Delta_B = 374 - 349 = 25$$

$$\Delta_C = 374 - 325 = 49$$

$$\Delta_D = 374 - 295 = 79$$

Smaller the value of $(I.E. - |E.G.E.|)$,

greater is the tendency

for ionic bond formation.

$$25 < 46 < 49 < 79$$

$\therefore$

$$EB > EA > EC > ED$$

$$\boxed{EB > EA > EC > ED}$$

$$\boxed{\text{Correct Option : (1)}}$$

Question 18

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.

Correct answer: 6

Source solution

Central atom utilising sp^2 hybrid orbitals $SO_2, C_2H_4, BCl_3, HCHO, C_6H_6, BF_3$

Question 19

Number of compounds/species from the following with non-zero dipole moment is
$\mathbf{BeCl_2, BCl_3, NF_3, XeF_4, CCl_4, H_2OH_2\ S, HBr, CO_2, H_2, HCl}$

Numerical answer: _____

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

Correct answer: 5

Source solution

Polar molecule : $\mathbf{NF_3, H_2O, H_2\ S, HBr, HCl}$ ($\mu \neq 0$)

Non Polar molecule: $\mathbf{BeCl_2, BCl_3, XeF_4, CCl_4, CO_2, H_2}$ ($\mu = 0$)
So answer is 5 .

Question 20

Number of compounds from the following with zero dipole moment is .
$\mathbf{HF, H_2, H_2\ S, CO_2, NH_3, BF_3, CH_4, CHCl_3, SiF_4, H_2O, BeF_2}$

Numerical answer: _____

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

Correct answer: 6

Source solution

$\mathbf{H_2, CO_2, BF_3, CH_4, SiF_4, BeF_2}$ are symm. molecule so dipole moment is zero

Question 21

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)

Correct answer: C

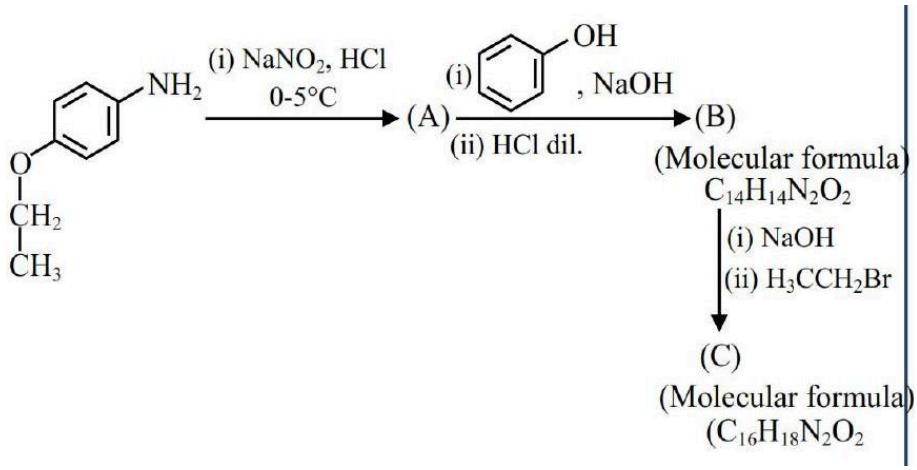
Source solution

TEST PAPER WITH SOLUTION

Sol.
(A) $\psi_{MO} = \psi_A - \psi_B$
(III) ABMO
(B) $\mu = Q \times r$
(I) Dipole moment
(C) $\frac{N_b - N_a}{2}$
(IV) Bond order
(D) $\psi_{MO} = \psi_A + \psi_B$
(II) BMO

Question 22

Consider the following sequence of reactions.



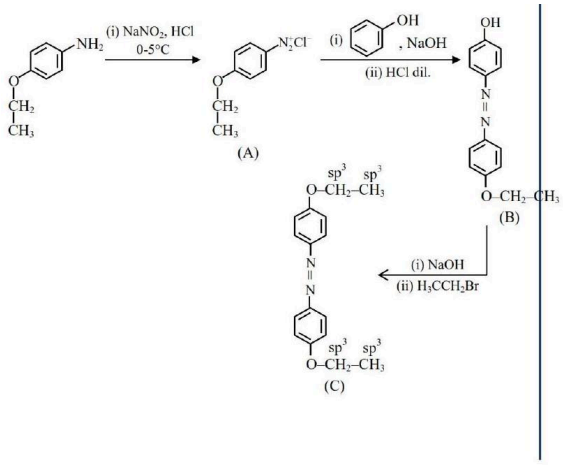
Total number of $\mathbf{sp^3}$ hybridised carbon atoms in the major product C formed is .

Numerical answer: _____

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

Correct answer: 4

Source solution



Question 23

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)

Correct answer: C

Source solution

Solution:

In molecular orbital (MO) theory:

$$\Psi_{MO} = \Psi_A + \Psi_B \Rightarrow \text{Bonding molecular orbital}$$

$$\Psi_{MO} = \Psi_A - \Psi_B \Rightarrow \text{Anti-bonding molecular orbital}$$

$$\mu = Q \times r \Rightarrow \text{Dipole moment}$$

$$\text{Bond order} = \frac{N_b - N_a}{2}$$

where N_b is the number of electrons in bonding orbitals and N_a is the number of electrons in anti-bonding orbitals.

Therefore, the correct matching is:

$$(\text{A}) \rightarrow (\text{III}), \quad (\text{B}) \rightarrow (\text{I}), \quad (\text{C}) \rightarrow (\text{IV}), \quad (\text{D}) \rightarrow (\text{II})$$

Question 24

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)

Correct answer: A

Source solution

Solution

Using Molecular Orbital Theory:

$$\text{Ne}_2: \quad \text{Bond Order} = \frac{N_b - N_a}{2} = 0$$

$$\therefore \text{Ne}_2 \rightarrow (iii)$$

$$\mathrm{N_2}: \quad \text{Bond Order} = 3$$

$$\therefore \mathrm{N_2} \rightarrow (iv)$$

$$\mathrm{F_2}: \quad \text{Bond Order} = 1$$

$$\therefore \mathrm{F_2} \rightarrow (i)$$

$$\mathrm{O_2}: \quad \text{Bond Order} = 2$$

$$\therefore \mathrm{O_2} \rightarrow (ii)$$

$$\boxed{A \rightarrow III,\ B \rightarrow IV,\ C \rightarrow I,\ D \rightarrow II}$$

$$\boxed{(a)-(iii),\ (b)-(iv),\ (c)-(i),\ (d)-(ii)}$$

$$\boxed{\text{Correct Answer : (1)}}$$

Thermodynamics

Questions 25-26 / 2 selected / 0.7% practice weight / Consolidate

Question 25

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 $\mathbf{(\mathit{l})}$ + $\mathbf{H_2}$ $\rightarrow$ 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)

Correct answer: B

Source solution

$\mathbf{2SO_2(\,g) + O_2(\,g) \xrightarrow{V_2O_5} 2SO_3(\,g)}$:
contact process

$$4NH_3(g) + 5O_2(g) \xrightarrow{Pt(s)-Rh(s)} 4NO(g) + 6H_2O(g) :$$

Ostwald's process

$N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$; Haber's process

Vegetable oil $(l) + H_2(g) \xrightarrow{Ni(s)}$ vegetable ghee : Hydrogenation

---

Question 26

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).

Correct answer: 5

Source solution

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G = 57.8 - \frac{298(-176)}{1000}$$
$$\Delta G = -5.352\ kJ/mol$$

| Nearest integer value |$= 5$

Equilibrium

Questions 27-65 / 39 selected / 13.0% practice weight / Focus first

Question 27

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 x is . (Integer answer)
[Given $\mathbf{R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Correct answer: 6

Source solution

moles of $\mathbf{NH_4HS}$ initially taken $= \frac{5.1\ g}{51\ g/mol}$

$$= 0.1\ mol$$

volume of vessel $= 2\ell$

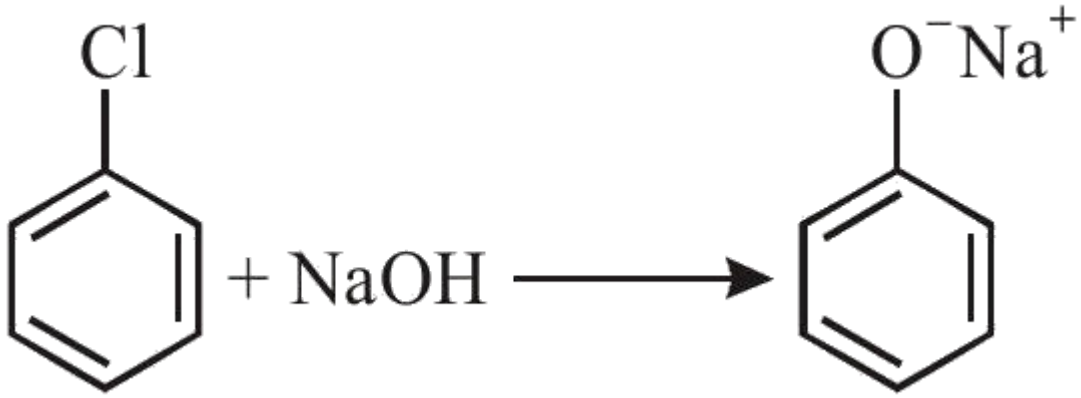
	$NH_4HS_{(s)} \rightleftharpoons$	$NH_{3(g)} + H_2S_{(g)}$	
$t = 0$	0.1 mol		
$t = \infty$	$0.1(1 - 0.2)$	0.1×0.2	0.1×0.2

$\Rightarrow$ partial pressure of each component
$P = \frac{nRT}{V} = \frac{0.1 \times 0.2 \times 0.082 \times 300}{2}$
$= 0.246\ atm$

$\Rightarrow \mathbf{k_P = P_{NH_3} \times P_{H_2S} = (0.246)^2 = 0.060516}$
$= 6.05 \times 10^{-2}$
$\Rightarrow 6$

Question 28

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

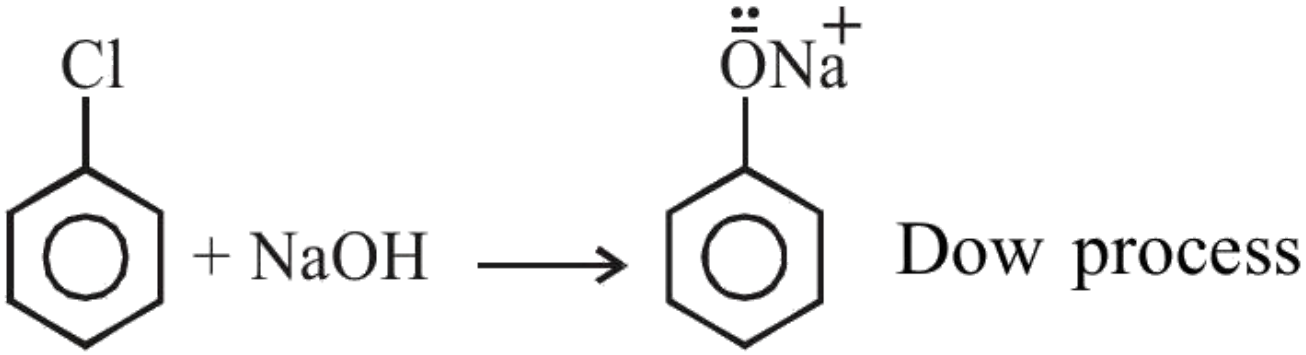
D. 623 K, 300 atm

Correct answer: D

Source solution

Sol.

Temperature = 623 K
Pressure = 300 atm



Question 29

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)

Correct answer: B

Source solution

Cl_2O_7 Acidic
Na_2O Basic
Al_2O_3 Amphoteric
N_2O Neutral

Question 30

$37.8\ g\ N_2O_5$ 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.

Correct answer: 962

Source solution

Initial pressure of N_2O_5

$$= \frac{\frac{37.8}{108} \times 0.082 \times 500}{1} = 14.35 \text{ bar}$$

$$2\ N_2O_5 \rightleftharpoons 2\ N_2O_4 + O_2$$

$t = 0 \quad 14.35$

$t = \text{ eq} \quad 14.35 - 2P \quad 2P \quad P$

$P_{Total} \text{ at eqb } = 14.35 + P = 18.65$

$P = 4.3$

$P_{N_2O_5} = 5.75 \text{ bar}$

$P_{N_2O_4} = 8.6 \text{ bar}$

$P_{O_2} = 4.3 \text{ bar}$

$$k_p = \frac{(8.6)^2 \times (4.3)}{(5.75)^2} = 9.619 = x \times 10^{-2}$$

$x = 961.9 \approx 962$

Ans. 962

Question 31

For the reaction $\mathbf{A(g) \rightleftharpoons B(g)}$ at 495 K , $\mathbf{\Delta_r G^\circ = -9.478\ kJ\ mol^{-1}}$.
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).
$\mathbf{[R = 8.314\ J\ mol^{-1}\ K^{-1}; \ell n10 = 2.303]}$

Numerical answer: _____

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

Correct answer: 20

Source solution

$\mathbf{\Delta G^\circ = -RT\ell nK_{eq}}$
Given $\mathbf{\Delta G^\circ = -9.478 KJ/mole}$

$$\mathbf{T = 495\ K \quad R = 8.314\ J\ mol^{-1}}$$

So $\mathbf{-9.478 \times 10^3 = -495 \times 8.314 \times \ell nK_{eq}}$

$$\mathbf{\ln K_{eq} = 2.303 = \ln 10}$$

So $\mathbf{K_{eq} = 10}$
Now $\mathbf{A(g) \rightleftharpoons B(g)}$
$\mathbf{t = 0 \quad 22 \quad 0}$
$\mathbf{t = t \quad 22 - x \quad x}$
$\mathbf{K_{eq} = \frac{[B]}{[C]} = \frac{x}{22-x} = 10}$
or $\mathbf{x = 20}$
So millmoles of $\mathbf{B = 20}$

Question 32

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).

Correct answer: 3

Source solution

$[NH_4^+] = 0.0504 \& [NH_3] = 0.0210$
So $K_b = \frac{[NH_4^+][HO^-]}{[NH_3]}$
$[HO^-] = \frac{K_b \times [NH_3]}{[NH_4^+]} = 1.8 \times 10^{-5} \times \frac{2}{5} \times \frac{210}{504} = 3 \times 10^{-6}$

Question 33

Assuming that $\mathbf{Ba(OH)_2}$ is completely ionised in aqueous solution under the given conditions the concentration of $\mathbf{H_3O^+}$ions in 0.005 M aqueous solution of $\mathbf{Ba(OH)_2}$ at 298 K is ___ $\times \mathbf{10^{-12}}$ $\mathbf{mol\ L^{-1}}$. (Nearest integer)

Numerical answer: _____

Enter the requested integer (0 decimal places).

Correct answer: 1

Source solution

$$\mathbf{Ba(OH)_2 \rightarrow Ba^{+2} + 2OH}$$

$$\mathbf{2 \times \overset{\downarrow}{0.005} = 0.01 = 10^{-2}}$$

At 298 K : in aq. solution $\mathbf{\left[H_3O^+\right]\left[OH^-\right] = 10^{-14}}$

$$\mathbf{\left[H_3O^+\right] = \frac{10^{-14}}{10^{-2}} = 10^{-12}}$$

Question 34

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.

Correct answer: 44

Source solution

$$\mathbf{CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(\,g)} + H_{2(\,g)}}$$

$\mathbf{t = 0}$	1 mol	1 mol	0	0
at equ.	$\mathbf{1 - x}$	$\mathbf{1 - x}$	x	x

at equilibrium $\mathbf{40\%}$ by mass water reacts with CO

$\mathbf{x = 0.4}$

$\mathbf{1 - x = 0.6}$

$\mathbf{K_C = \frac{[CO_2][H_2]}{[CO][H_2O]} = \frac{0.4 \times 0.4}{0.6 \times 0.6} = 0.44}$

$\mathbf{K_C \times 10^2 = 44}$

Question 35

For the reaction $\mathbf{A}_{(g)} \rightarrow \mathbf{B}_{(g)}$, the value of the equilibrium constant at 300 K and 1 atm is equal to 100.0. The value of $\Delta_r \mathbf{G}$ for the reaction at 300 K and 1 atm in $\mathbf{J mol}^{-1}$ is $-x\mathbf{R}$, where x is .
(Rounded off to the nearest integer)
$[\mathbf{R} = 8.31\ \mathbf{J\ mol}^{-1}\ \mathbf{K}^{-1}$ and $\ln 10 = 2.3]$

Numerical answer: _____

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

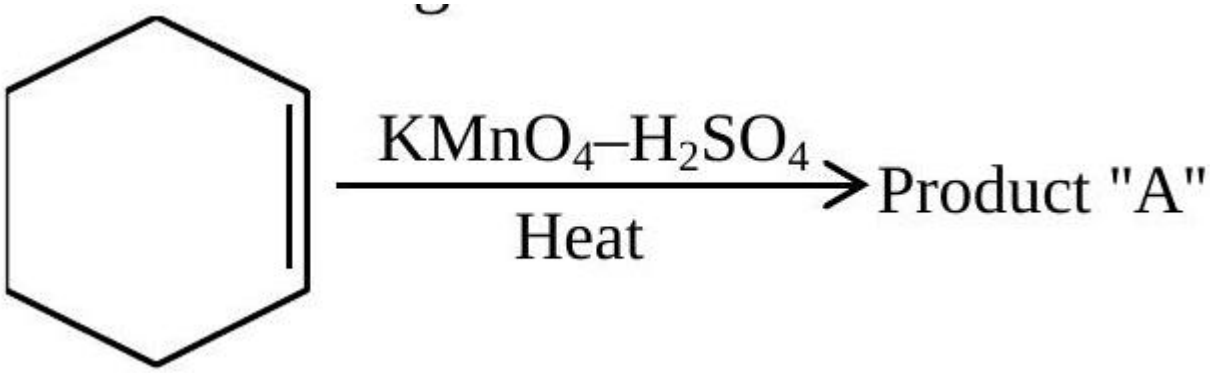
Correct answer: 1380

Source solution

$\Delta G^\circ = -RT \ln$ Keq.
$= -\mathbf{R} \times 300 \times \ln\left(10^2\right)$
$= 300 \times 2 \times 2.3 \times (-\mathbf{R})$
$= -1380\mathbf{R}$
$x = 1380$ ans.

Question 36

Consider the given chemical reaction :



Product " A " is :

A. picric acid

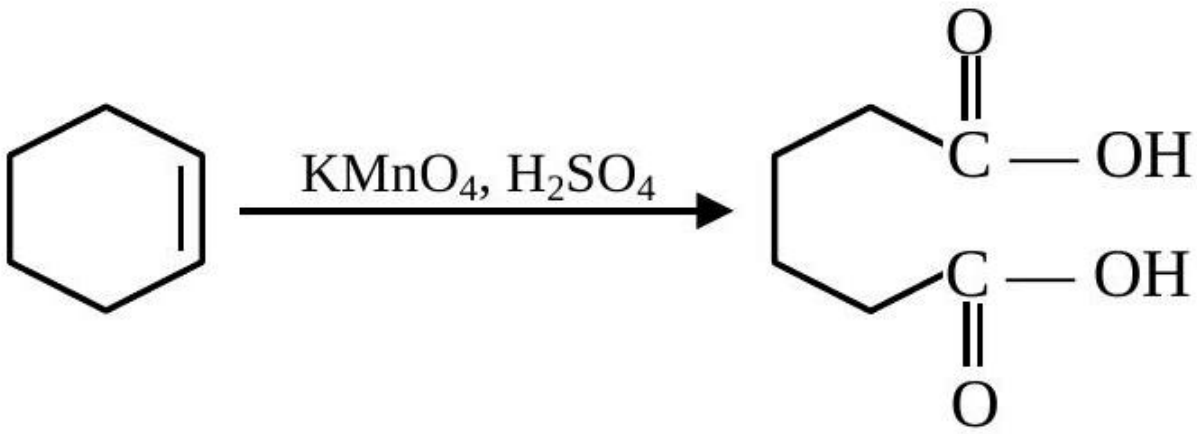
B. oxalic acid

C. acetic acid

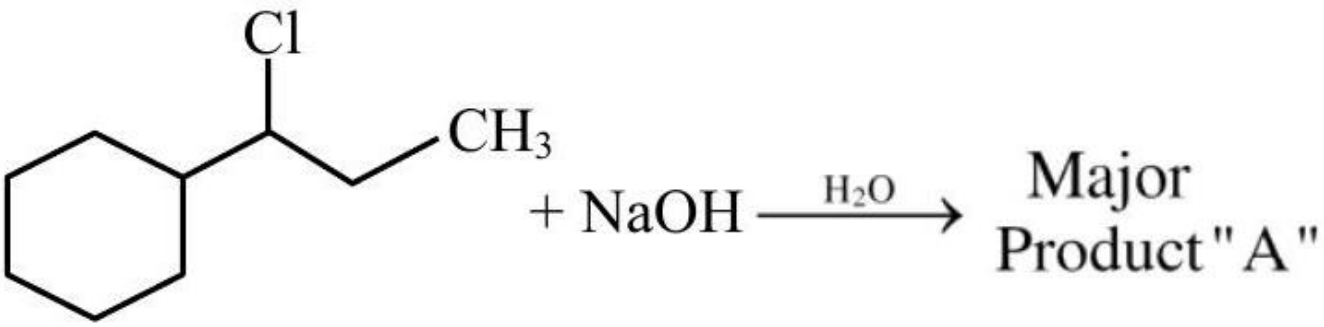
D. adipic acid

Correct answer: D

Source solution

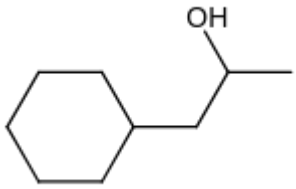


Question 37

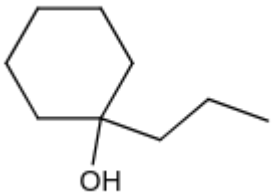


Consider the above chemical reaction. Product " A " is:

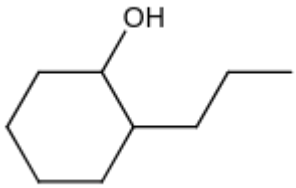
A.



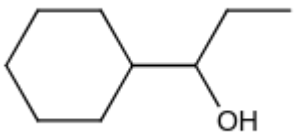
B.



C.

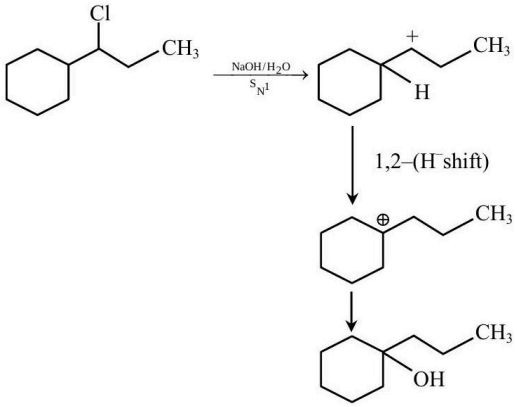


D.



Correct answer: B

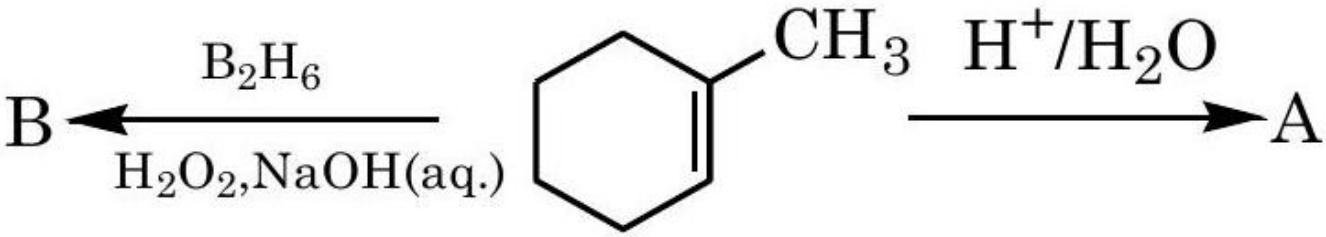
Source solution



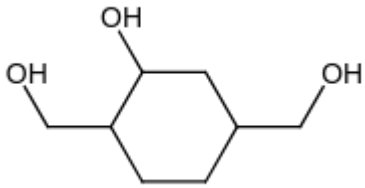
(Major Product)

Question 38

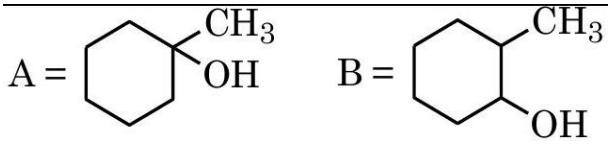
Product A and B formed in the following set of reactions are:



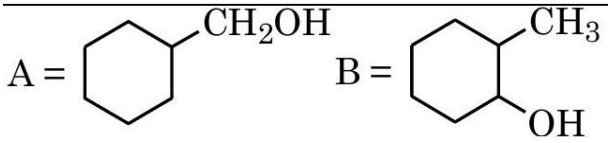
A. A =



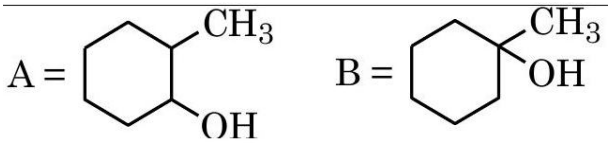
B.



C.

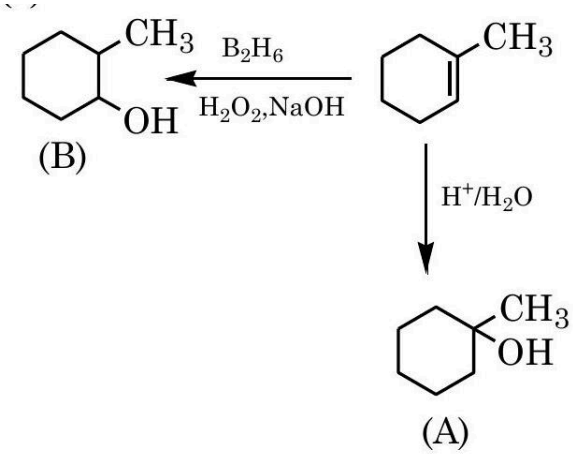


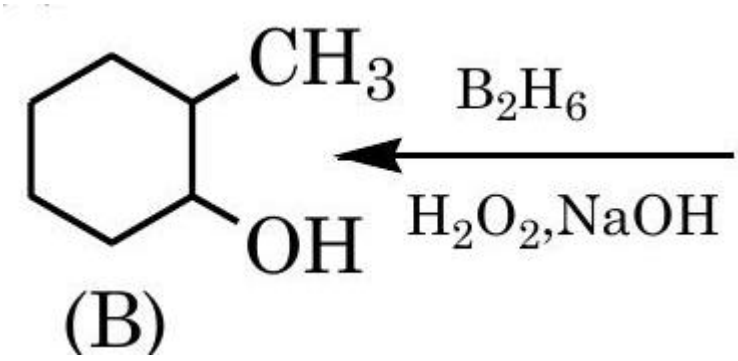
D.



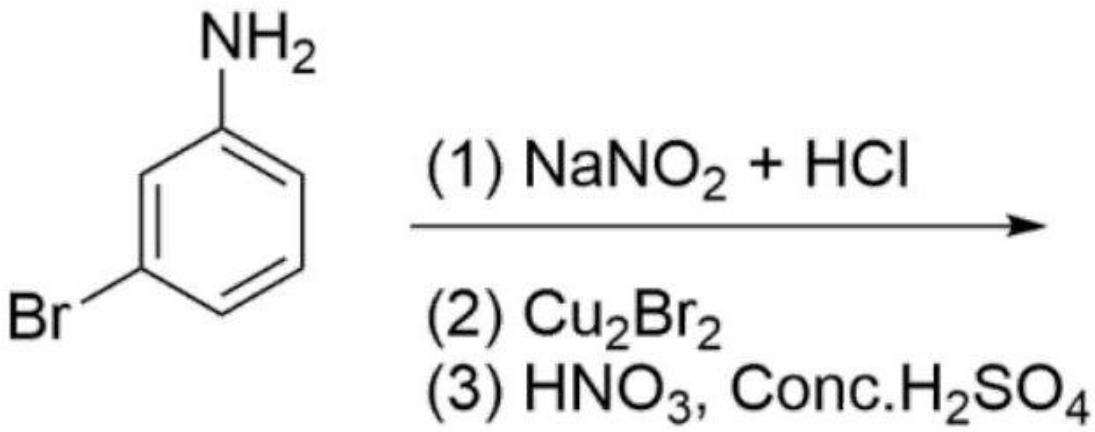
Correct answer: B

Source solution


CH3
B2H6
H2O2,NaOH
OH
(B)
CH3
H+/H2O
CH3
OH
(A)

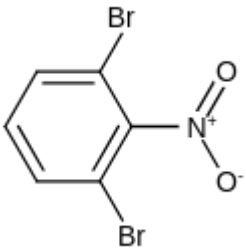

CH3
B2H6
H2O2,NaOH
OH
(B)

Question 39

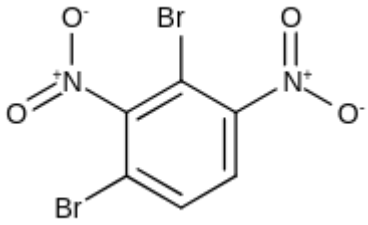


The major product for above sequence of reaction is:

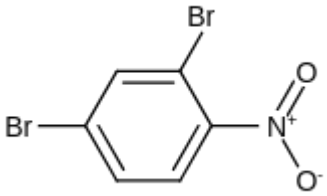
A.



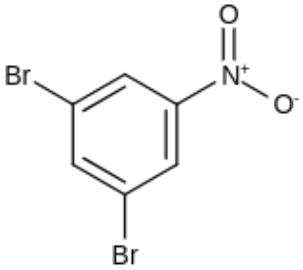
B.



C.



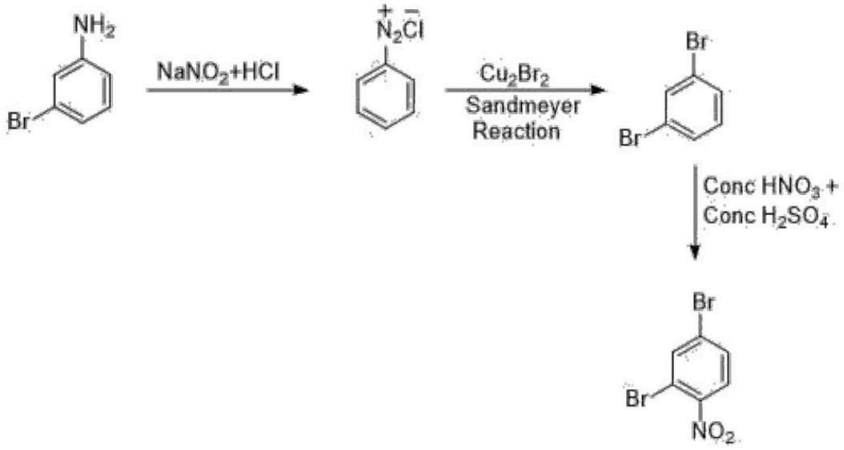
D.

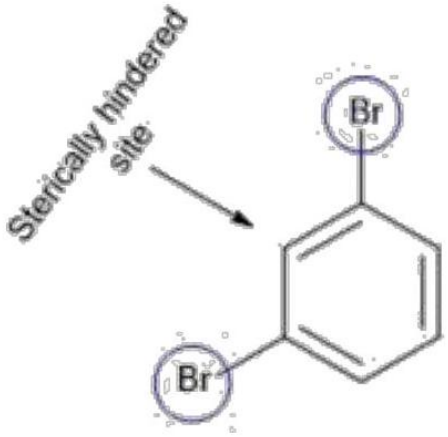


Correct answer: C

Source solution

Solution:

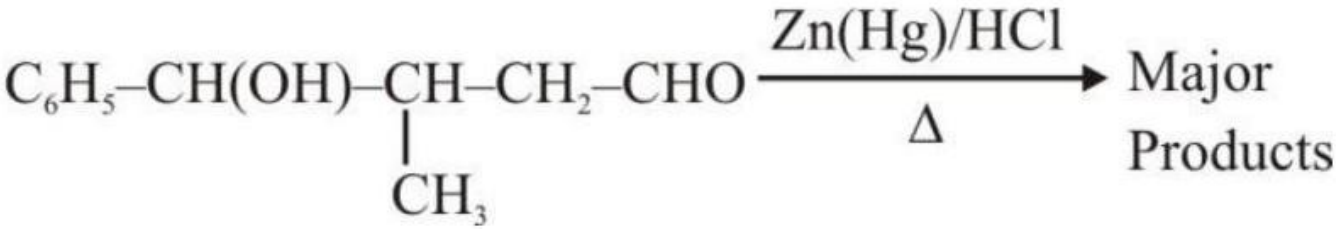




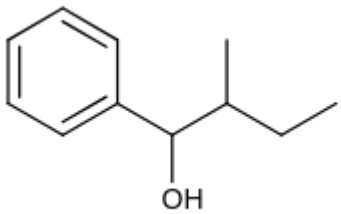
Hence, major product formed is that of option b.

Question 40

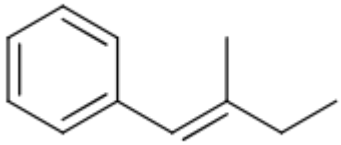
The major product formed in the following reaction is:



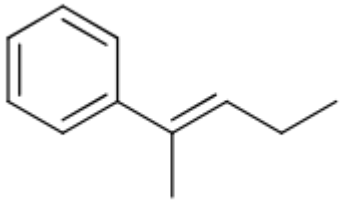
(A)



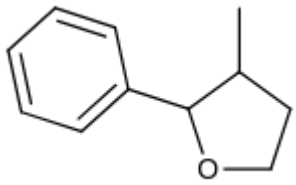
(B)



(C)



(D)



Choose the correct answer from the options given below:

A. A only

B. B only

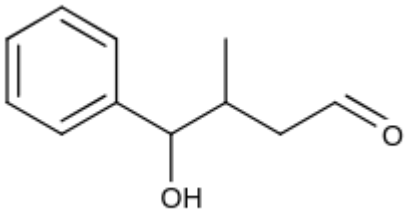
C. C only

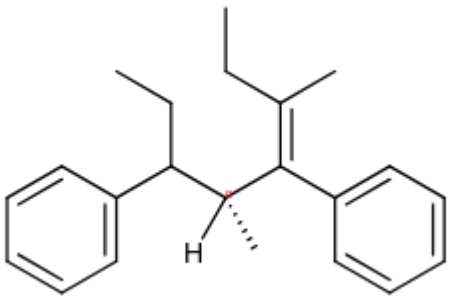
D. D only

Correct answer: B

Source solution

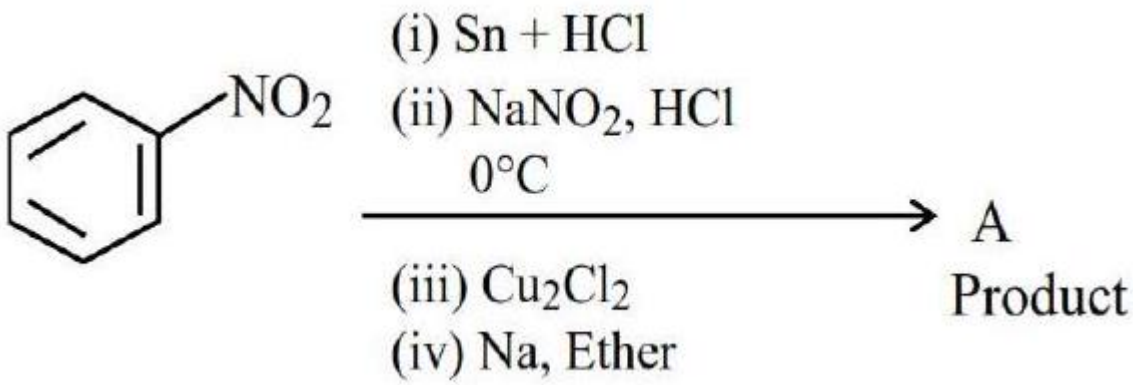
Solution :




H

Question 41

Consider the following sequence of reactions :



Molar mass of the product formed (A) is

gmol^{-1}.

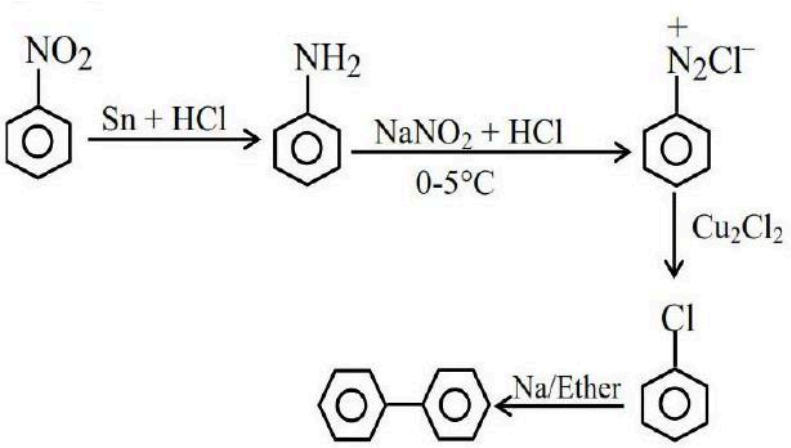
Numerical answer: _____

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

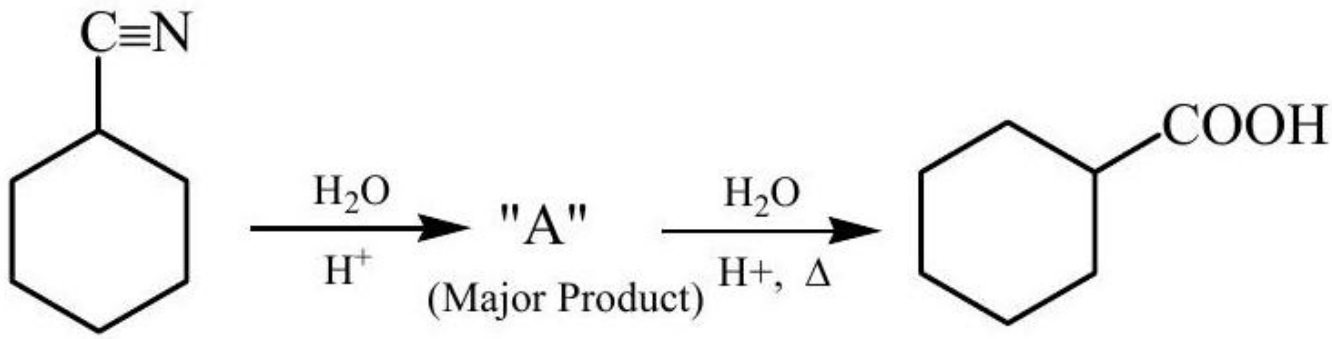
Correct answer: 154

Source solution

Sol.

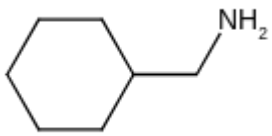


Question 42

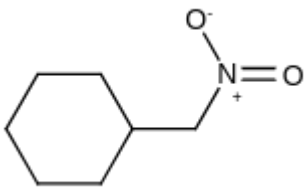


Consider the above chemical reaction and identify product " A "

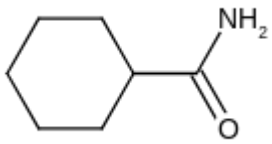
A.



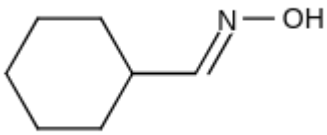
B.



C.

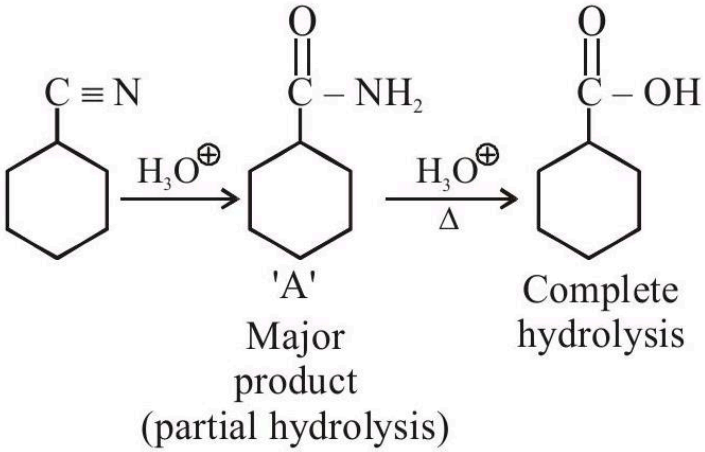


D.



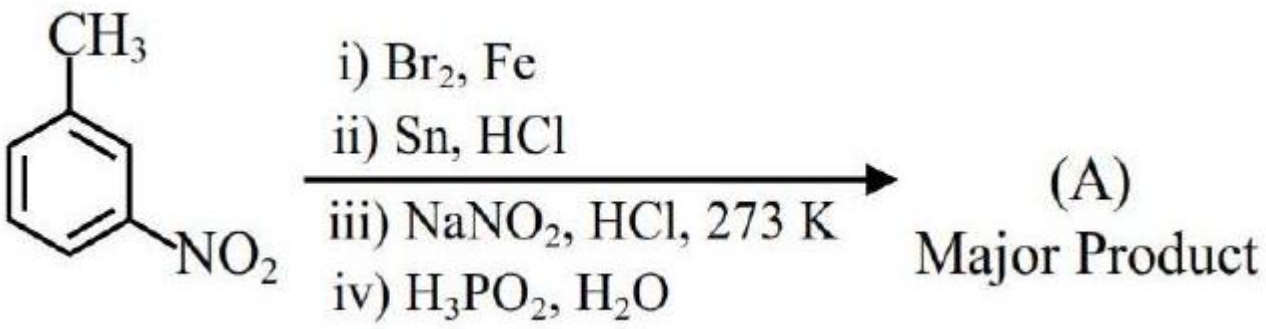
Correct answer: C

Source solution


C ≡ N
H3O⊕
O
C – NH2
'A'
Major
product
(partial hydrolysis)
H3O⊕
Δ
O
C – OH
Complete
hydrolysis

Question 43

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 $\text{C}:12, \text{H}:1$, $\text{O}:16, \text{Br}:80,\ \text{N}:14, \text{P}:31$)

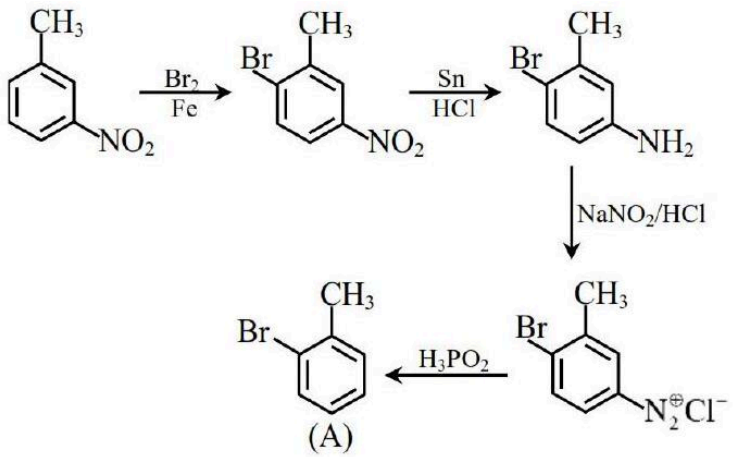
Numerical answer: _____

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

Correct answer: 171

Source solution

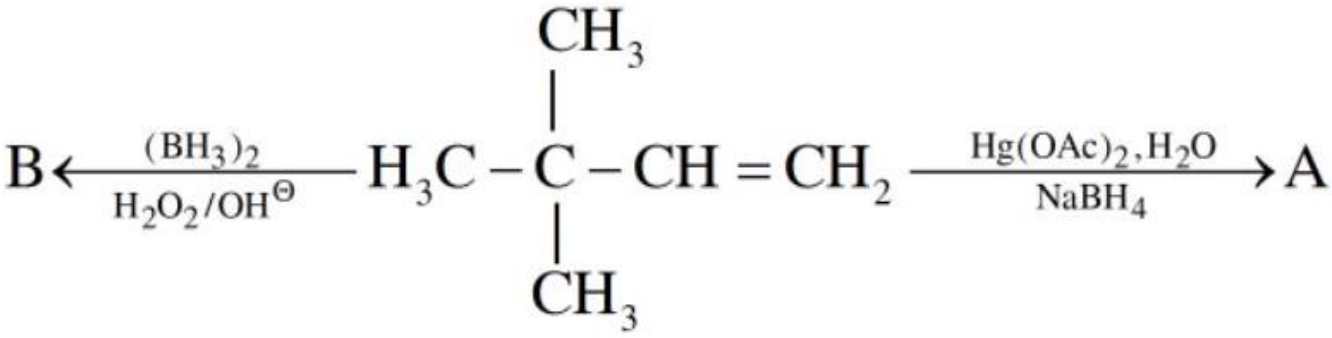
(171)



Molar mass of product $(\text{C}_7\text{H}_7\text{Br})(\text{A})$ is $171\ \text{g mol}^{-1}$

Question 44

Choose the correct option for the following reactions.



A. 'A' and 'B' are both Markovnikov addition products.

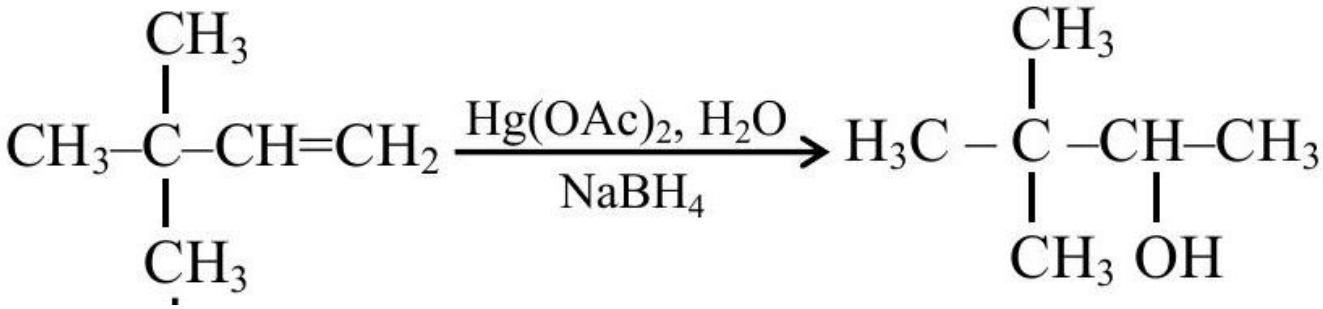
B. ' A ' is Markovnikov product and ' B ' is antiMarkovnikov product.

C. 'A' and 'B' are both anti-Markovnikov products.

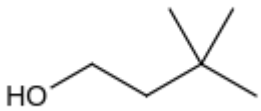
D. ' B ' is Markovnikov and ' A ' is antiMarkovnikov product.

Correct answer: B

Source solution



(A)
(Markovnikov product)

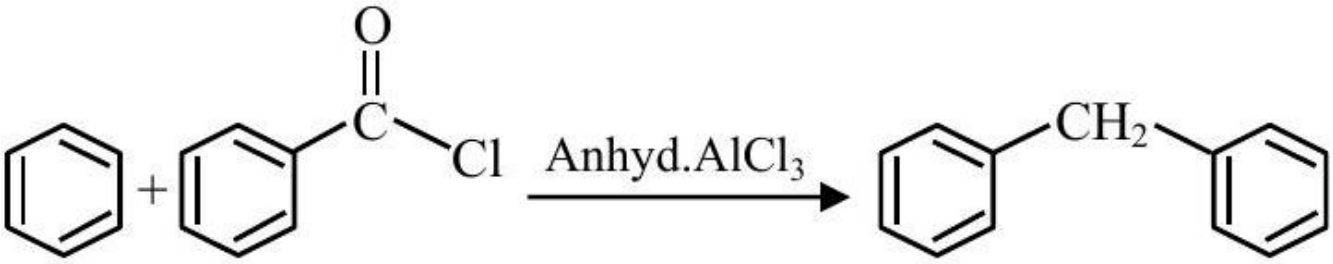


(B)
(Anti Markovnikov product)

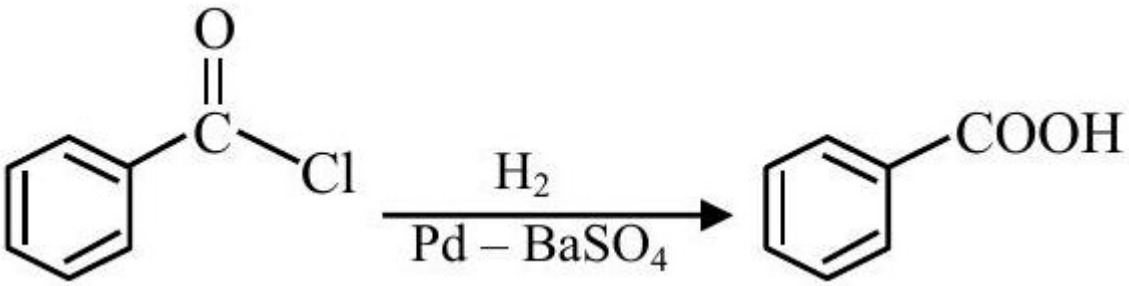
Question 45

The number of correct reaction(s) among the following is .

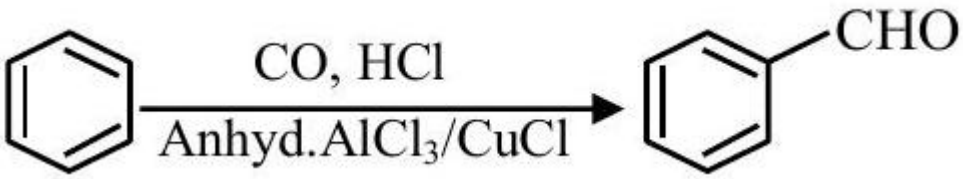
(A)



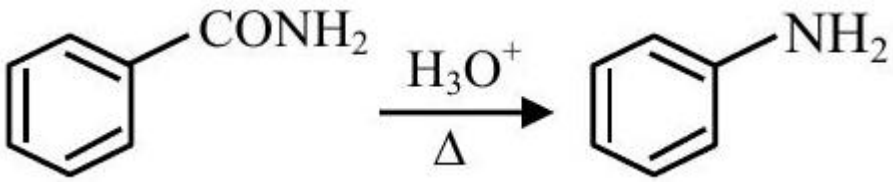
(B)



(C)



(D)



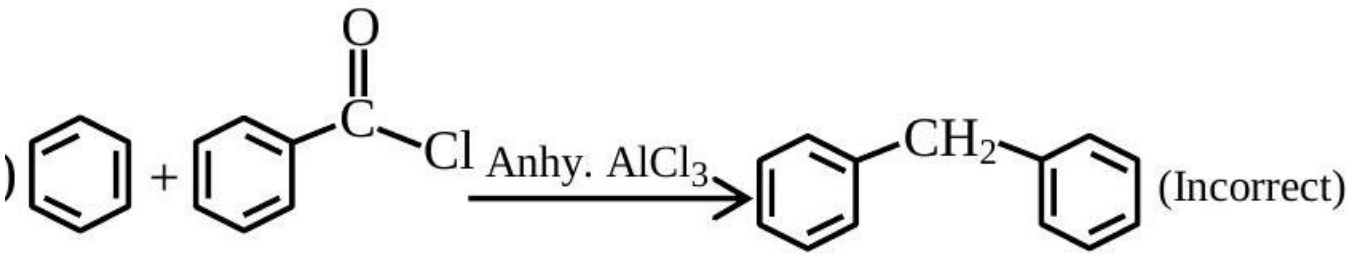
Numerical answer: _____

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

Correct answer: 1

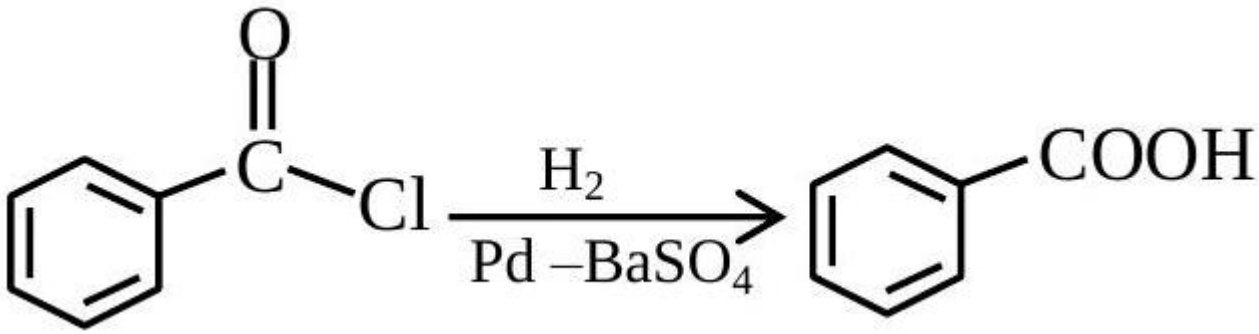
Source solution

(A)



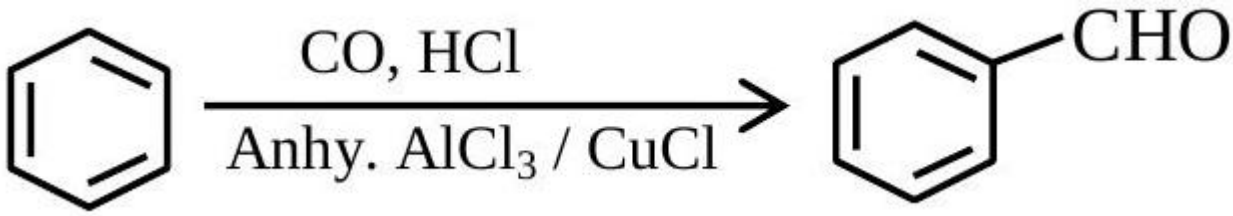
(Incorrect)

(B)



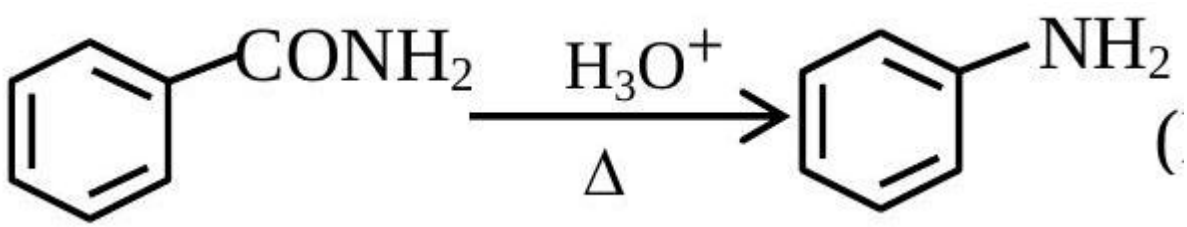
(Incorrect)

(C)



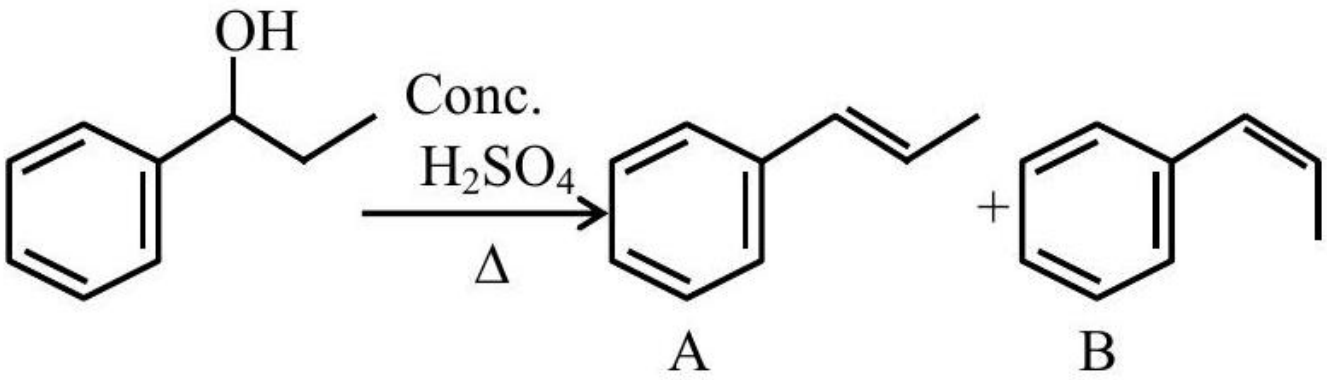
(Correct)

(D)



(Incorrect)

Question 46



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

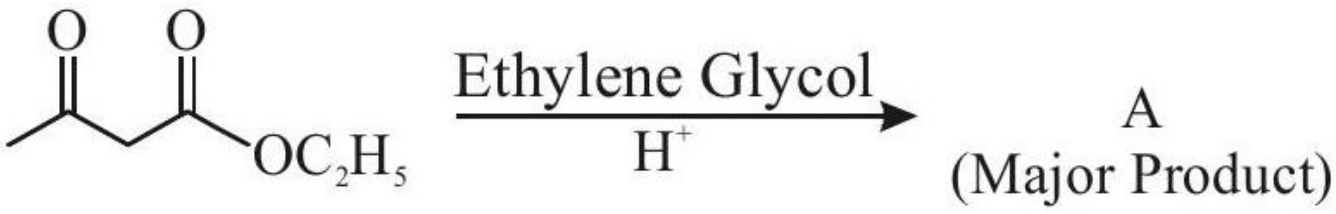
D. Compound **B** will be the major product

Correct answer: C

The source provides a brief answer only. A detailed worked solution is not available for this question.

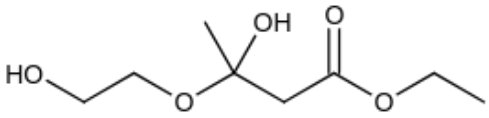
Source solution

Question 47

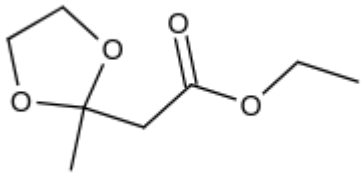


The product " A " in the above reaction is:

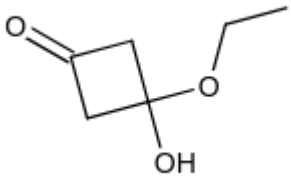
A.



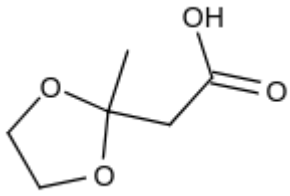
B.



C.

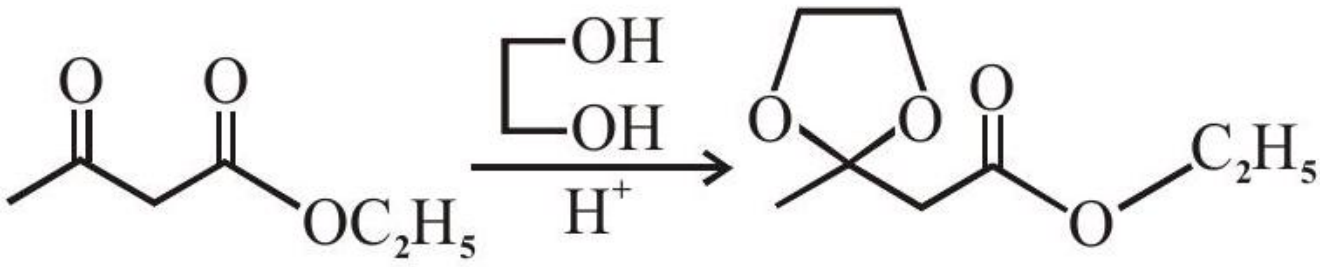


D.



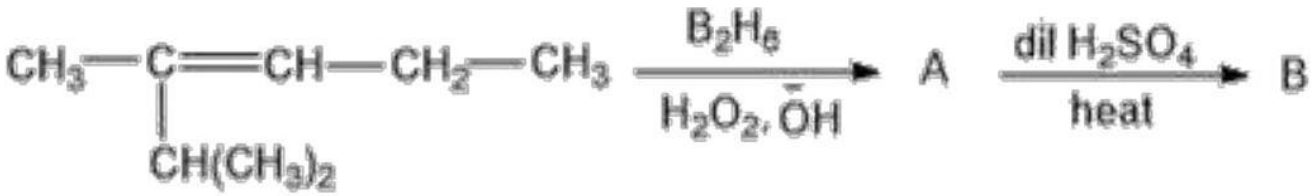
Correct answer: B

Source solution



Question 48

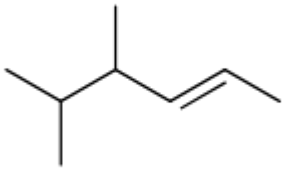
Find the final major product of the following reactions?



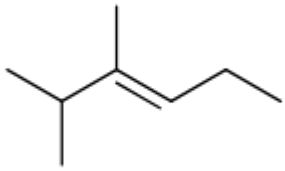
A.



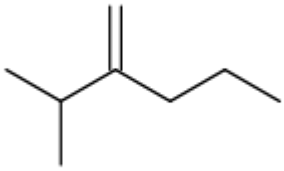
B.



C.



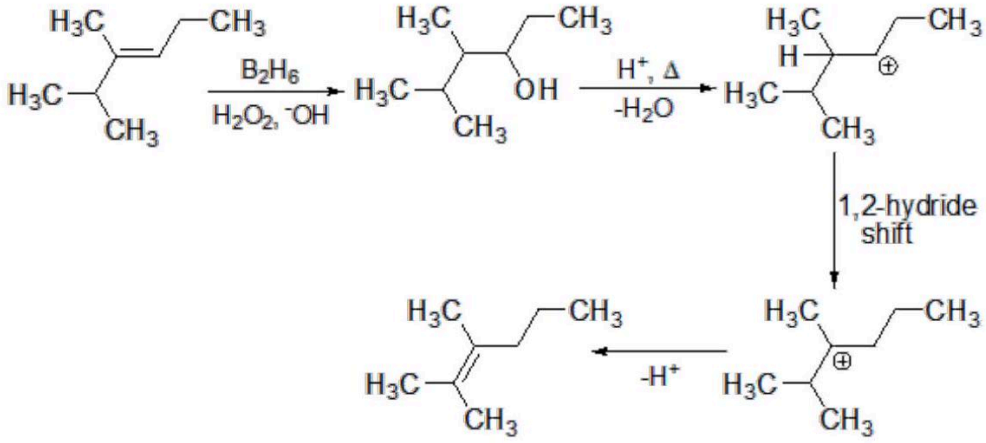
D.



Correct answer: A

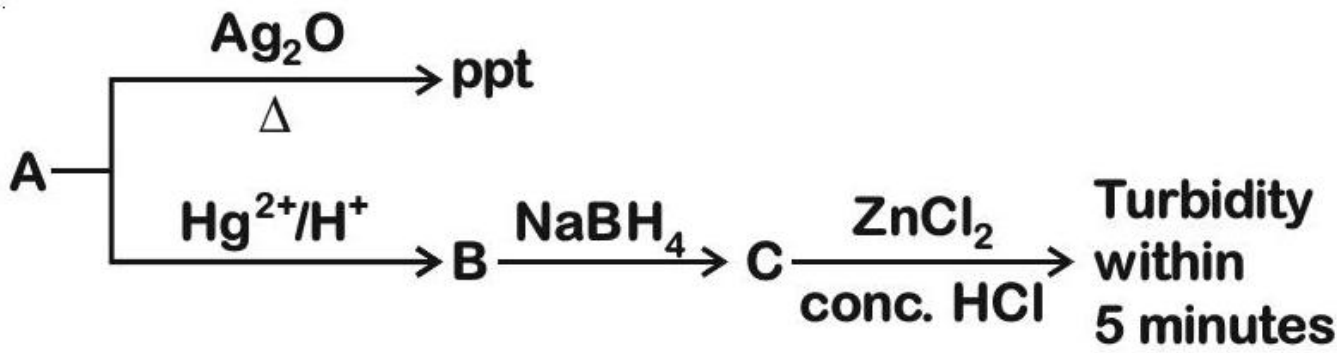
Source solution

Solution:


H3C
CH3
H3C
CH3
B2H6
H2O2, -OH
H3C
OH
H3C
CH3
H+, Δ
-H2O
H3C
H
CH3
H3C
CH3
1,2-hydride
shift
H3C
CH3
H3C
CH3
-H+
H3C
CH3
H3C
CH3

Question 49

Consider the following reactions :



'A' is

A. $CH_3 - C \equiv CH$

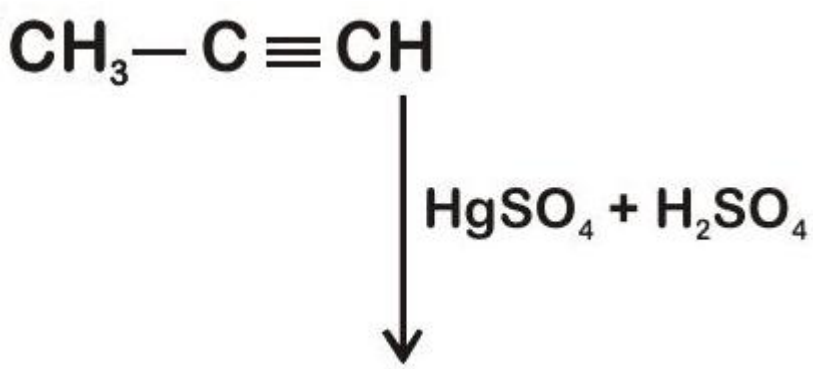
B. $CH_3 - C \equiv C - CH_3$

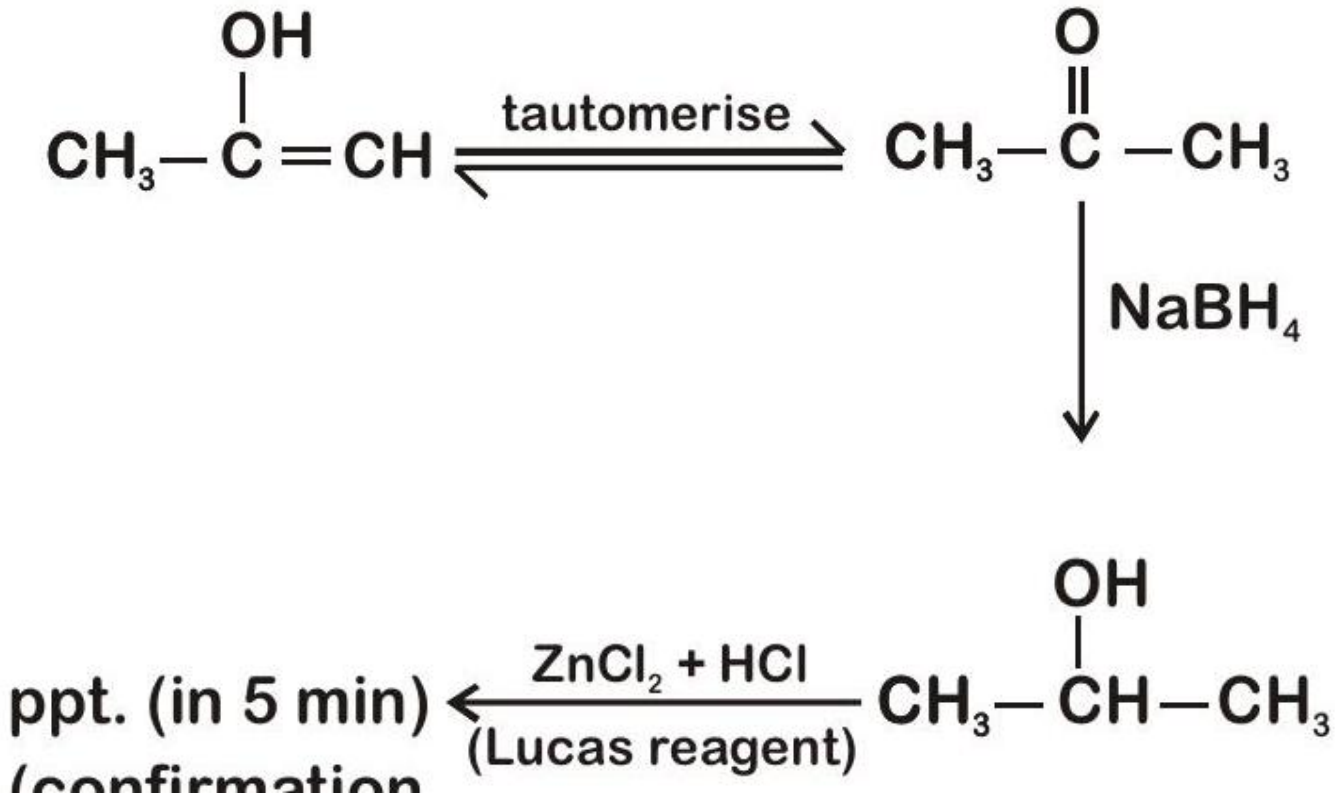
C. $CH_2 = CH_2$

D. $CH \equiv CH$

Correct answer: A

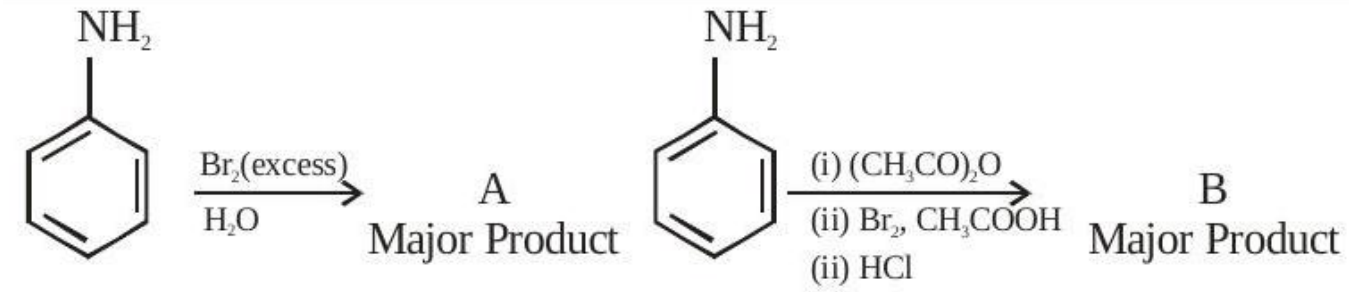
Source solution





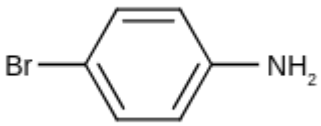
(confirmation of **2°** alcohol)

Question 50

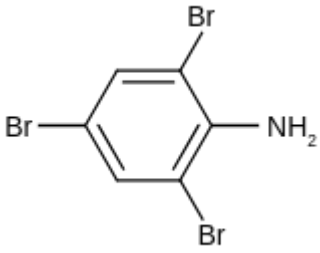


Consider the above reaction, the product A and product B respectively are

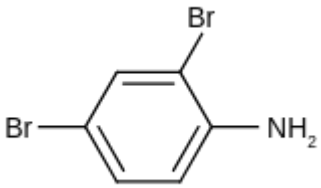
A.



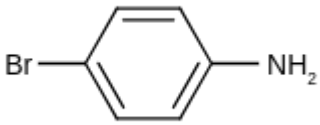
B.



C.

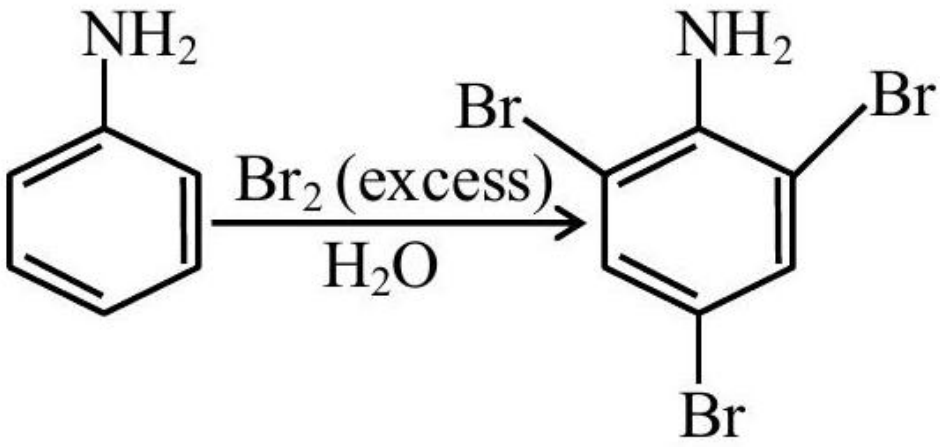


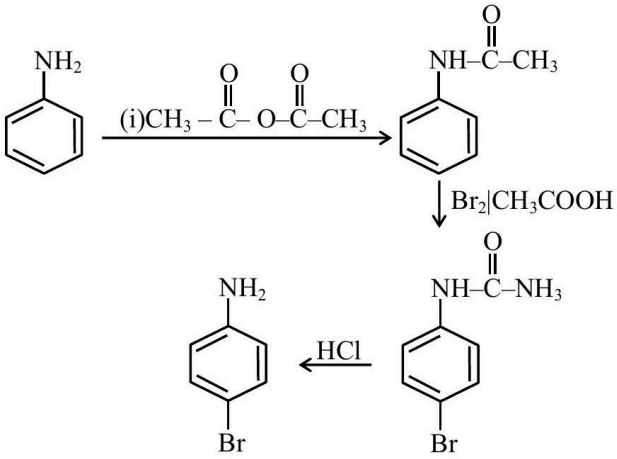
D.



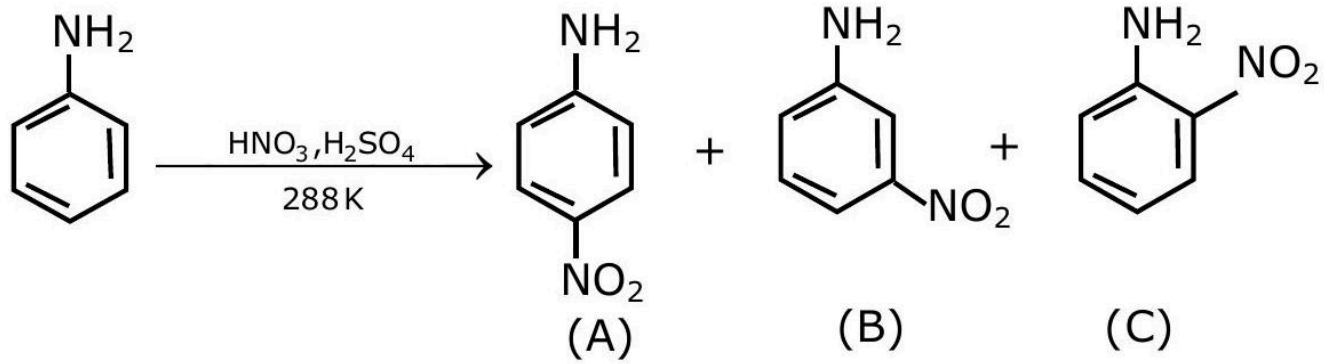
Correct answer: C

Source solution


NH2
Br2 (excess)
H2O
NH2
Br
Br
Br


NH2
(i)CH3 – C– O–C–CH3
NH–C–CH3
Br2|CH3COOH
NH–C–NH3
HCl
NH2
Br
Br

Question 51



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.

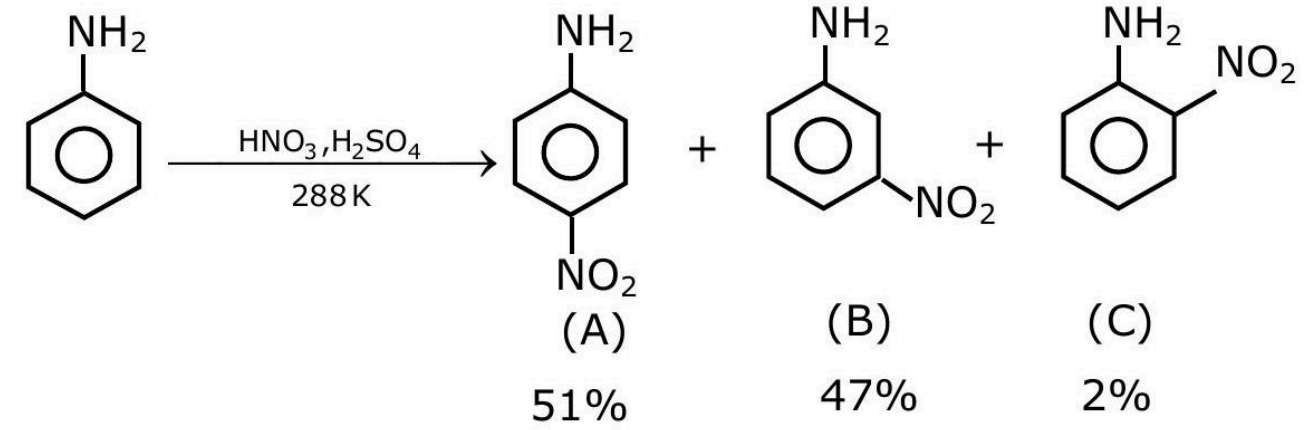
C. $-NH_2$ group is ortho and para directive, so product (B) is not possible.

D. Reaction is possible and compound (B) will be the major product.

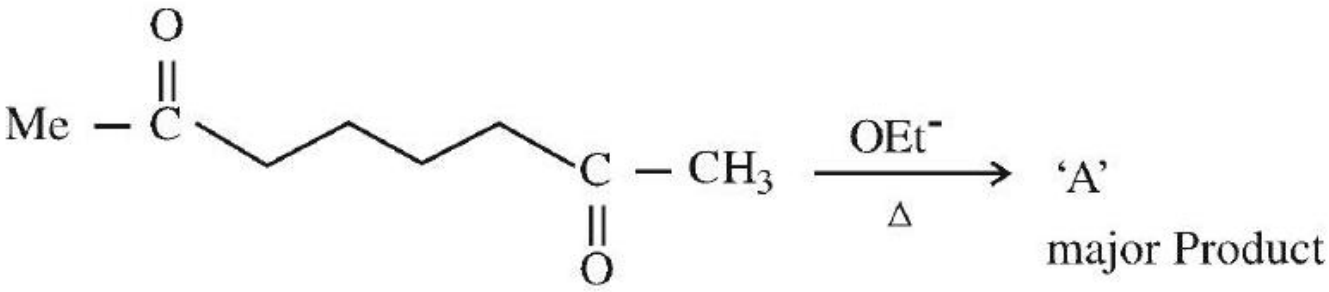
Correct answer: A

Source solution

-

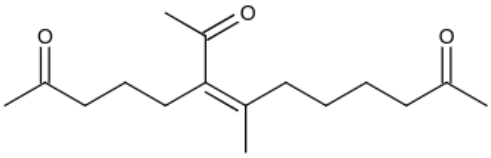


Question 52

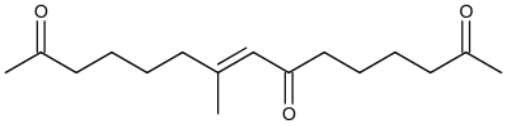


A in the above reaction is :

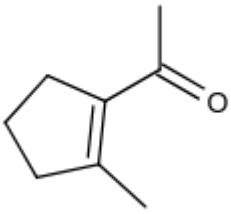
A.



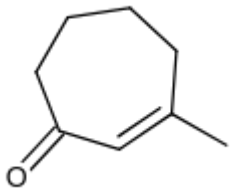
B.



C.

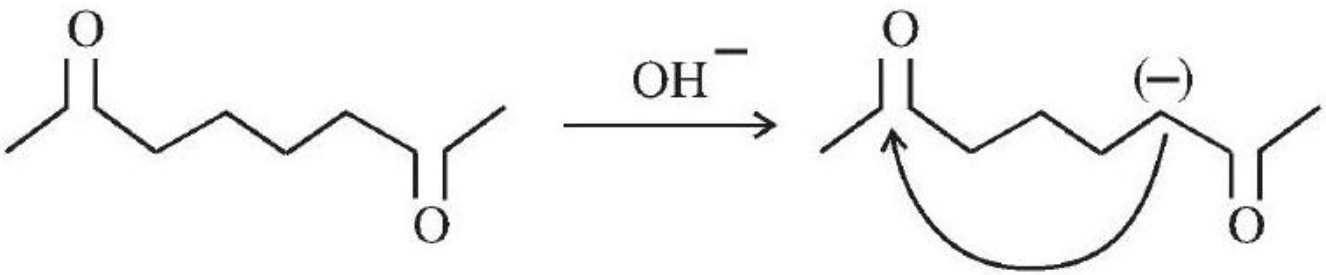


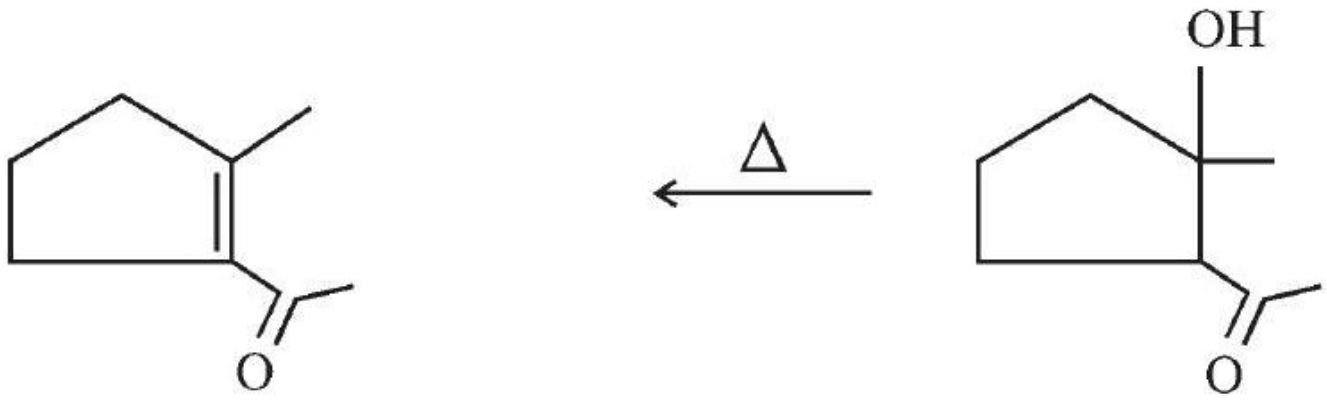
D.



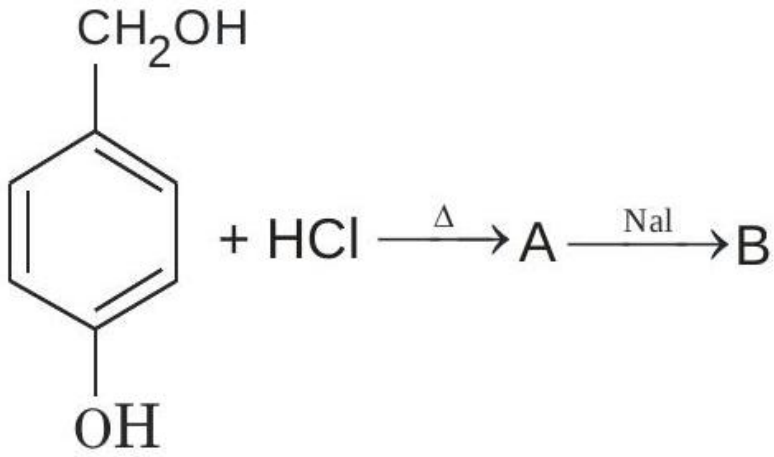
Correct answer: C

Source solution



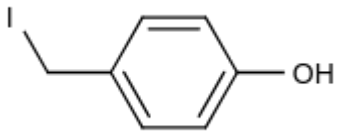

OH
Δ
O
O

Question 53

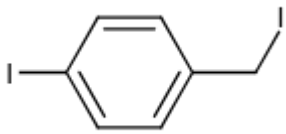


In the above reaction product B is:

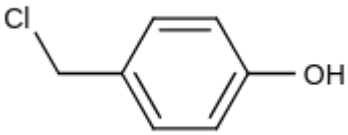
A.



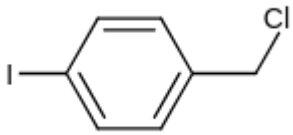
B.



C.

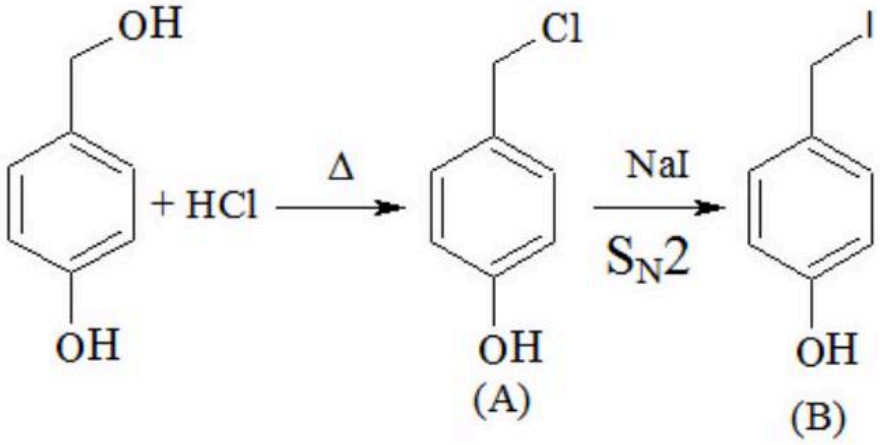


D.



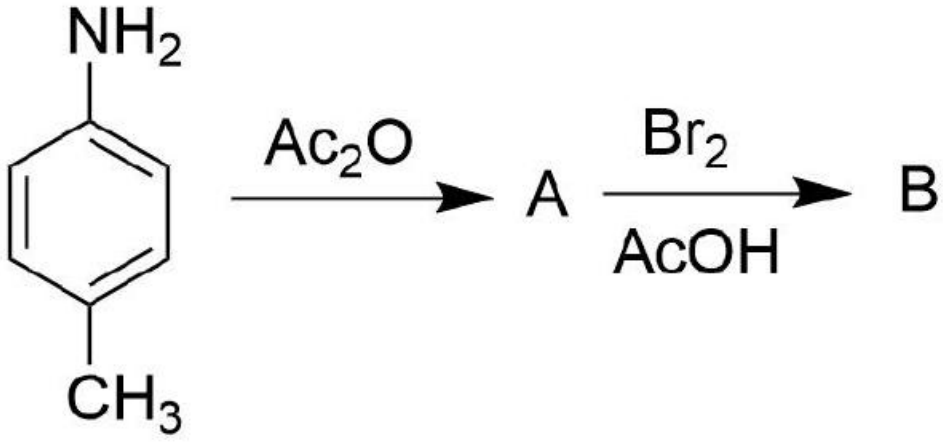
Correct answer: A

Source solution

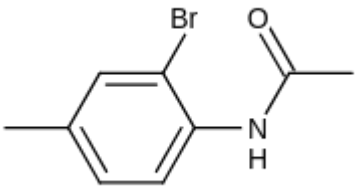

OH
+ HCl
Δ
Cl
NaI
S_N2
I
OH
OH
OH
(A)
(B)

Question 54

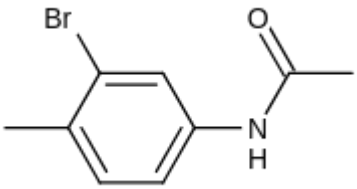
B in the given reaction is?



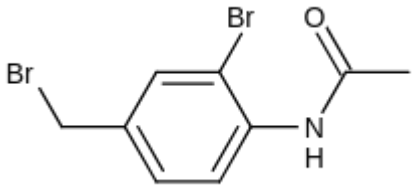
A.



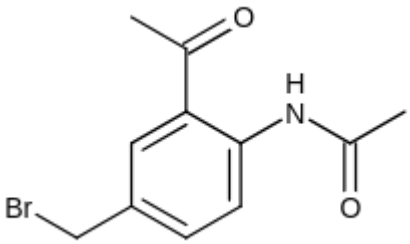
B.



C.



D.

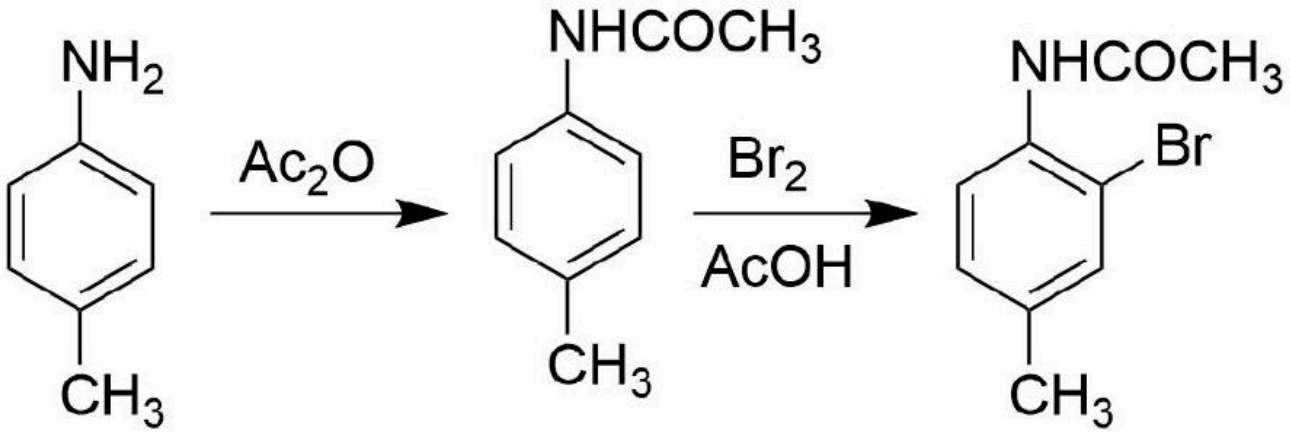


Correct answer: A

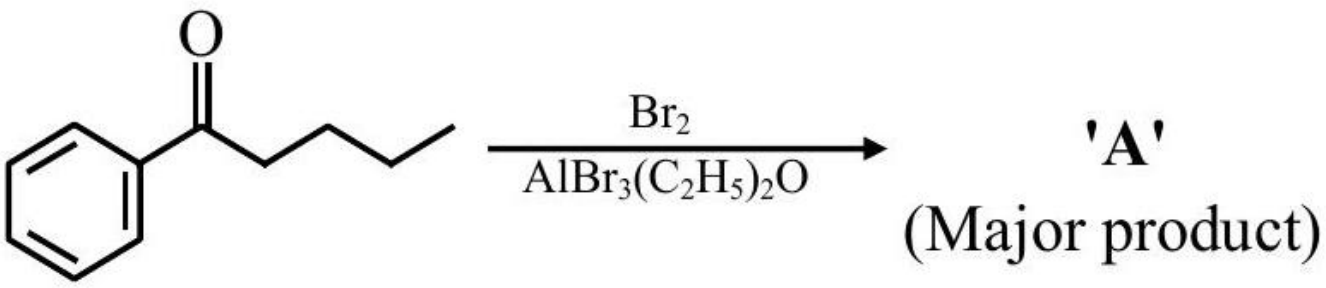
Source solution

Solution:

During trisubstitution, the acetanilide group attached to the benzene ring is more electron donating than the methyl group attached, owing to +M effect, and therefore, the incoming electrophile would prefer ortho w.r.t the acetanilide group.

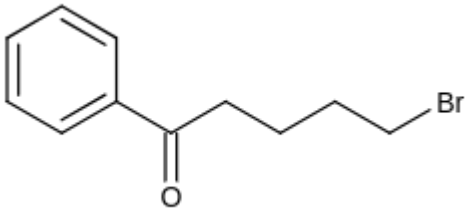

NH2
CH3
Ac2O
NHCOCH3
CH3
Br2
AcOH
NHCOCH3
Br
CH3

Question 55

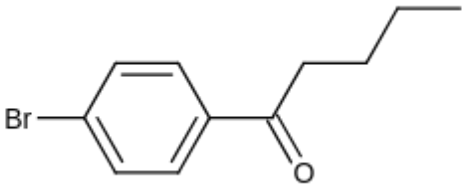


Consider the given reaction, the product **A** is :

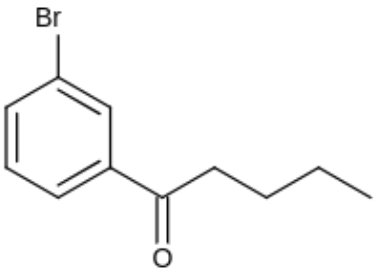
A.



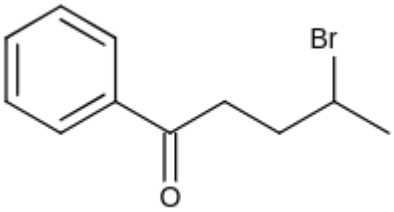
B.



C.

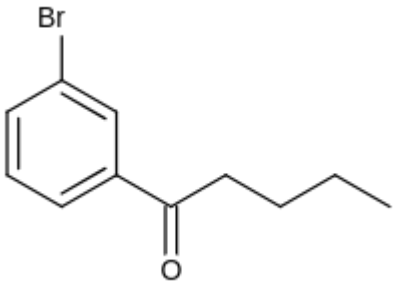


D.



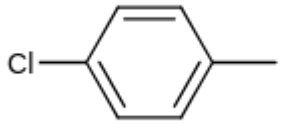
Correct answer: C

Source solution

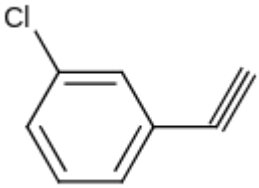

Br
O

Question 56

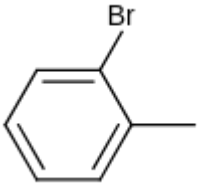
Among the following compounds I-IV, which one forms a yellow precipitate on reacting sequentially with (i) NaOH (ii) dil. HNO_3 (iii) $AgNO_3$?



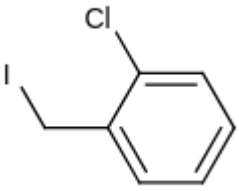
I



II



III



IV

A. II

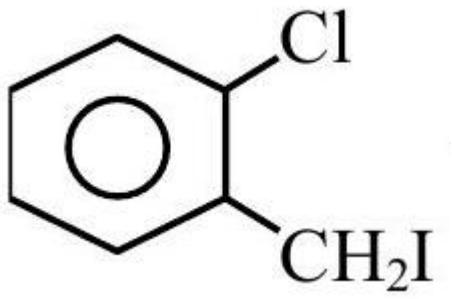
B. IV

C. I

D. III

Correct answer: B

Source solution



$\xrightarrow[\text{(ii) } HNO_3]{\text{(i) NaOH}}$ AgI ppt is

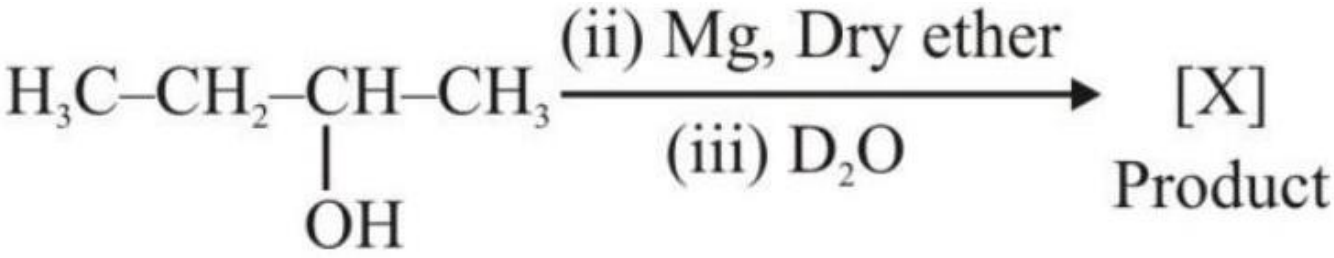
(ii) HNO_3 found which is

(iii) $AgNO_3$ found which is

yellow colour

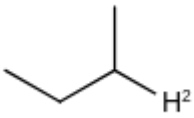
Other compounds halide can't be removed because corresponding $C^+$is highly unstable.

Question 57

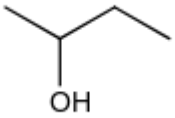


Product [X] formed in the above reaction is :

A.



B.



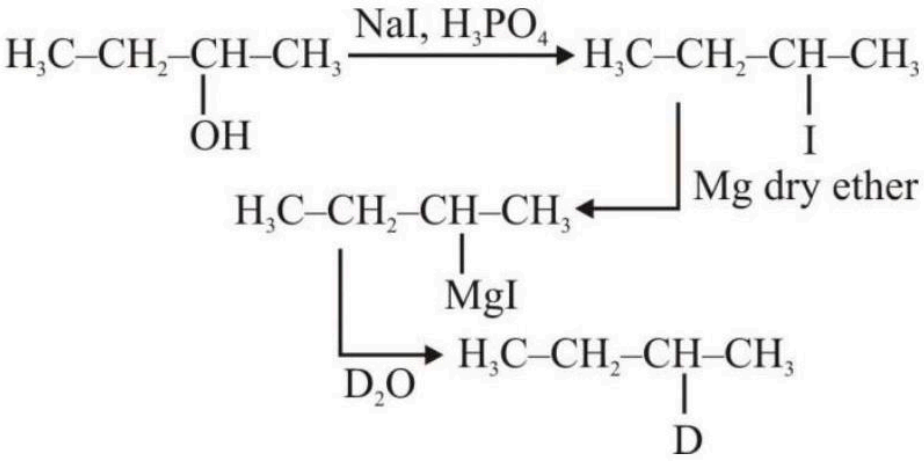
C. $H_3C-CH_2-CH=CH_2$

D. $H_3C-CH=CH-CH_3$

Correct answer: A

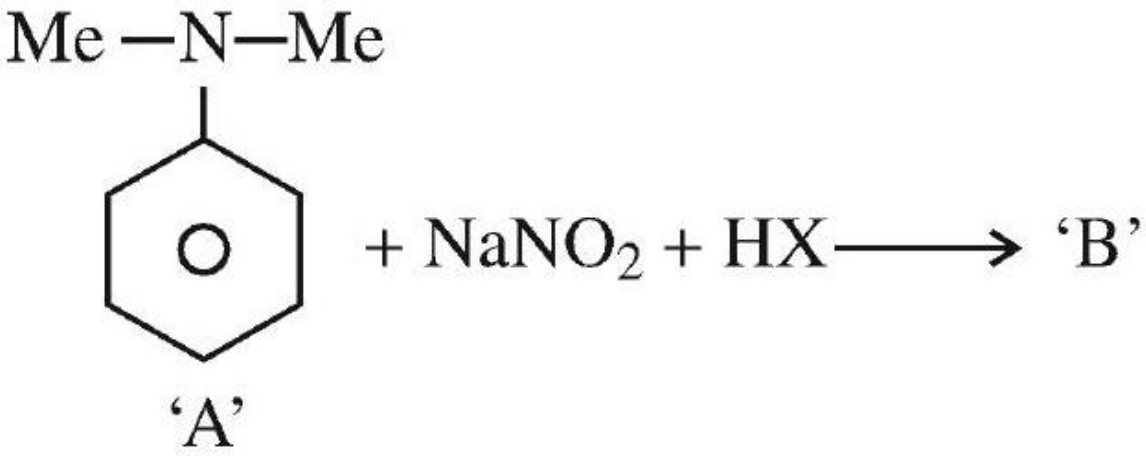
Source solution

Solution :



Question 58

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

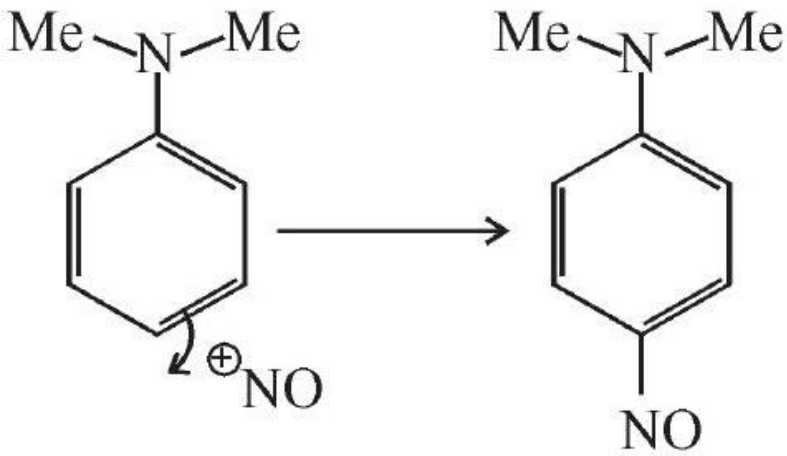
---

Correct answer: B

Source solution

$NaNO_2 + HX \rightarrow HNO_2 + NaX$

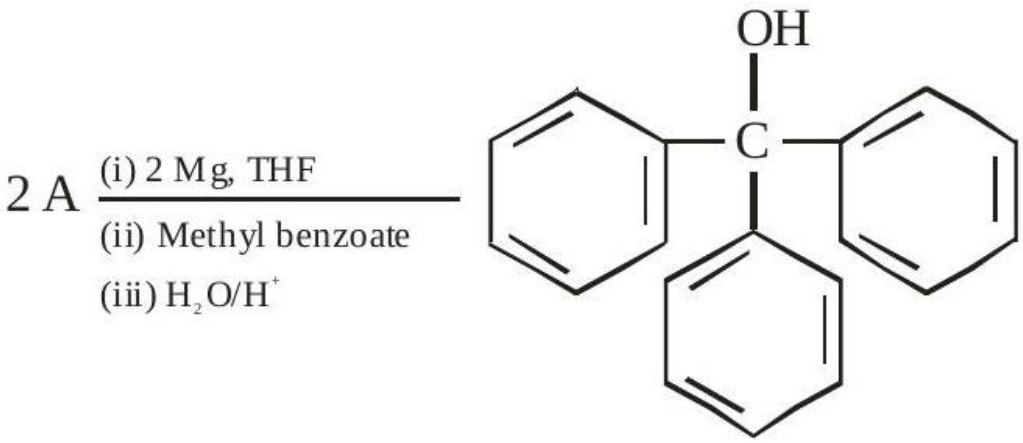
$H - O - N = O \xrightarrow[-H_2O]{H^\oplus} NO^\oplus$ (Nitrosonium ion)



P - Nitroso product

Question 59

In the given reaction



'A' can be

A. benzyl bromide

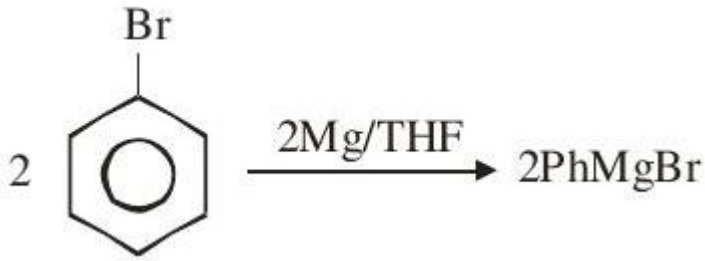
B. bromobenzene

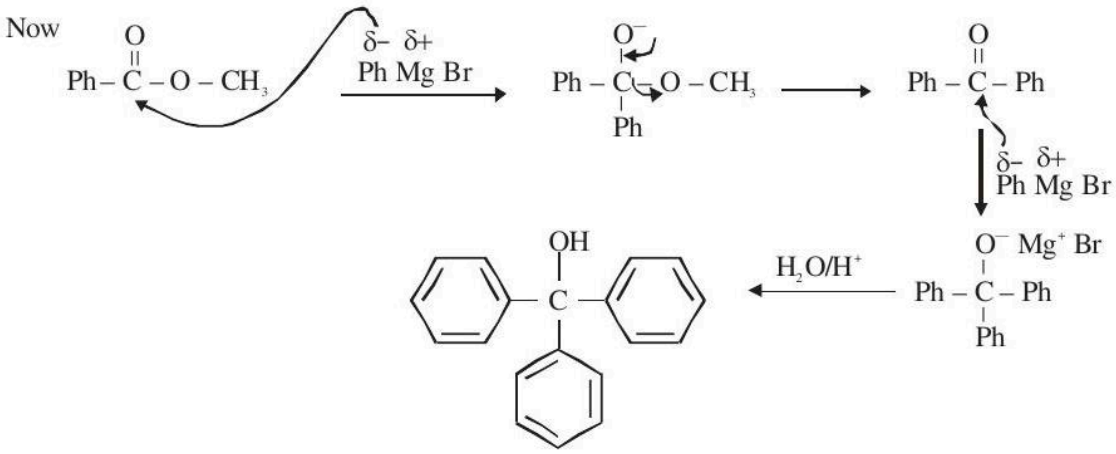
C. cyclohexyl bromide

D. methyl bromide

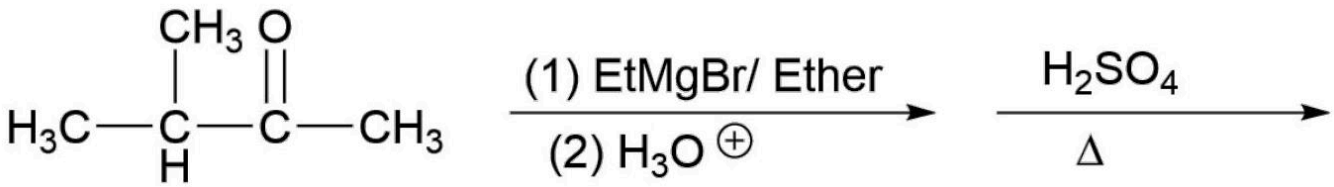
Correct answer: B

Source solution



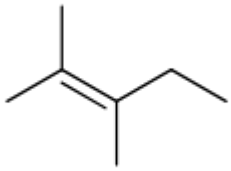

Now
Ph – C – O – CH3
δ– δ+
Ph Mg Br
Ph – C – O – CH3
Ph
Ph – C – Ph
δ– δ+
Ph Mg Br
O⁻ Mg⁺ Br
Ph – C – Ph
Ph
H2O/H+
OH
C

Question 60

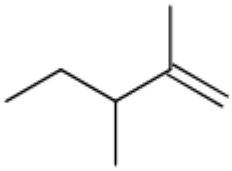


What will be the major product?

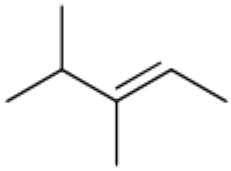
A.



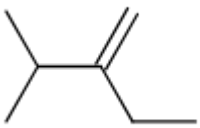
B.



C.



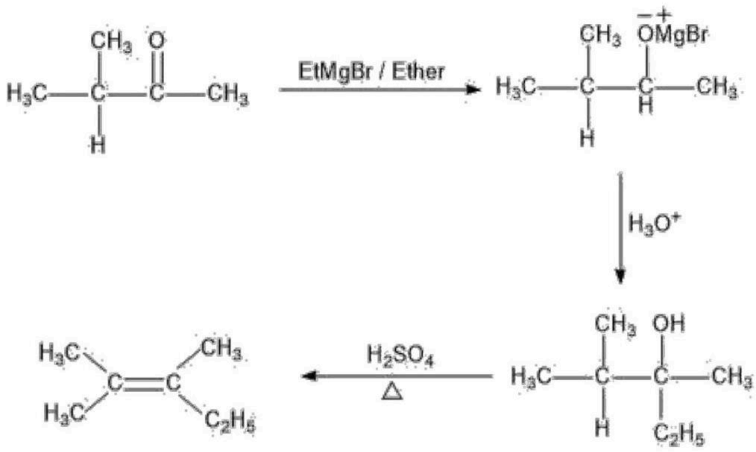
D.



Correct answer: A

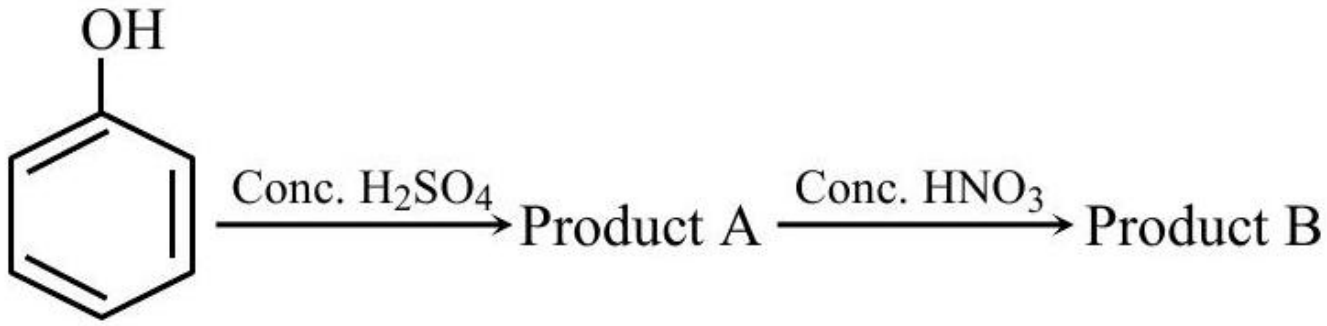
Source solution

Solution:



Question 61

Consider the given chemical reaction sequence :



Total sum of oxygen atoms in Product A and Product B are

Numerical answer: _____

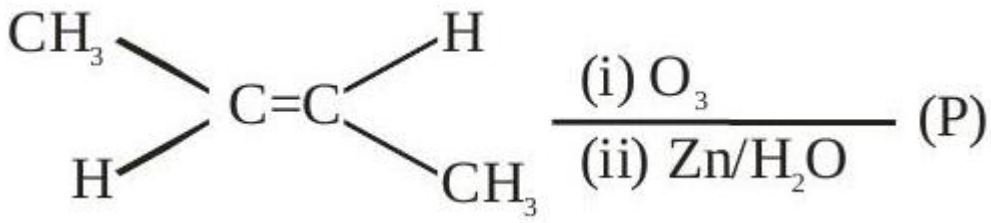
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Correct answer: 14

Source solution

Picric acid is prepared by treating phenol first with concentrated sulphuric acid which converts it to phenol-2,4-disulphonic acid and then with concentrated nitric acid to get 2, 4, 6 trinitrophenol.

Question 62



Consider the given reaction. The total number of oxygen atoms present per molecule of the product (P) is

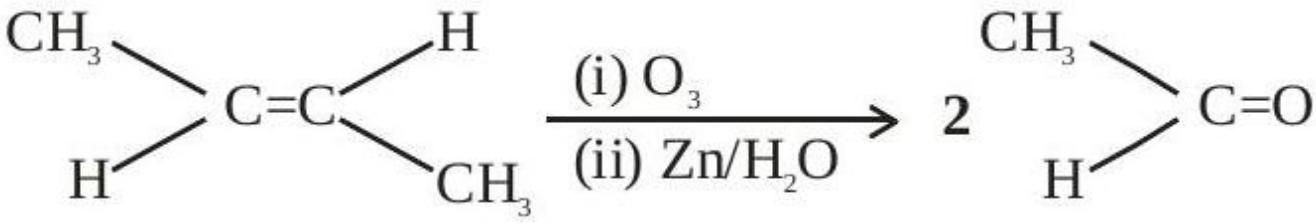
.

Numerical answer: _____

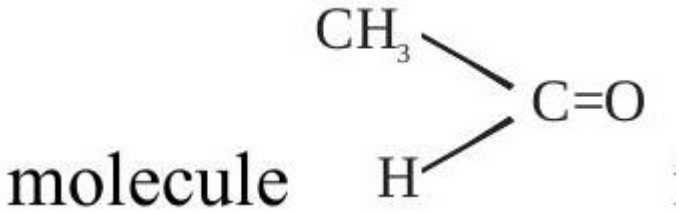
Enter the requested value (an integer; 0 decimal places). Use the units and scaling stated in the question.

Correct answer: 1

Source solution



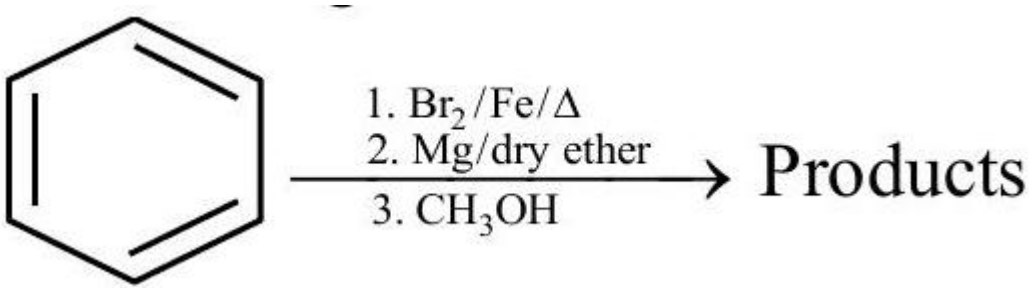
Hence total number of oxygen atom present per



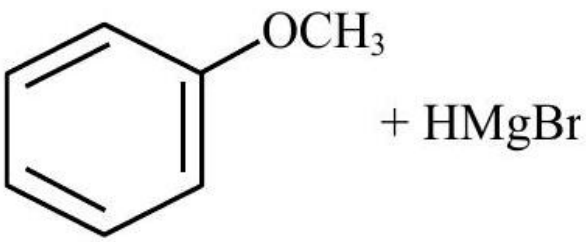
is 1 .

Question 63

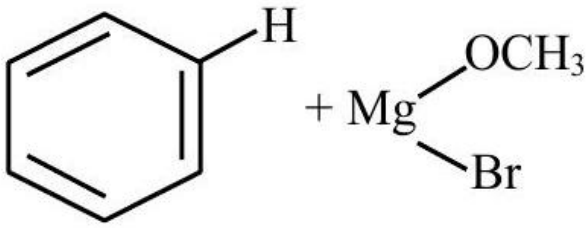
For the following:



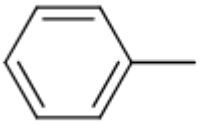
A.



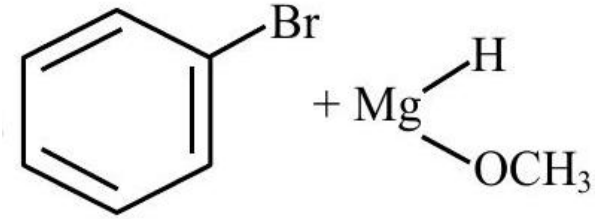
B.



C.

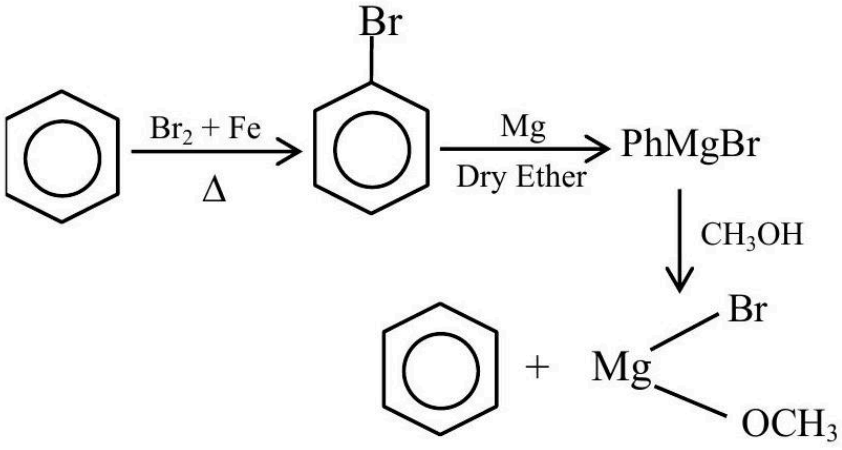


D.



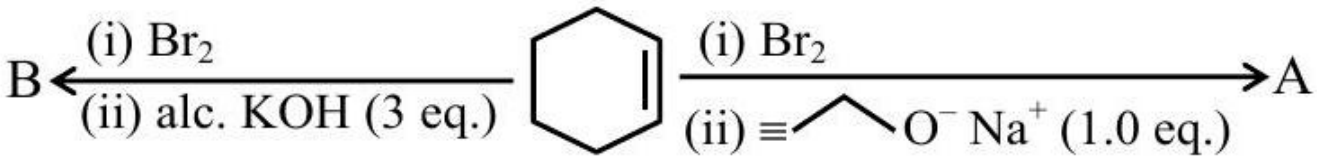
Correct answer: B

Source solution



Question 64

The major products from the following reaction sequence are product A and product B .



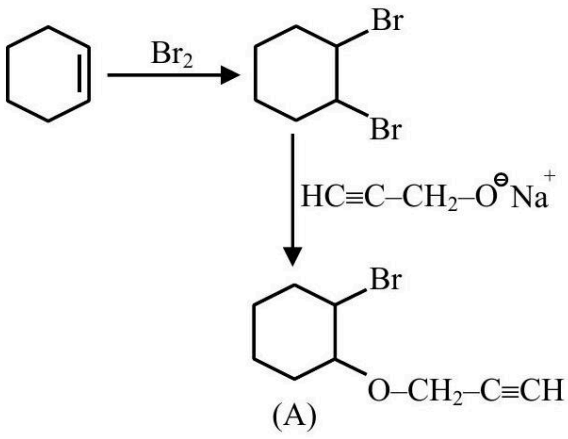
The total sum of π electrons in product A and product B are (nearest integer)

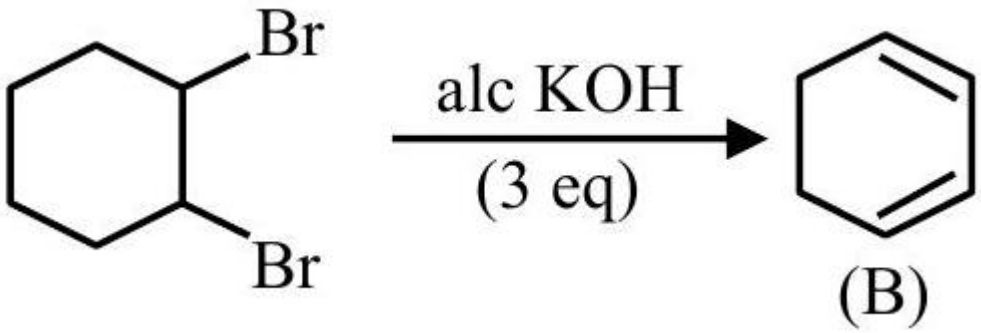
Numerical answer: _____

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

Correct answer: 8

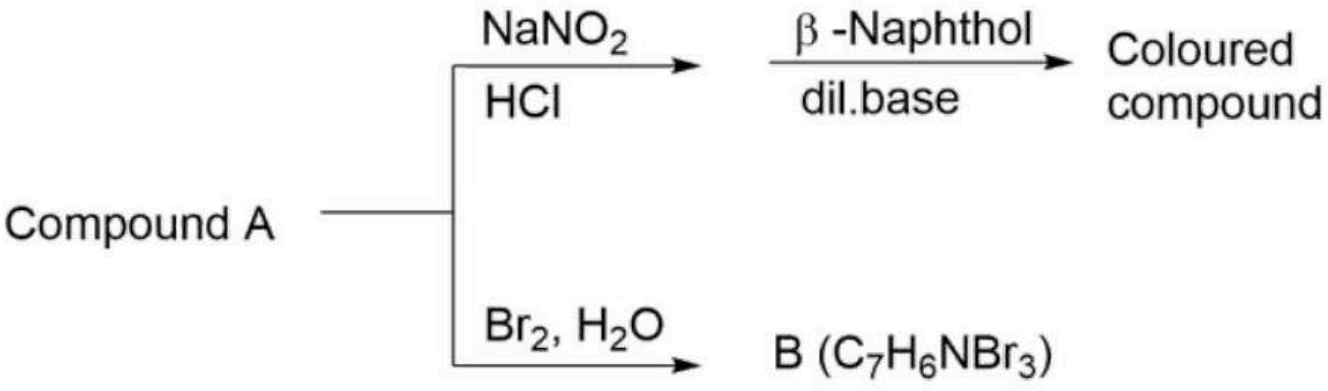
Source solution





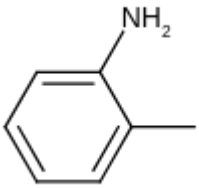
(B)

Question 65

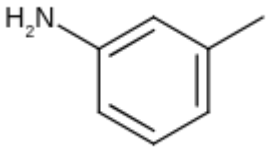


Compound A will be:

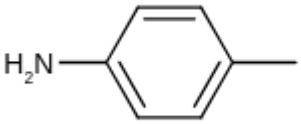
A.



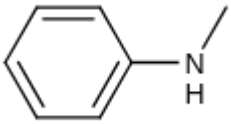
B.



C.



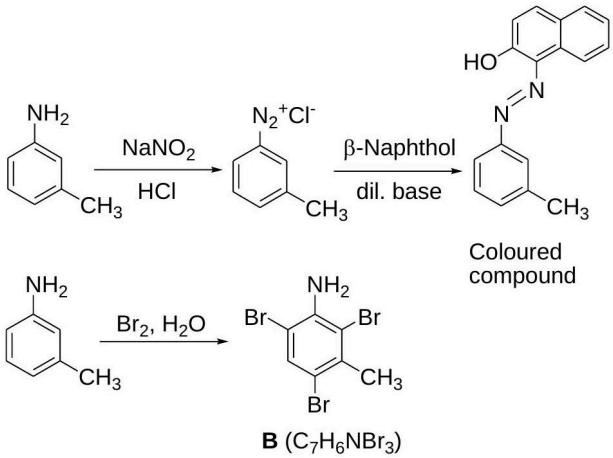
D.



Correct answer: B

Source solution

Solution:


NH2
CH3
NaNO2
HCl
N2+Cl-
CH3
β-Naphthol
dil. base
HO
N
N
CH3
Coloured
compound
NH2
CH3
Br2, H2O
NH2
Br
Br
CH3
Br
B (C7H6NBr3)

Redox Reactions

Questions 66-66 / 1 selected / 0.3% practice weight / Consolidate

Question 66

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.

Correct answer: 3

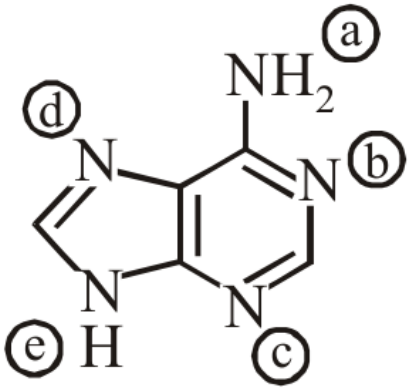
Source solution

Compounds	SO_3	H_2SO_3	$SOCl_2$	SF_4	$BaSO_4$	$H_2\ S_2O_7$
O.S.of Sulphur:	+6	+4	+4	+4	+6	+6

Organic Chemistry - Some Basic Principles and Techniques

Question 67

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)

Correct answer: A

Source solution

Sol. Localised lone pair e^-.

Question 68

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)

Correct answer: C

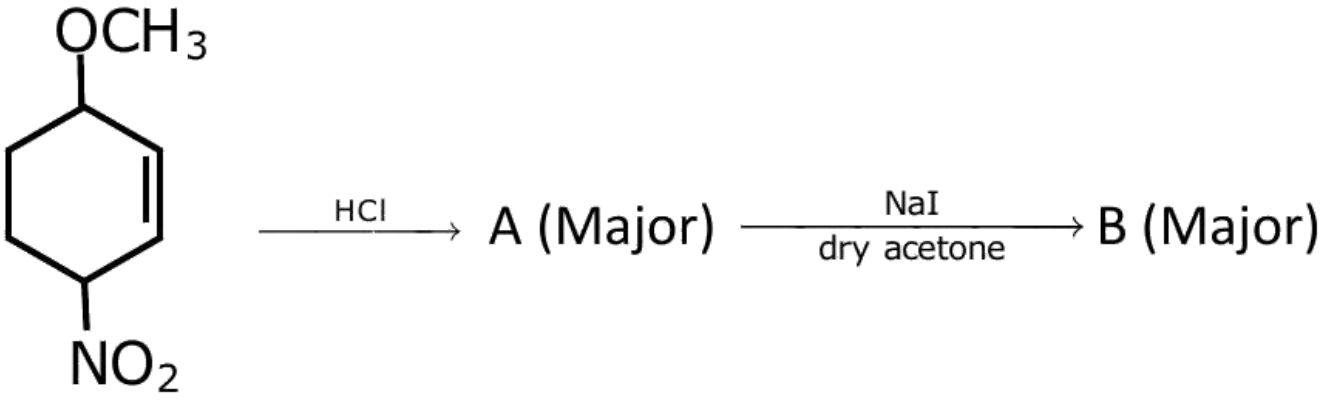
The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

Factual

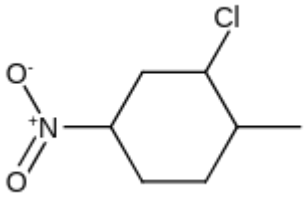
Question 69

Identify A and B in the chemical reaction.

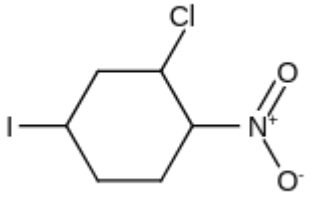


A. $A =$

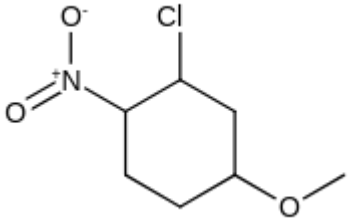
$B =$



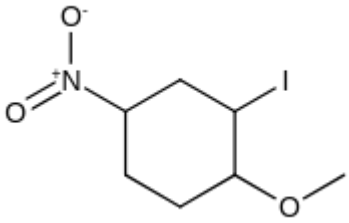
B. $B =$



C. $B =$



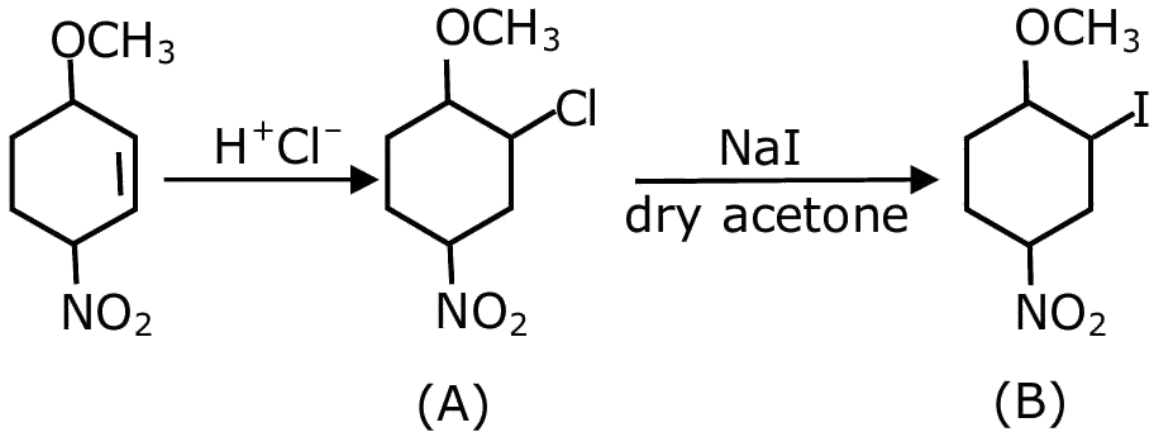
D. $B =$



Correct answer: D

Source solution

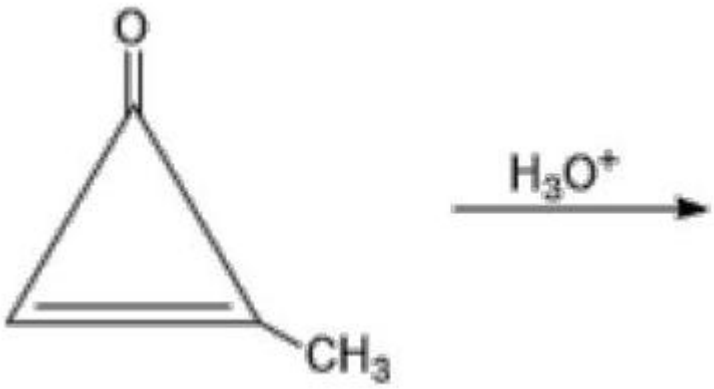
Sol. (4)



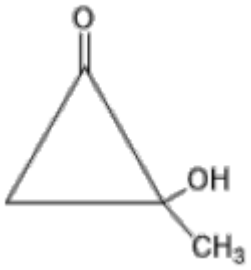
(A) (B)

Question 70

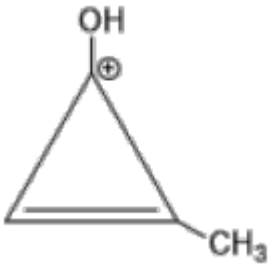
The major product of the following reactions is



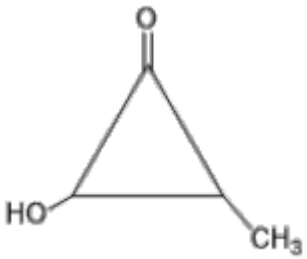
A.



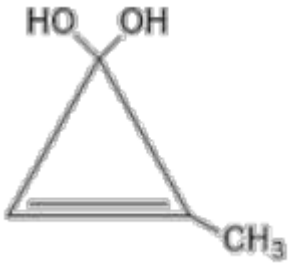
B.



C.

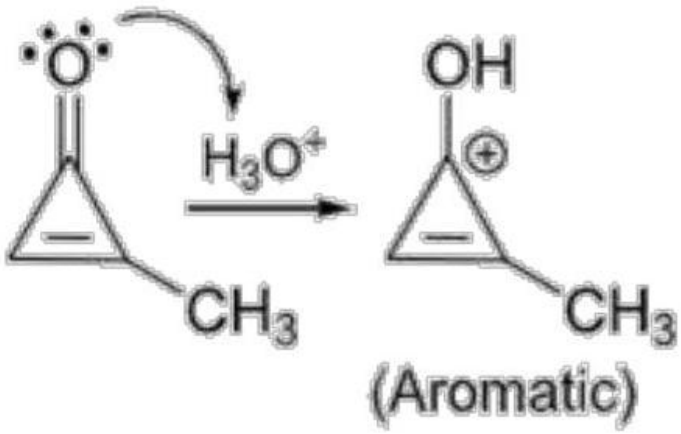


D.



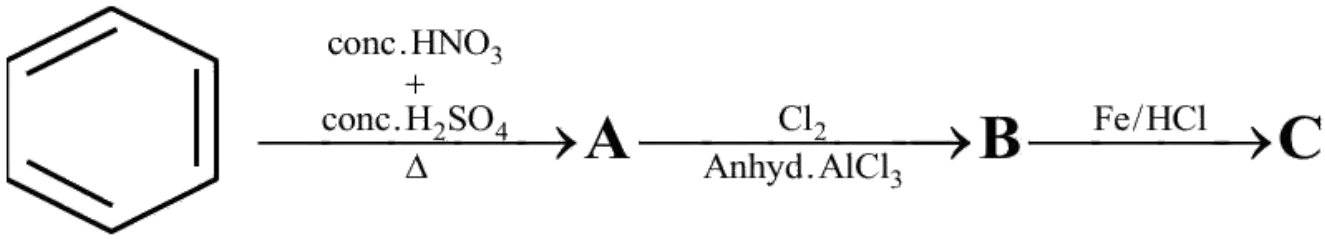
Correct answer: B

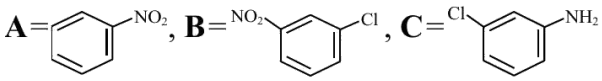
Source solution

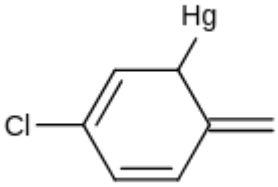

O
H_3O^+
OH
CH_3
CH_3
(Aromatic)

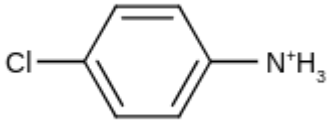
Question 71

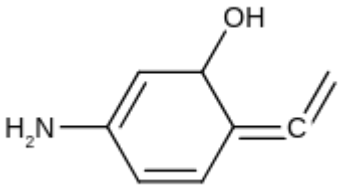
Identify correct **A**, **B** and **C** in the reaction sequence given below :



A. 

B. 

C. 

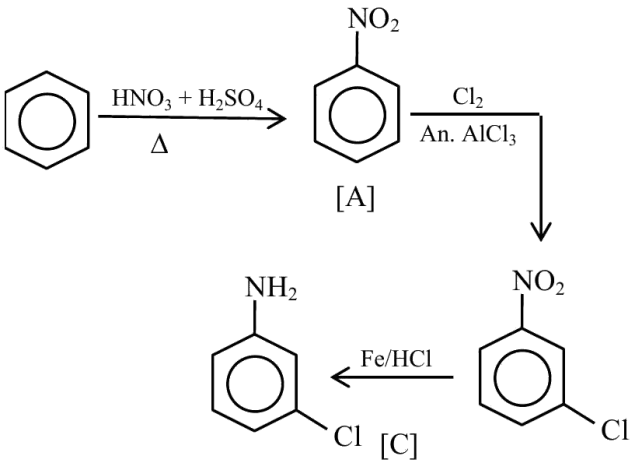
D. 

Correct answer: A

Source solution

Sol.

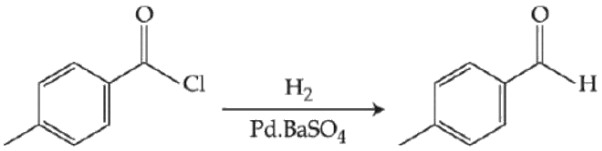
[B]



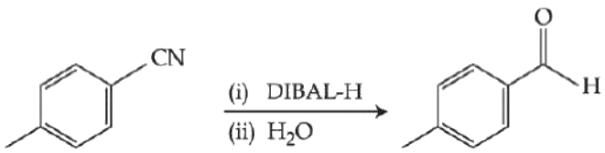
Question 72

Which one of the following reactions does not represent correct combination of substrate and product under the given conditions ?

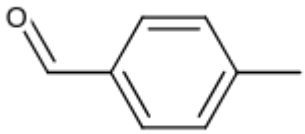
A.



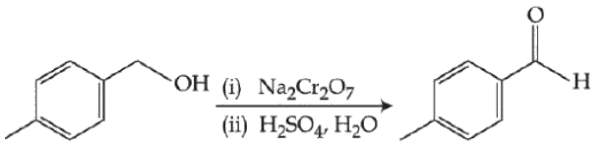
B.



C.



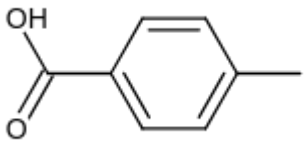
D.



Correct answer: D

Source solution

Sol.

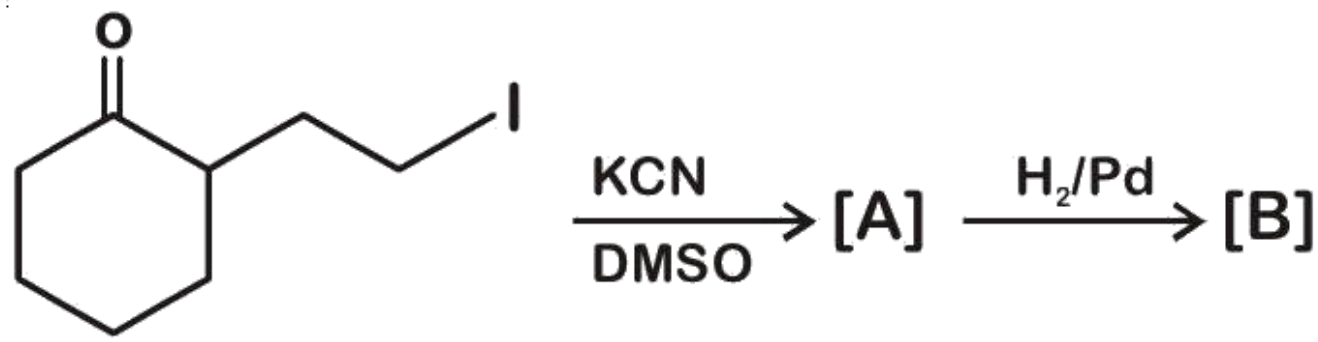


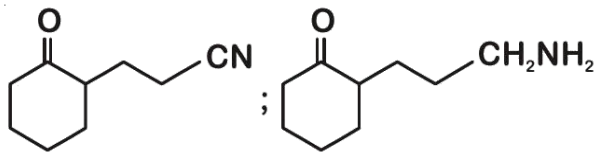
Hydrocarbons

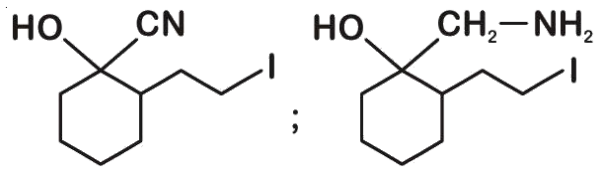
Questions 73-193 / 121 selected / 40.3% practice weight / Focus first

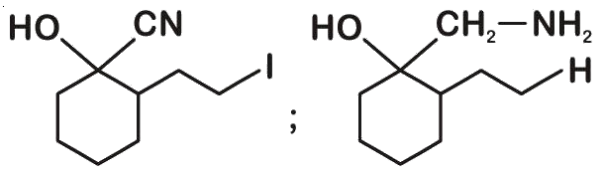
Question 73

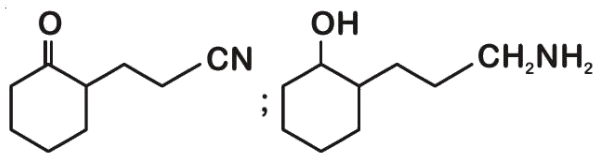
The major products A and B for the following reactions are, respectively



A. 

B. 

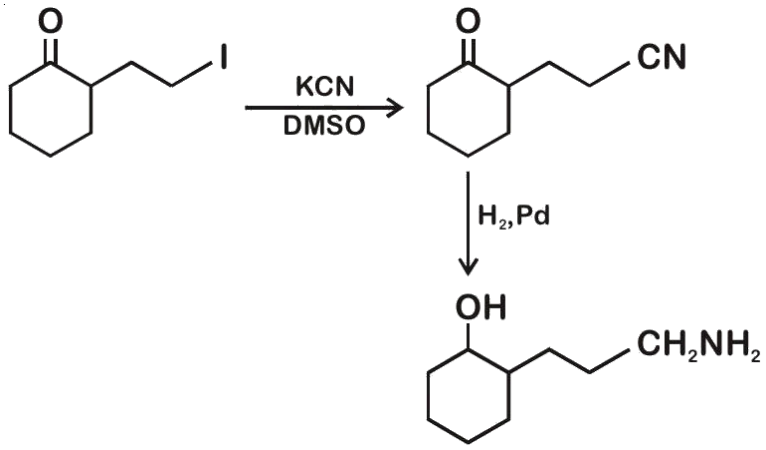
C. 

D. 

Correct answer: D

Source solution

Sol.


O
I
KCN
DMSO
O
CN
H2,Pd
OH
CH2NH2

Question 74

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

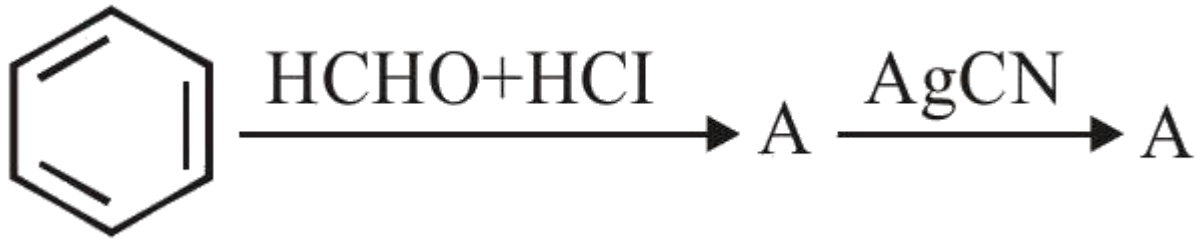
Correct answer: A

Source solution

Sol. 1
Hoffmann degradation $\rightarrow Br_2$, NaOH
Clemenson reduction $\rightarrow Zn - Hg/HCl$
Cannizaro reaction $\rightarrow$ Conc. KOH, Δ
Reimer-Tiemann reaction $\rightarrow CuCl_3, NaOH/H_3O^{\oplus}$

Question 75

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

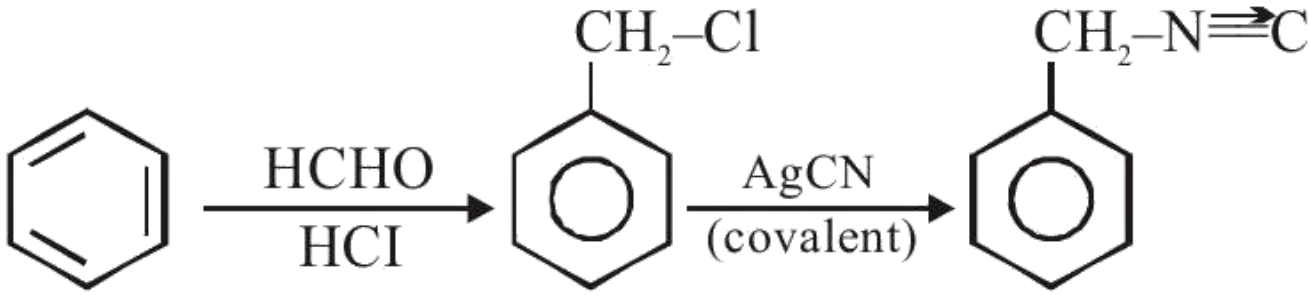
C. $\mathbf{A}$ = Benzyl chloride, $\mathbf{B}$ = Benzyl cyanide

D. A = Benzyl chloride, B = Benzyl isocyanide

Correct answer: D

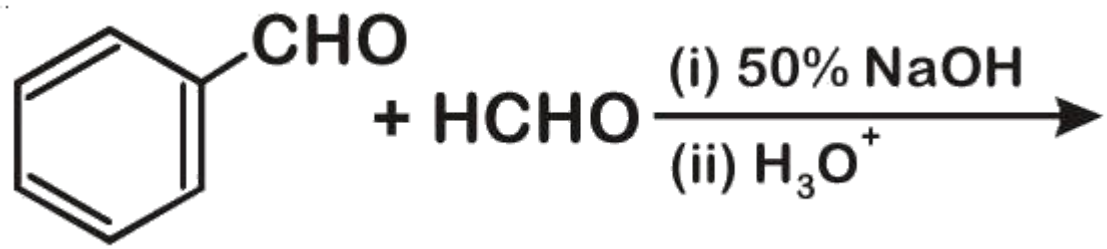
Source solution

Sol.

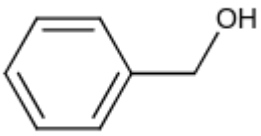


Question 76

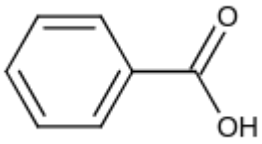
Major products of the following reaction are :



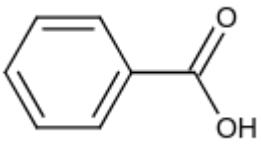
A. HCOOH and



B.



C. CH_3OH and

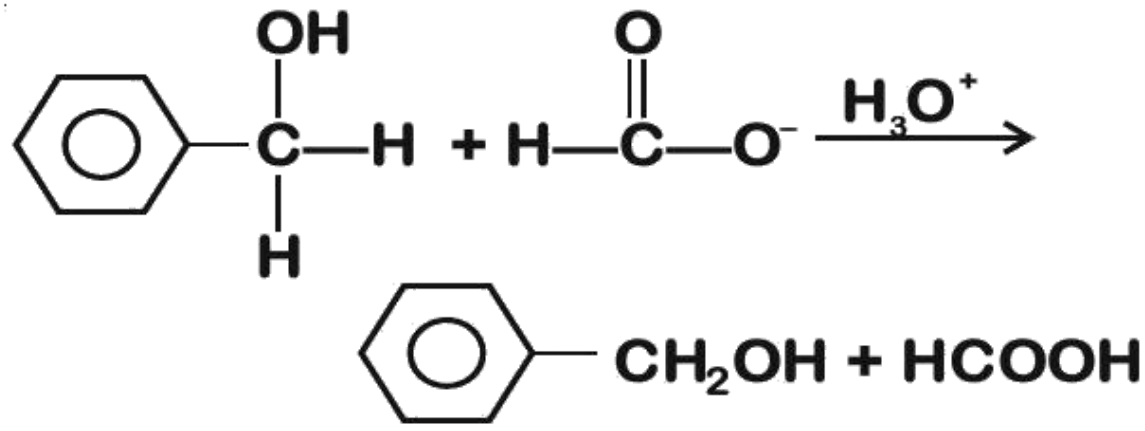


D. CH_3OH and HCO_2H

Correct answer: A

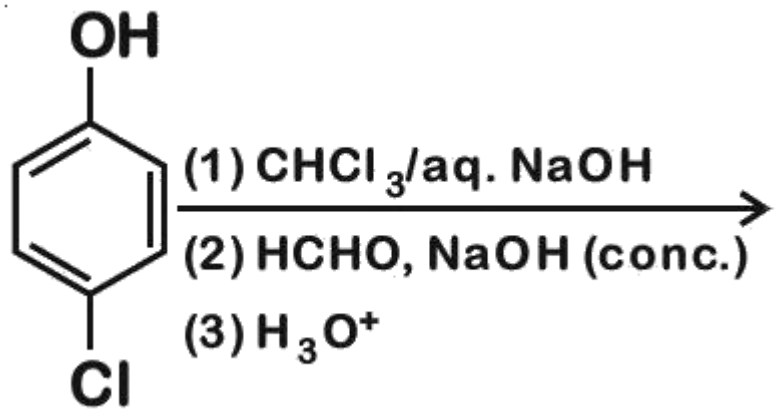
Source solution

Sol.

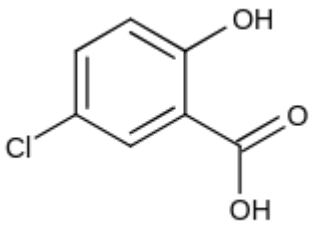


Question 77

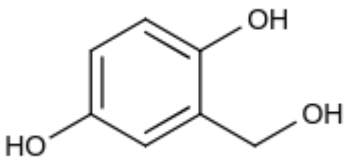
The major products of the following reaction are :



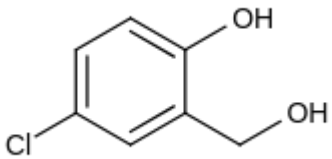
A.



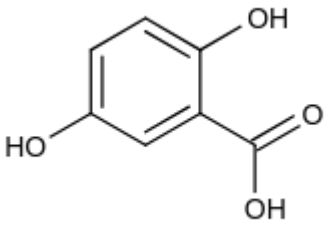
B.



C.



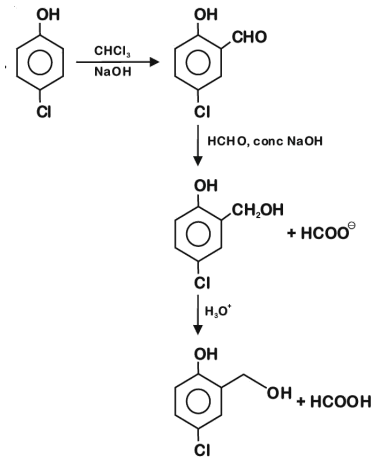
D.



Correct answer: C

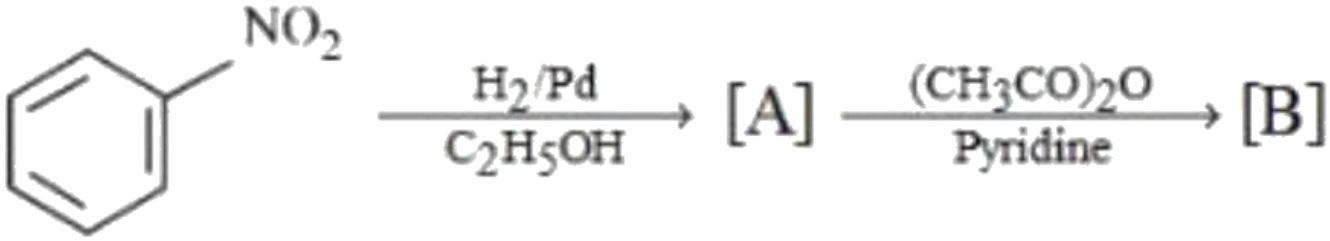
Source solution

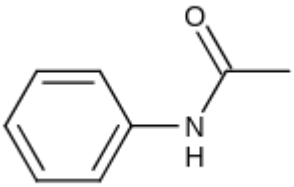
Sol.


OH
Cl
CHCl3
NaOH
OH
CHO
Cl
HCHO, conc NaOH
OH
CH2OH
+ HCOO⊖
Cl
H3O⊕
OH
OH
+ HCOOH
Cl

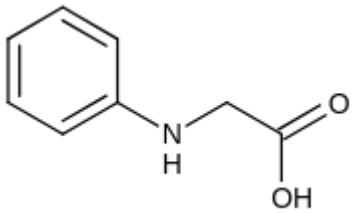
Question 78

Consider the above reaction and identify the product B. Options

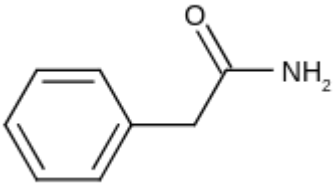




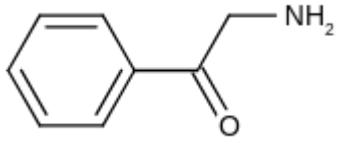
A.



B.



C.

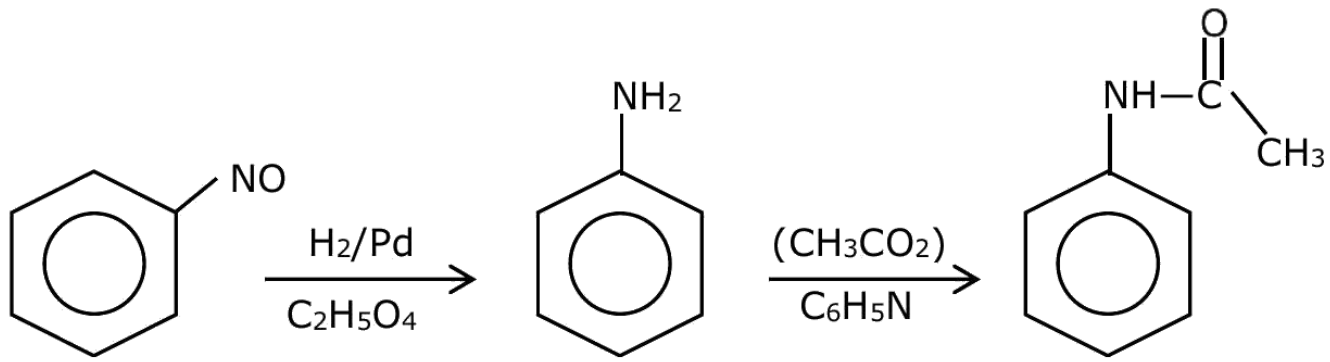


D.

Correct answer: A

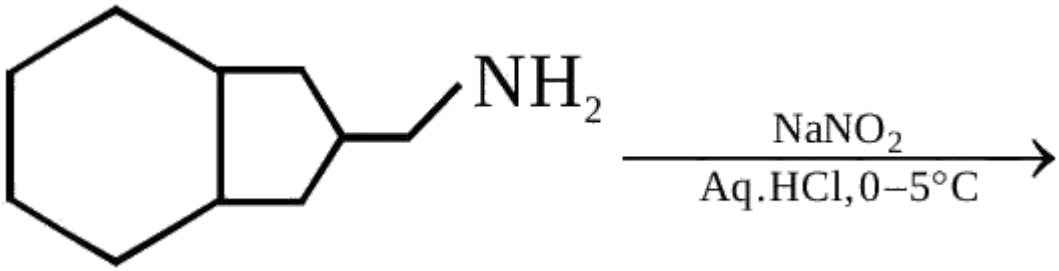
Source solution

Sol. 1

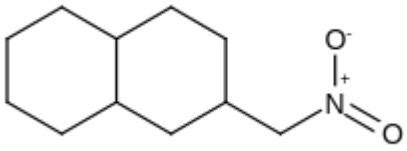


Question 79

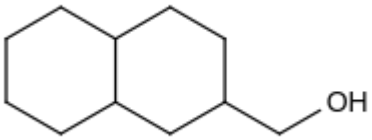
The major product formed in the reaction given below will be :



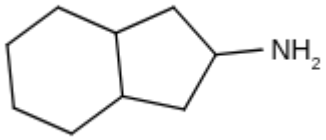
A.



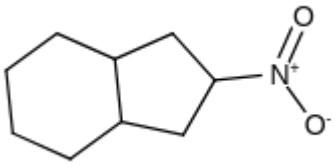
B.



C.



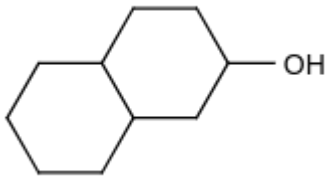
D.



Correct answer: A

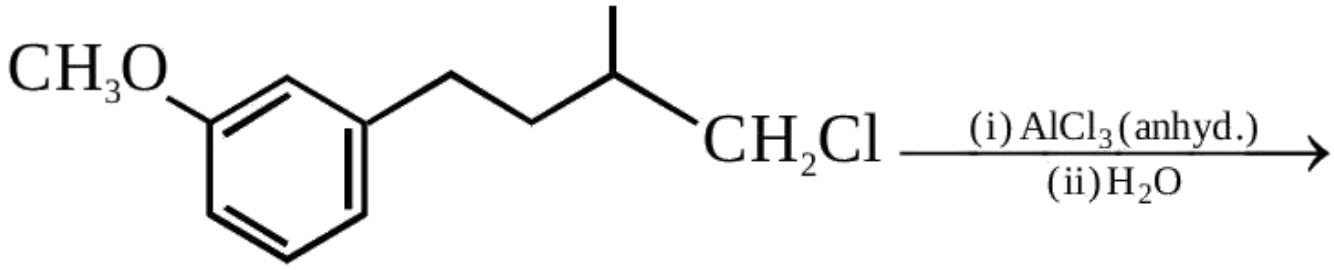
Source solution

Sol. Answer should be

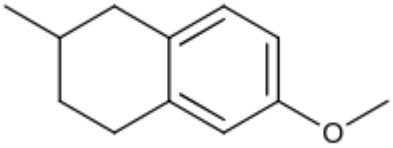


Question 80

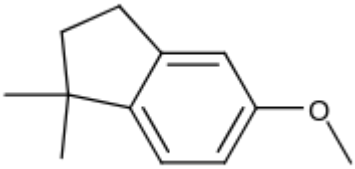
The major product of the following reaction is:



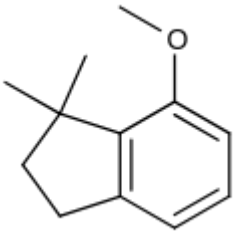
A.



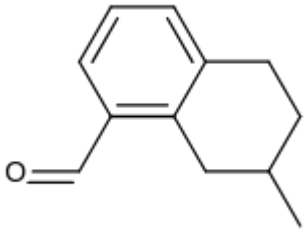
B.



C.



D.

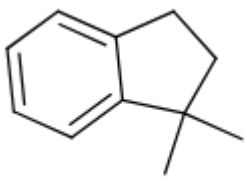


Correct answer: B

Source solution

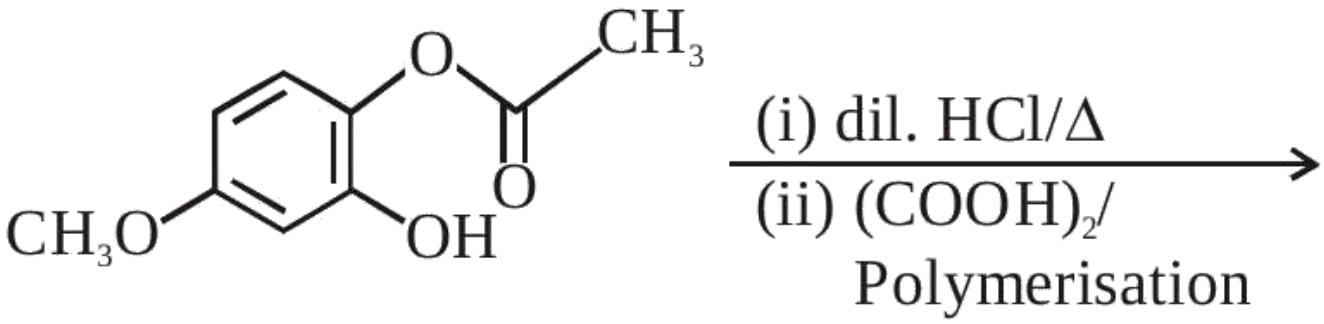
Sol.

1, 2shift of $\mathbf{H^-}$
int ra F.C.A.

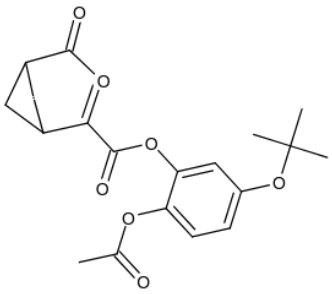


Question 81

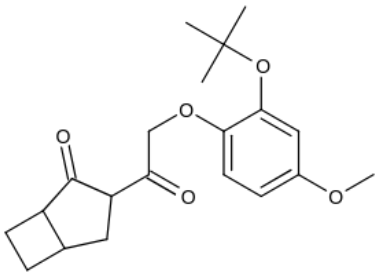
The major product of the following reaction is:



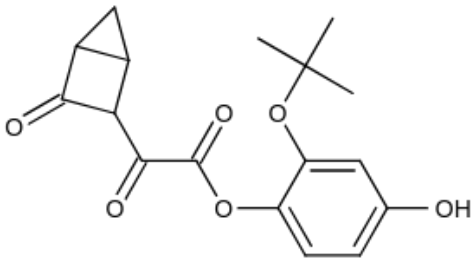
A.



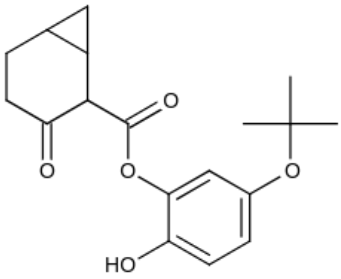
B.



C.



D.



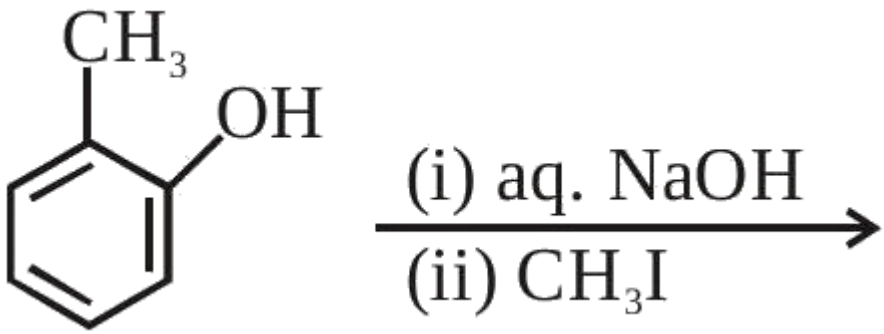
Correct answer: C

The source provides a brief answer only. A detailed worked solution is not available for this question.

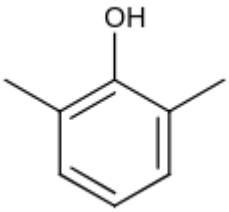
Source solution

Question 82

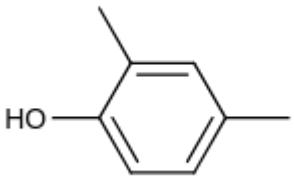
The major product of the following reaction is:



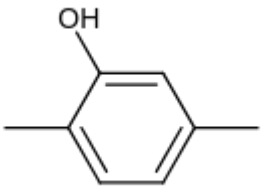
A.



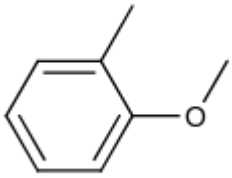
B.



C.



D.



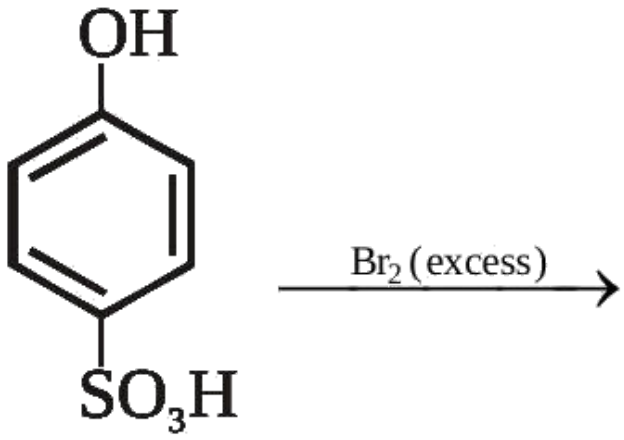
Correct answer: D

The source provides a brief answer only. A detailed worked solution is not available for this question.

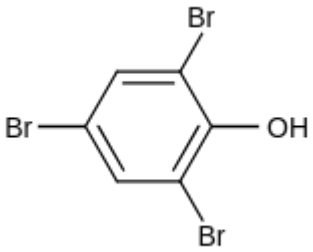
Source solution

Question 83

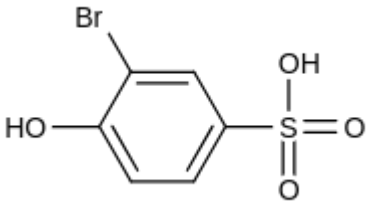
The major product of the following reaction is :



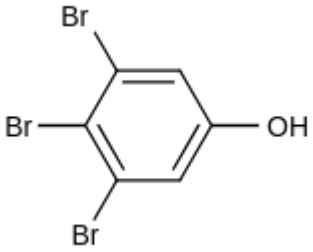
A.



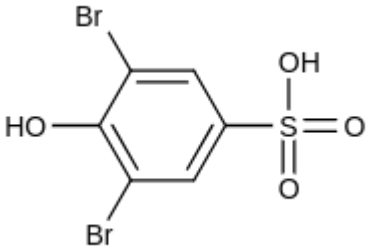
B.



C.



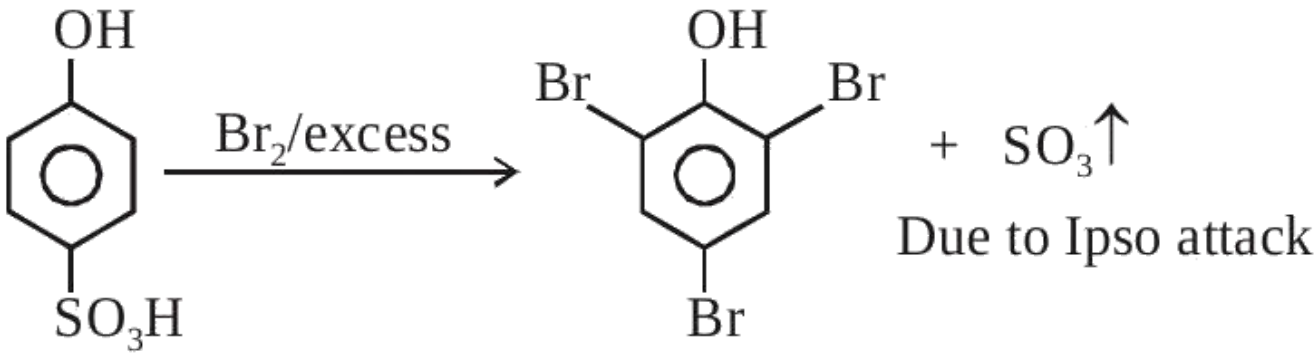
D.



Correct answer: A

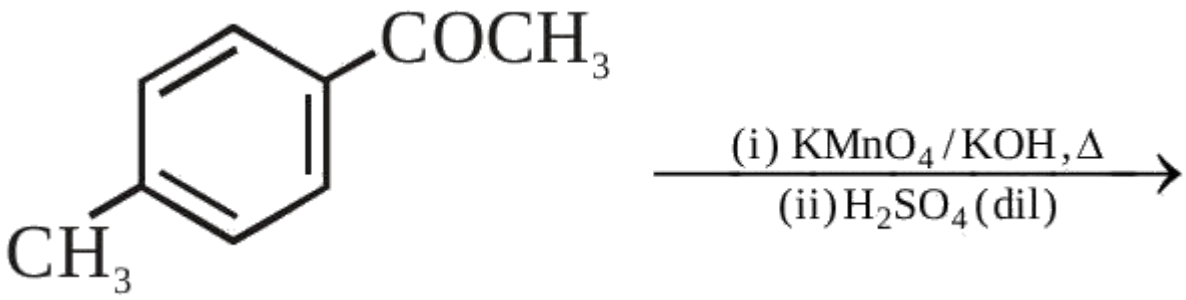
Source solution

Sol.

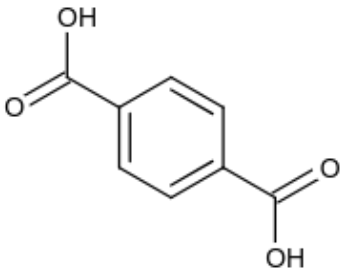

OH
Br_2/excess
SO_3H
OH
Br
Br
Br
+ $SO_3\uparrow$
Due to Ipso attack

Question 84

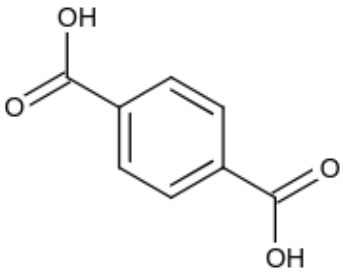
The major product of the following reaction is :



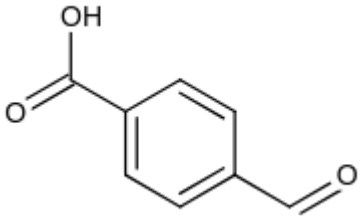
A.



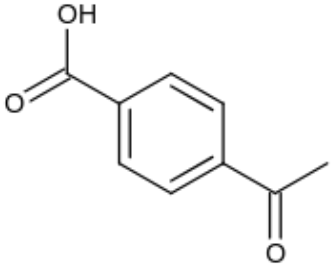
B.



C.



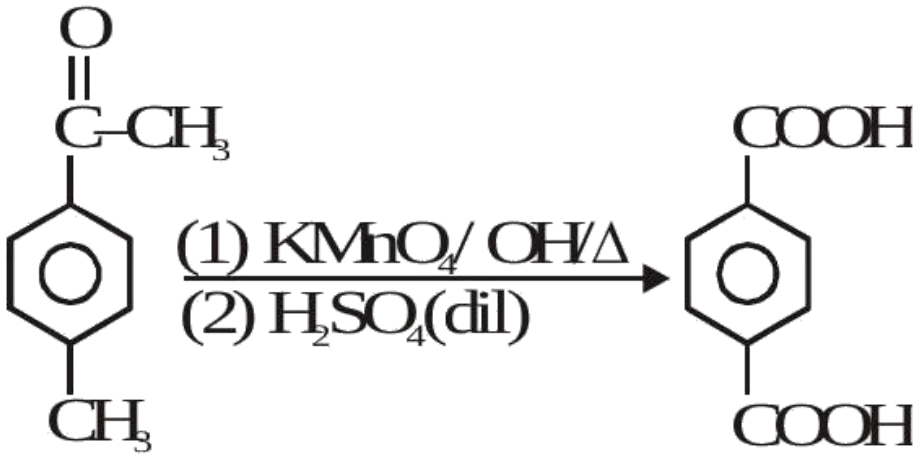
D.



Correct answer: B

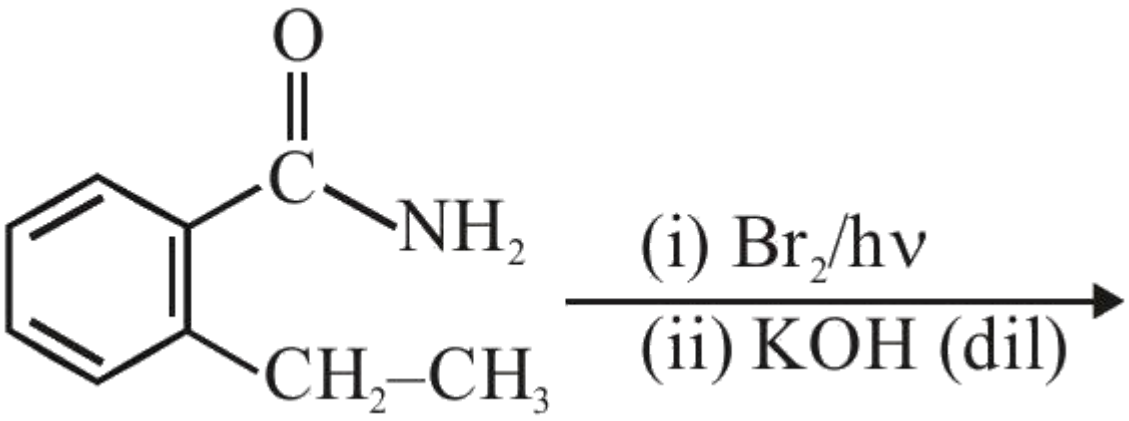
Source solution

Sol.

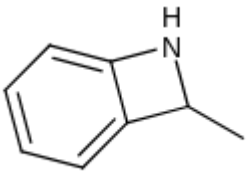

O
C–CH3
CH3
(1) KMnO4/ OH/Δ
(2) H2SO4(dil)
COOH
COOH

Question 85

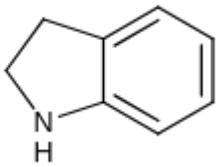
The major product of the following reaction is :



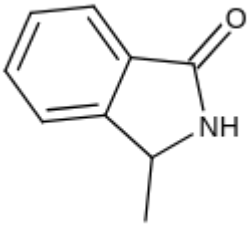
A.



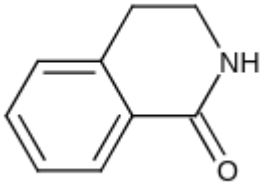
B.



C.



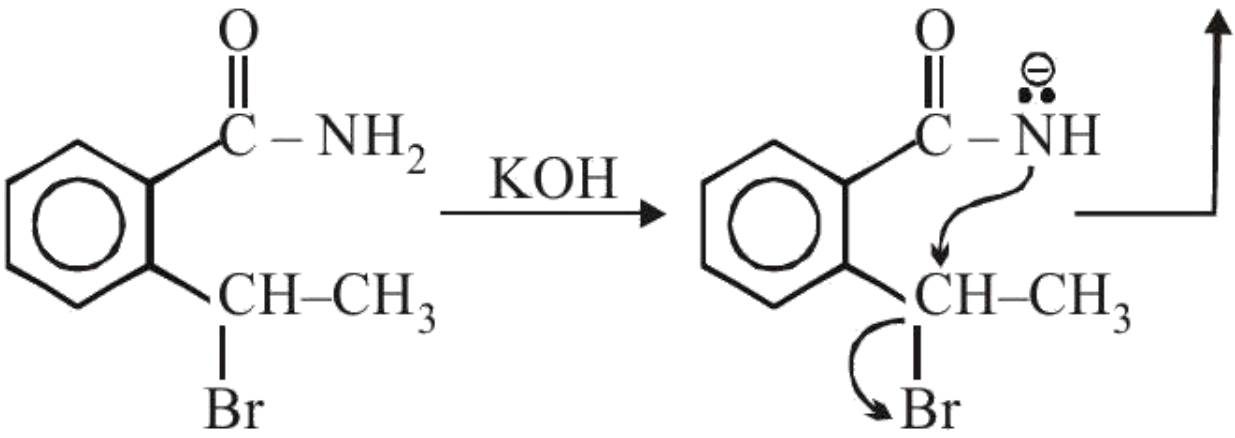
D.



Correct answer: C

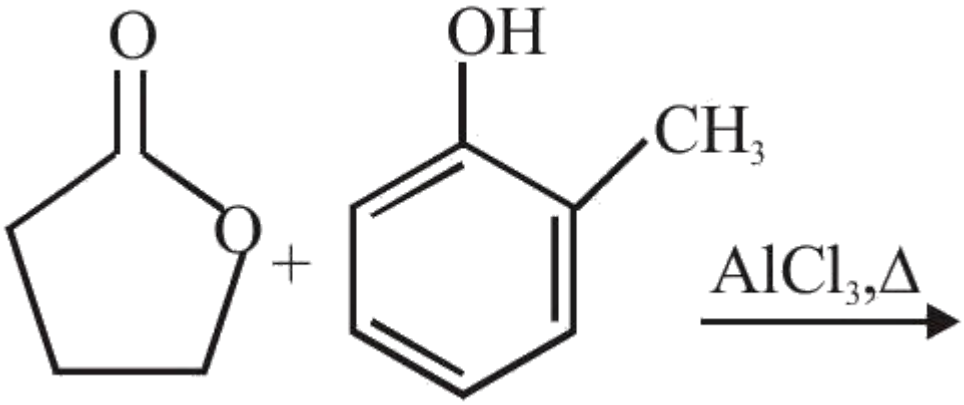
Source solution

Sol.

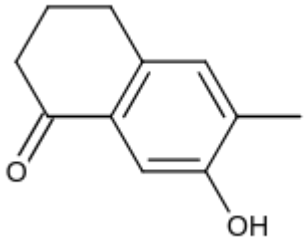

O
C – NH2
KOH
CH–CH3
Br
O
C – NH
CH–CH3
Br

Question 86

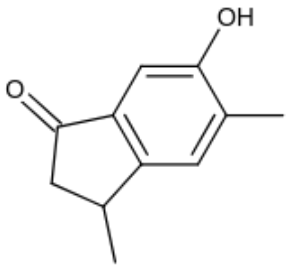
The major product of the following reaction is:



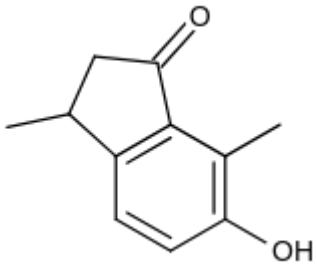
A.



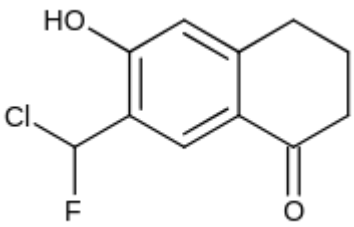
B.



C.



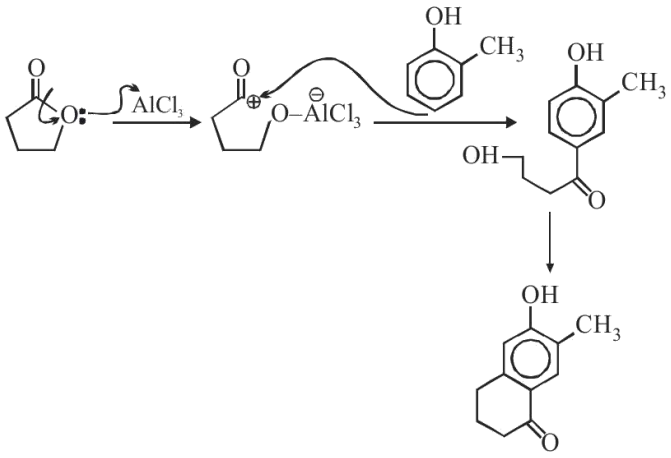
D.



Correct answer: D

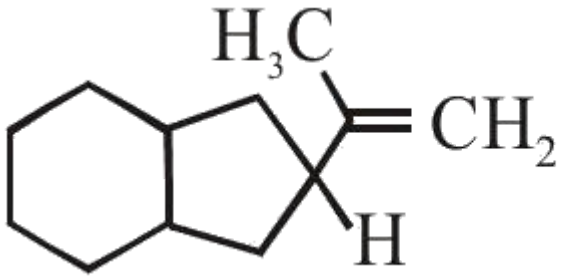
Source solution

Sol.


O
O:
AlCl3
O
O–AlCl3
OH
CH3
OH
CH3
OH
O
OH
CH3
O

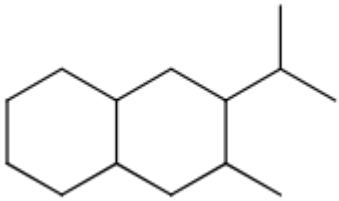
Question 87

The major product of the following reaction is:

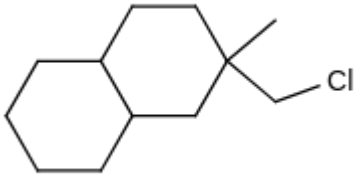




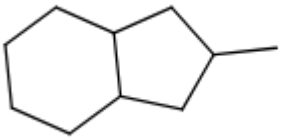
A.



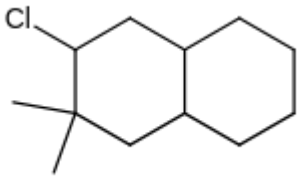
B.



C.



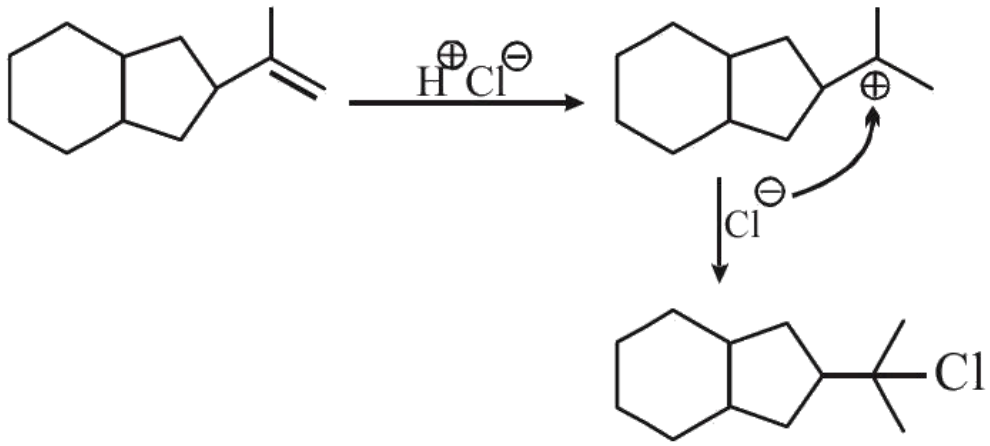
D.



Correct answer: A

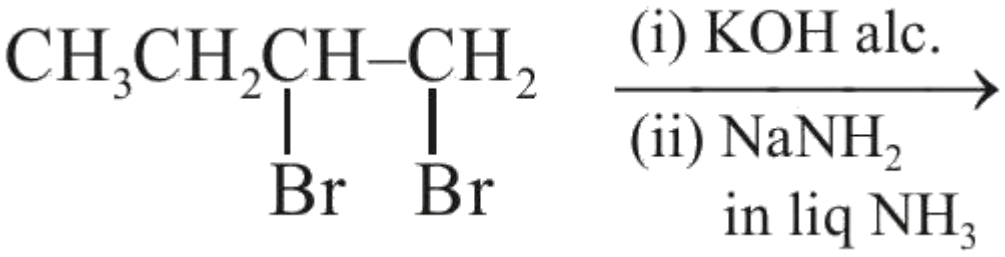
Source solution

Sol.

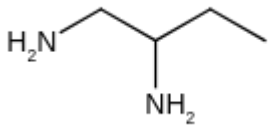


Question 88

The major product of the following reaction is:



A. $CH_3CH_2C \equiv CH$



B.

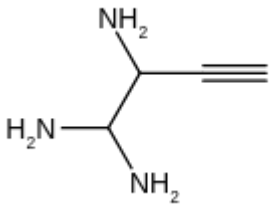
C. $CH_3CH = C = CH_2$

D. $CH_3CH = CHCH_2NH_2$

Correct answer: A

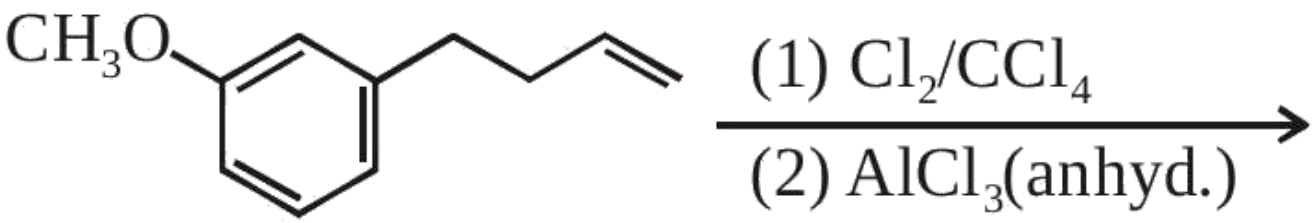
Source solution

Sol.

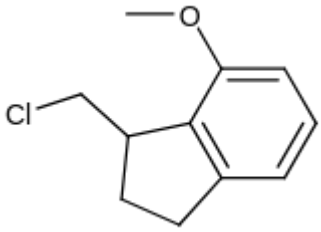


Question 89

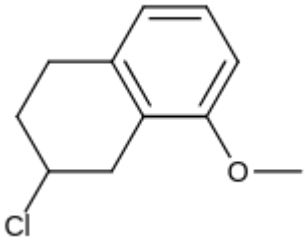
The major product of the following reaction is:



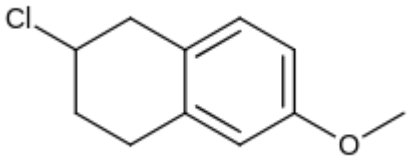
A.



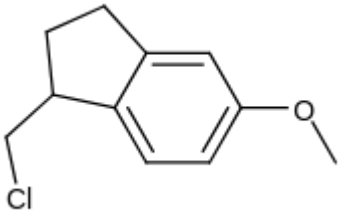
B.



C.



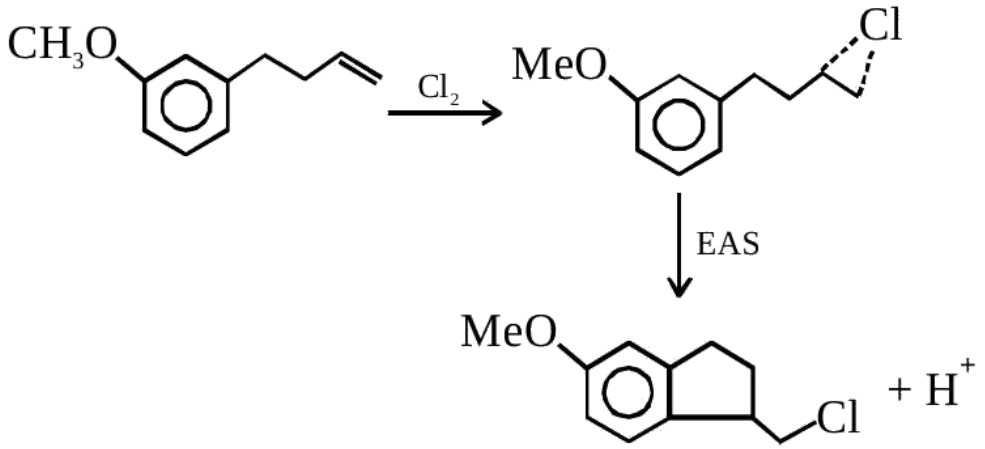
D.



Correct answer: D

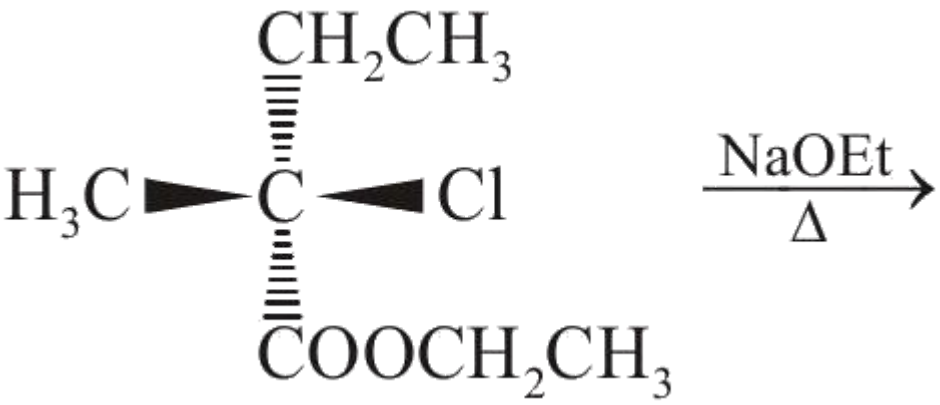
Source solution

Sol.

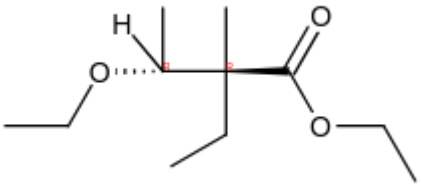

CH3O
Cl2
MeO
Cl
EAS
MeO
Cl
+ H+

Question 90

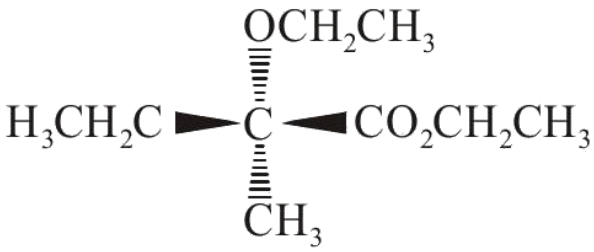
The major product of the following reaction is:



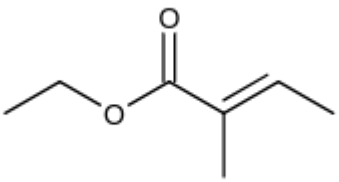
A.



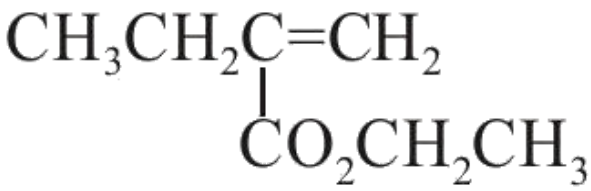
B.



C.



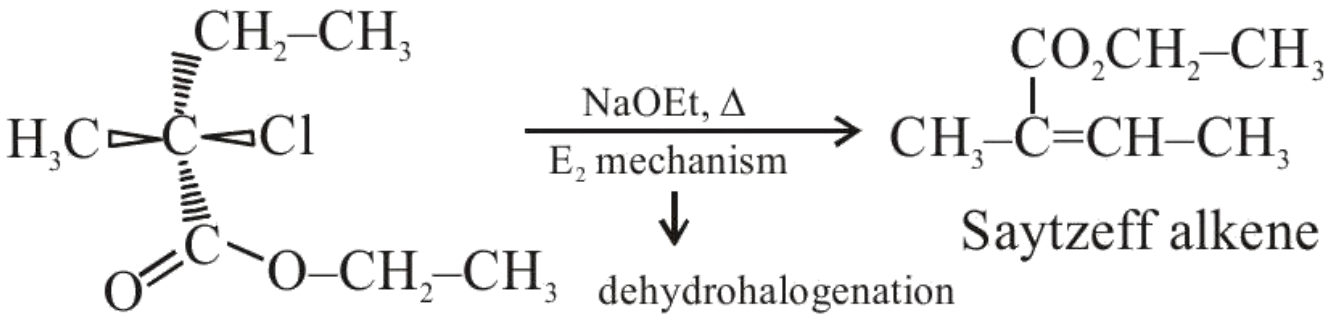
D.



Correct answer: C

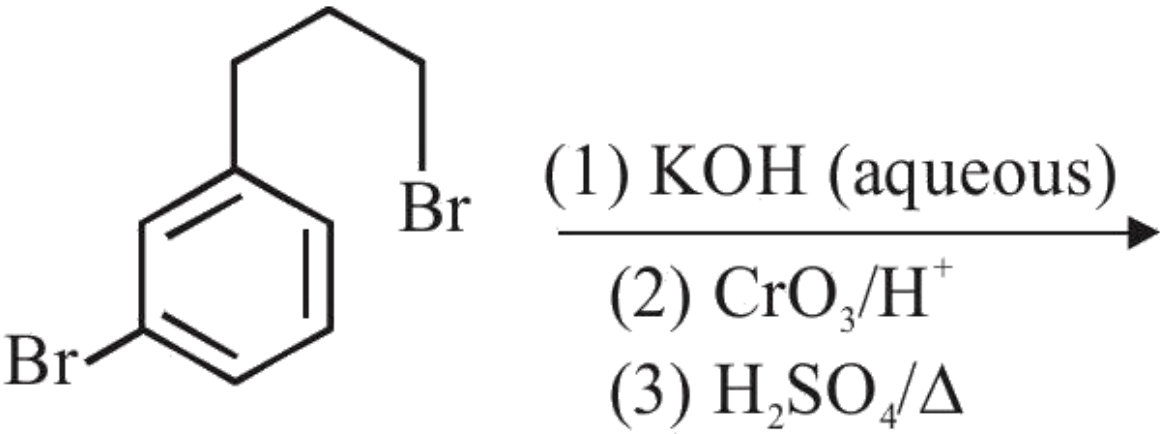
Source solution

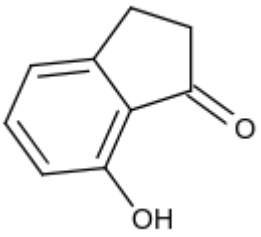
Sol.


CH2–CH3
H3C
C
Cl
C
O
O–CH2–CH3
NaOEt, Δ
E2 mechanism
dehydrohalogenation
CO2CH2–CH3
CH3–C=CH–CH3
Saytzeff alkene

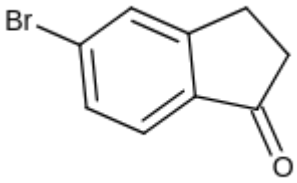
Question 91

The major product of the following reaction is:

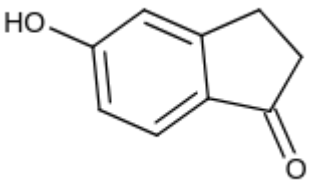




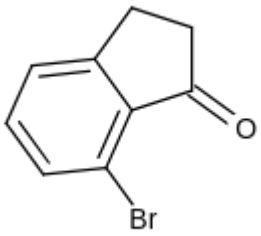
A.



B.



C.



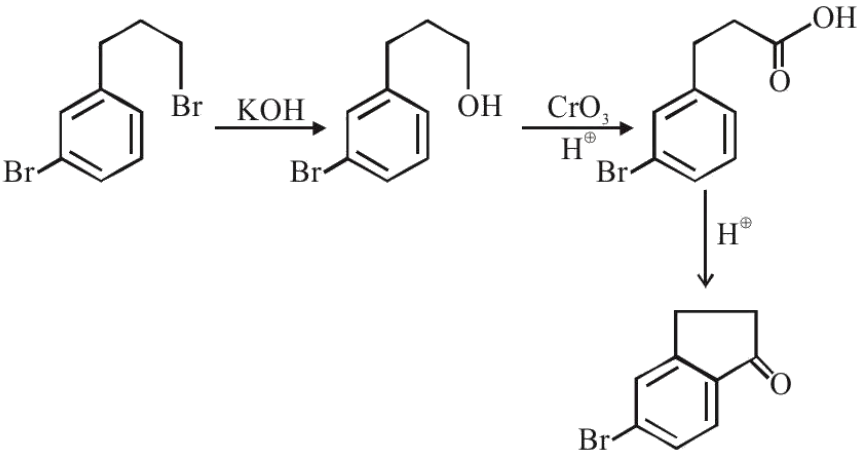
D.

Correct answer: B

Source solution

Sol.

During AES Br is o/p directing and major product will be formed on less hindrance p position :


Br
Br
KOH
OH
Br
CrO_3
$H^{\oplus}$
OH
O
Br
$H^{\oplus}$
O
Br

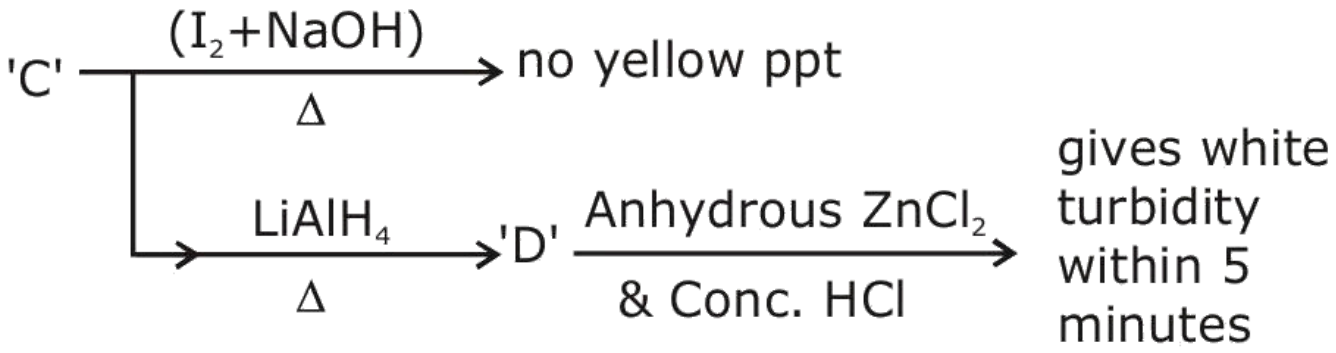
Question 92

Consider the following reactions :

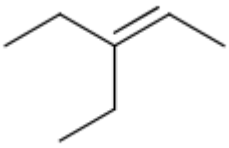
$\xrightarrow[(C_7H_{14})]{(A} \xrightarrow{\text{ozonolysis}} 'B' + 'C'$

$'B' \underbrace{\quad}_{\Delta} \Delta Ag_2O$ ($I_2 + NaOH$) yellow ppt

' A ' is :



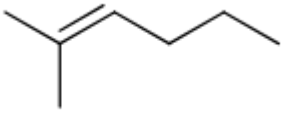
A.



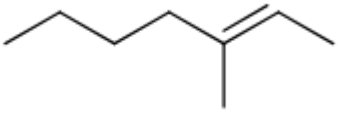
B.



C.



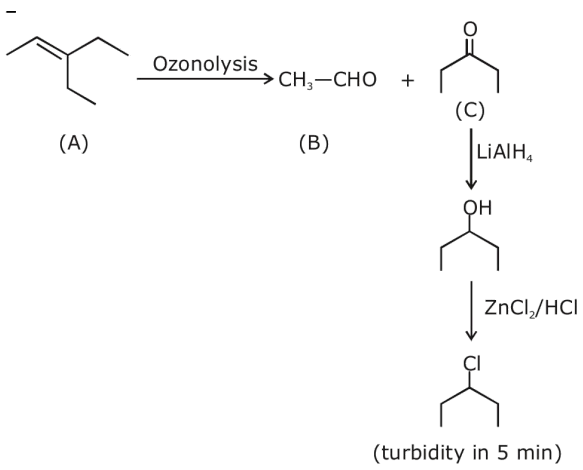
D.



Correct answer: A

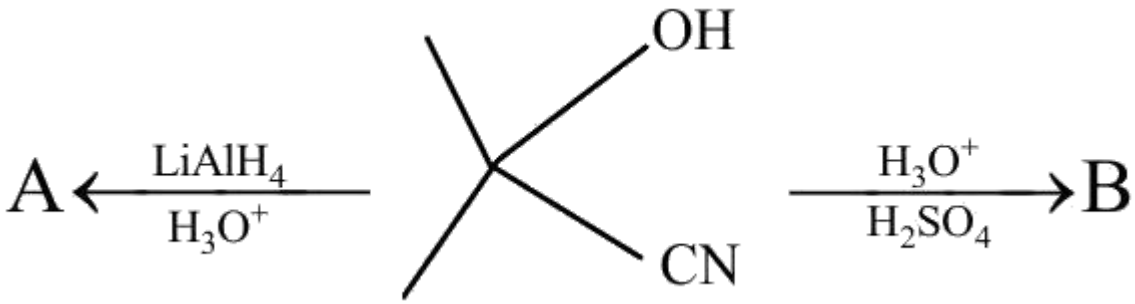
Source solution

Sol. 1}

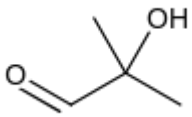

Ozonolysis
CH_3—CHO
+
O
(C)
(A)
(B)
$LiAlH_4$
OH
$ZnCl_2$/HCl
Cl
(turbidity in 5 min)

Question 93

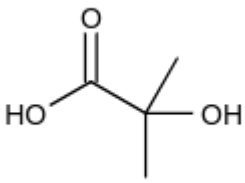
The major products A and B in the following set of reactions are :



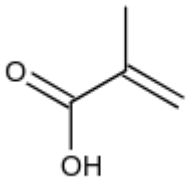
A.



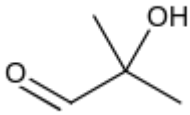
B.



C.



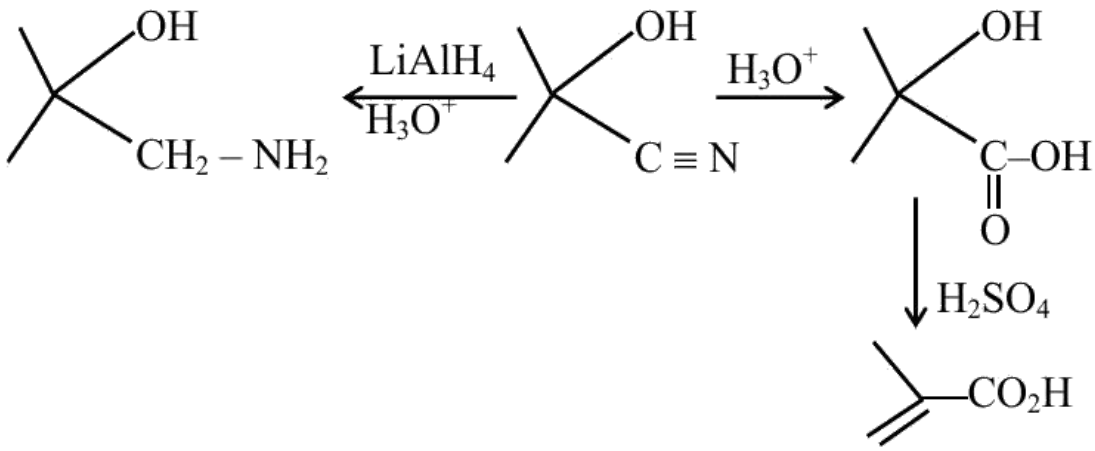
D.



Correct answer: C

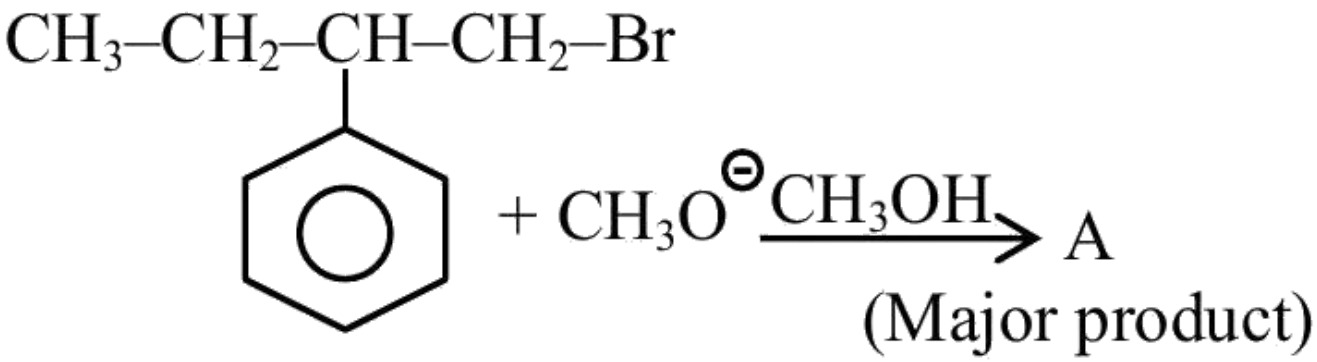
Source solution

Sol.

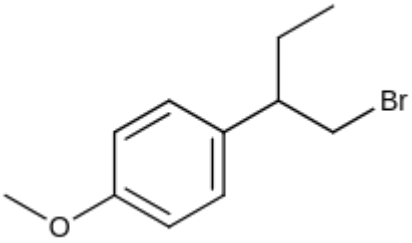

OH
CH2 – NH2
LiAlH4
H3O+
OH
C ≡ N
H3O+
OH
C–OH
O
H2SO4
CO2H

Question 94

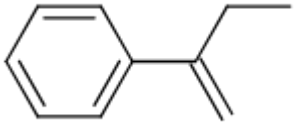
The major product (A) formed in the reaction given below is :



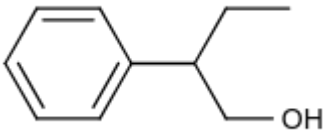
A.



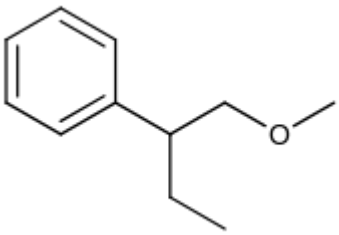
B.



C.



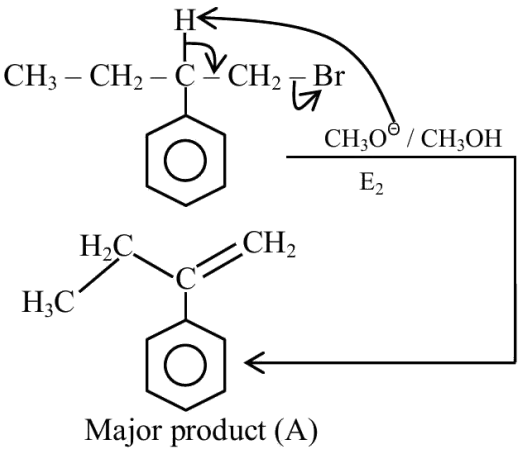
D.



Correct answer: B

Source solution

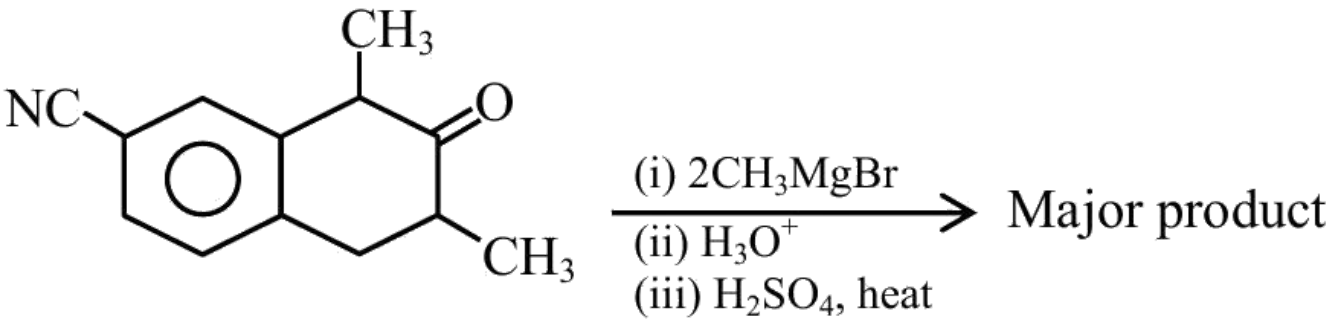
Sol.



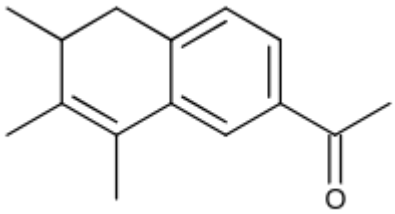
Major product (A)

Question 95

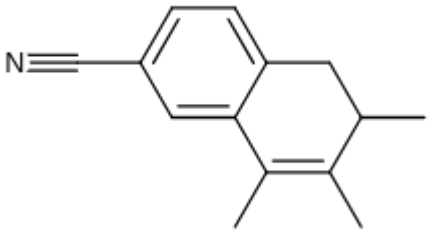
Which one of the following is the major product of the given reaction?



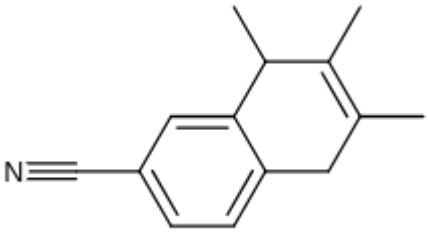
A.



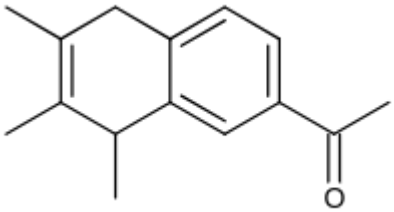
B.



C.



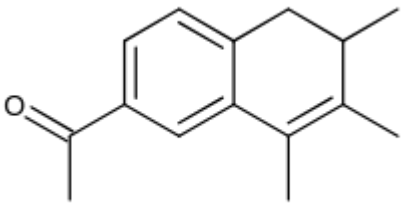
D.



Correct answer: A

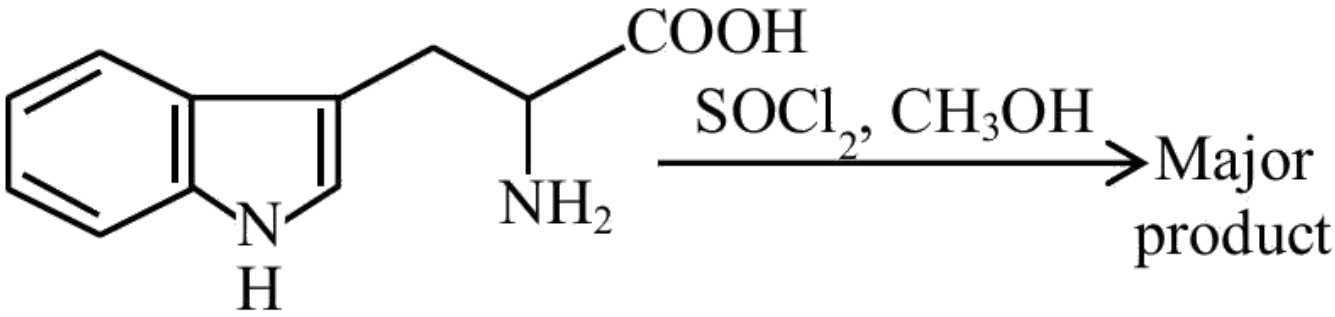
Source solution

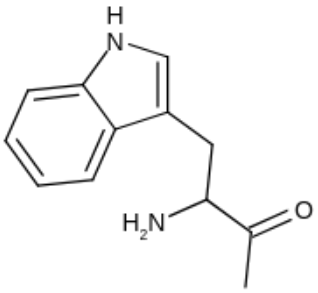
Sol.



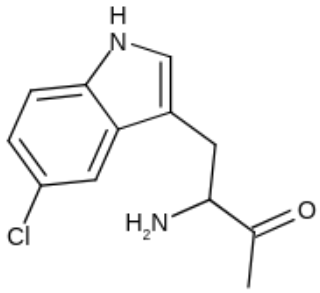
Question 96

The major product formed in the following reaction is :

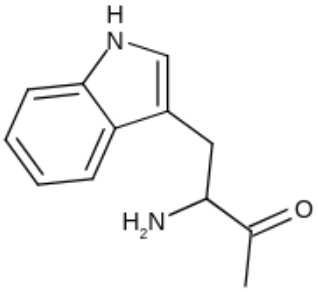




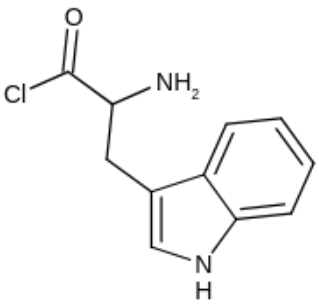
A.



B.



C.

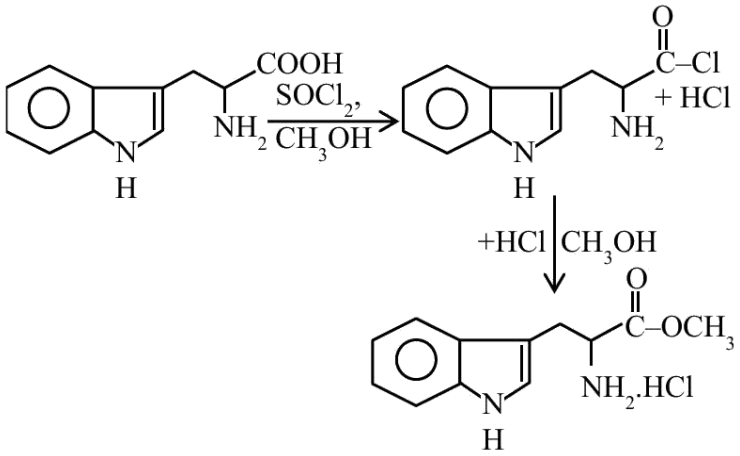


D.

Correct answer: C

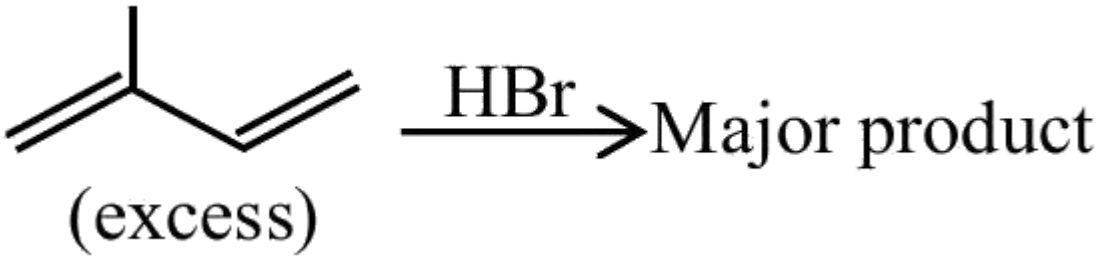
Source solution

Sol.

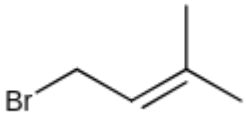

COOH
NH2
SOCl2,
CH3OH
O
C–Cl
+ HCl
NH2
N
H
+HCl
CH3OH
O
C–OCH3
NH2.HCl
N
H

Question 97

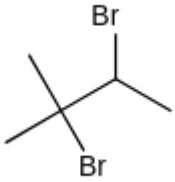
The major product formed in the following reaction is :



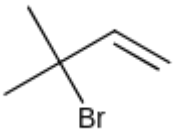
A.



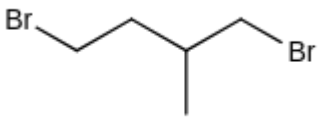
B.



C.



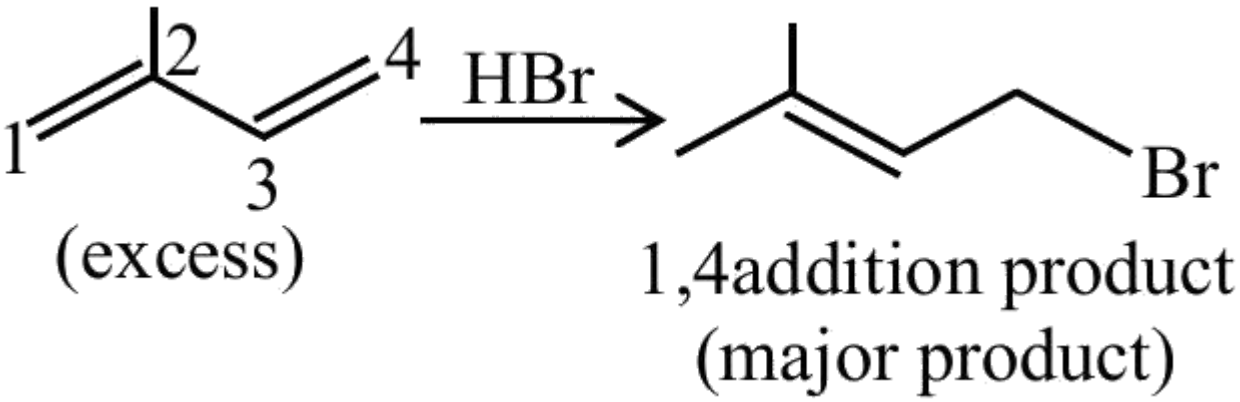
D.



Correct answer: A

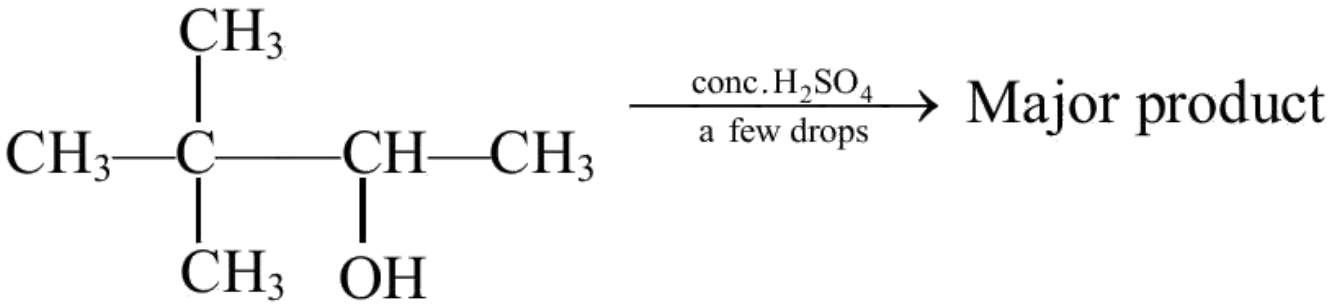
Source solution

Sol.

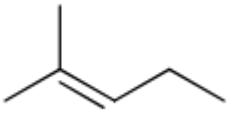


Question 98

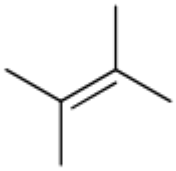
The major product formed in the following reaction is :



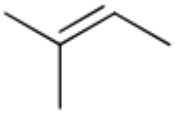
A.



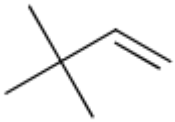
B.



C.



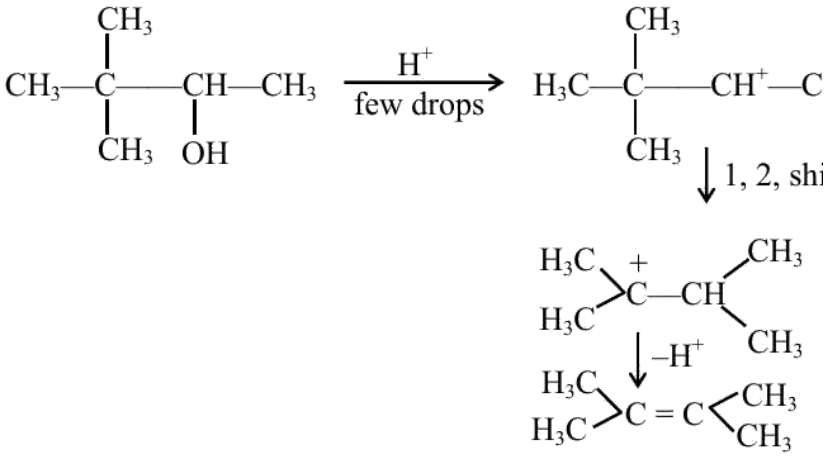
D.



Correct answer: B

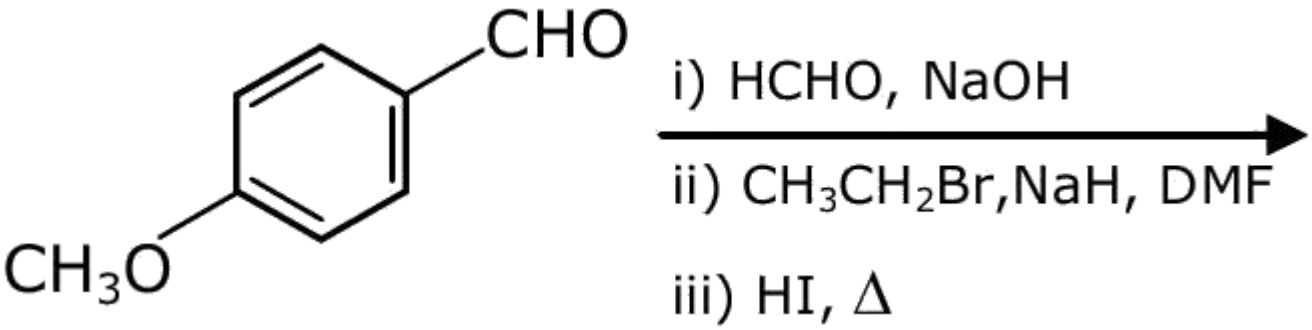
Source solution

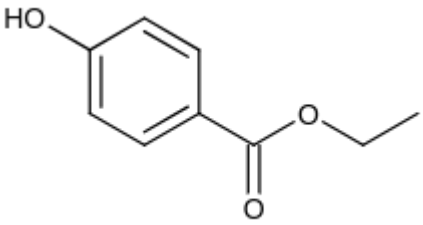
Sol.



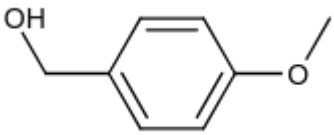
Question 99

Identify A in the following chemical reaction.

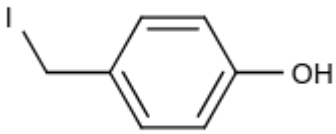




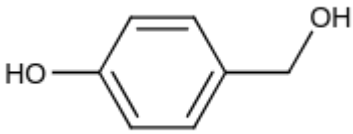
A.



B.



C.

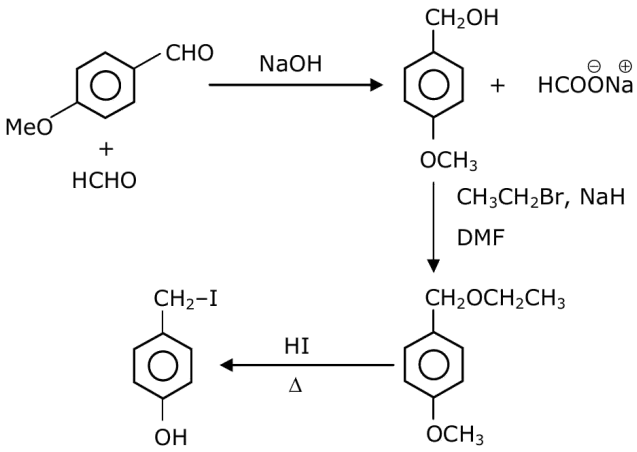


D.

Correct answer: C

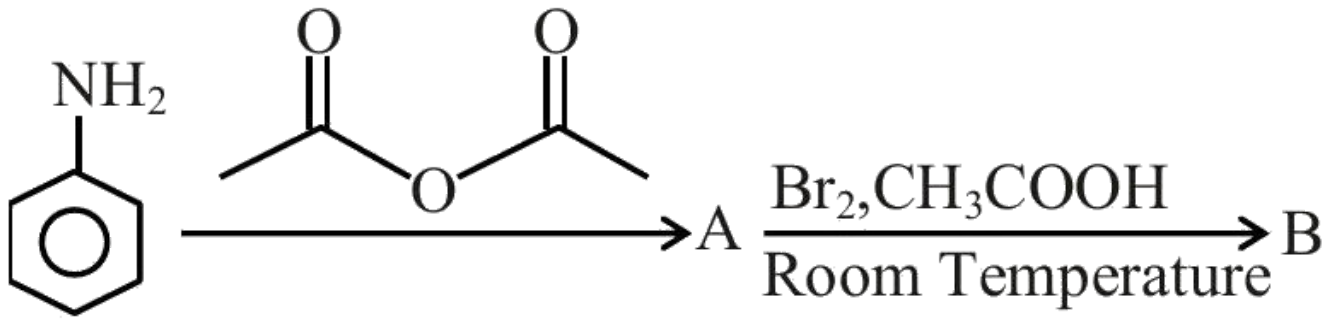
Source solution

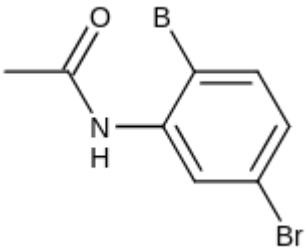
Sol.


CHO
MeO
+
HCHO
NaOH
CH2OH
OCH3
+
HCOONa
CH3CH2Br, NaH
DMF
CH2OCH2CH3
OCH3
HI
Δ
CH2–I
OH

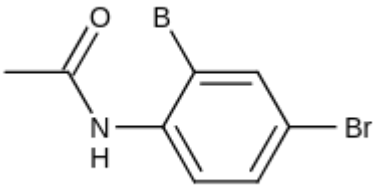
Question 100

The major products A and B formed in the following reaction sequence are :



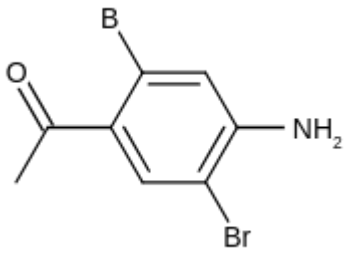


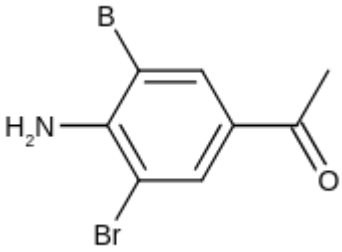
A.



B.

C. ,



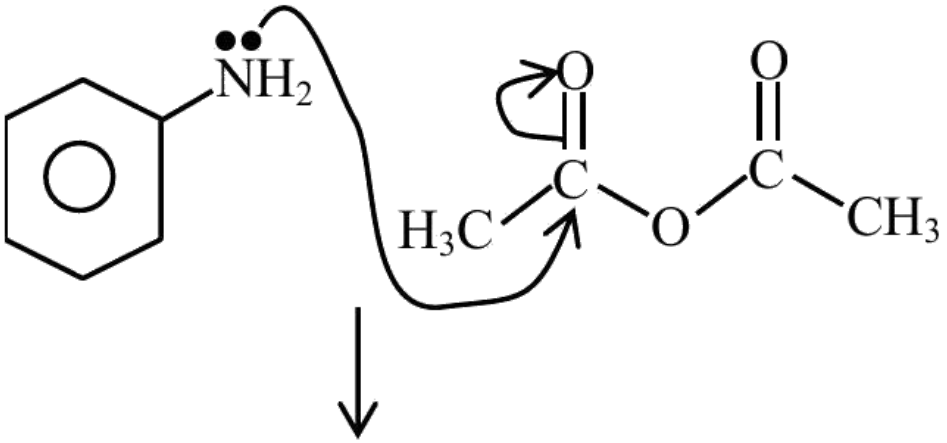


D.

Correct answer: B

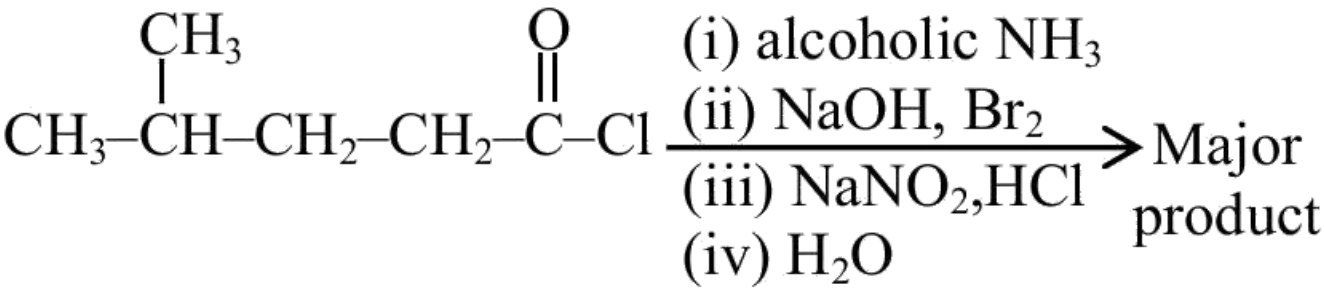
Source solution

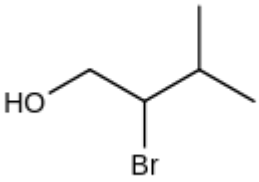
Sol.


NH2
O
O
C
C
H3C
O
CH3

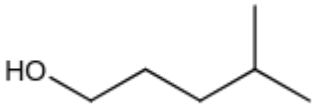
Question 101

The major product of the following reaction is :

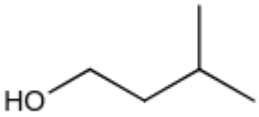




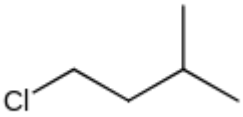
A.



B.



C.

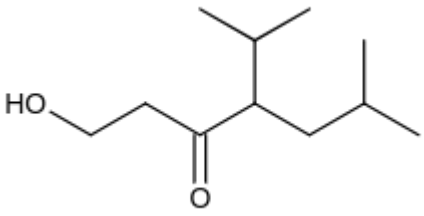


D.

Correct answer: C

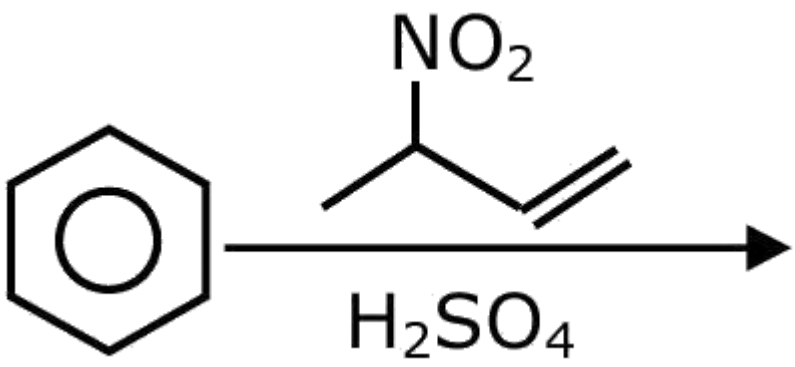
Source solution

Sol.

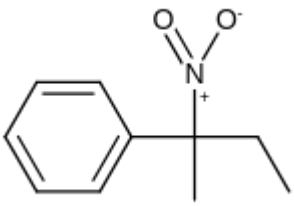


Question 102

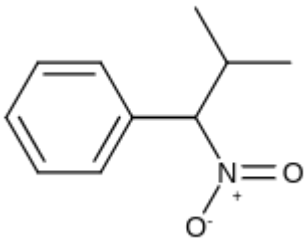
The major product of the following reaction is :



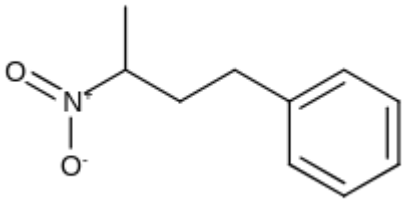
A.



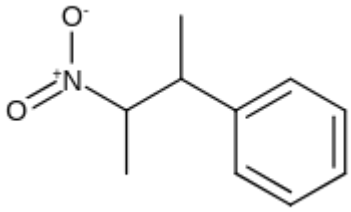
B.



C.



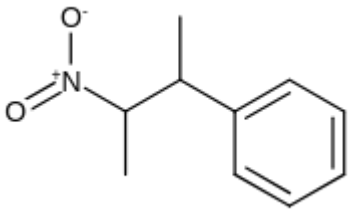
D.



Correct answer: D

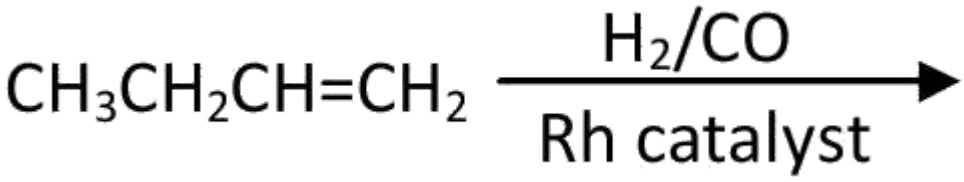
Source solution

Sol.



Question 103

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. $CH_3CH_2C=CH_2$

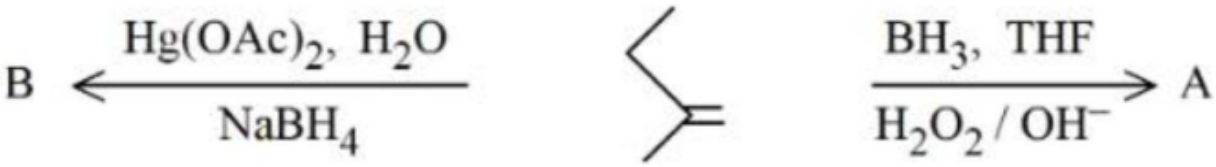
Correct answer: C

Source solution

Sol. $CH_3-CH_2-CH=CH_2 \xrightarrow[Rh\ \text{catalyst}]{H_2/CO} CH_3CH_2CH_2CHO$

Question 104

Find out the major products from the following reaction



A. 

B. 

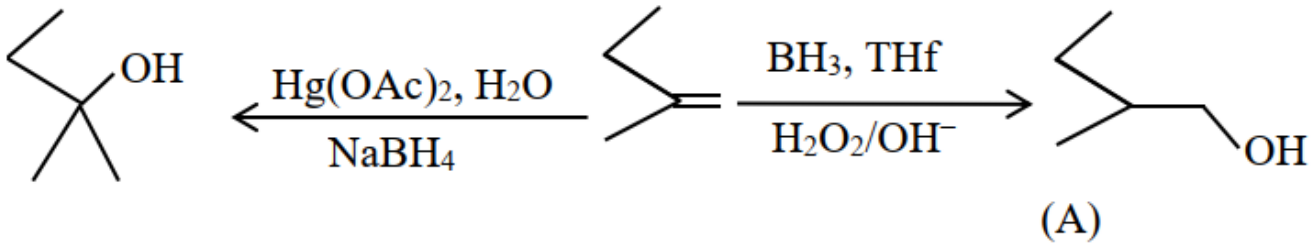
C. 

D. 

Correct answer: B

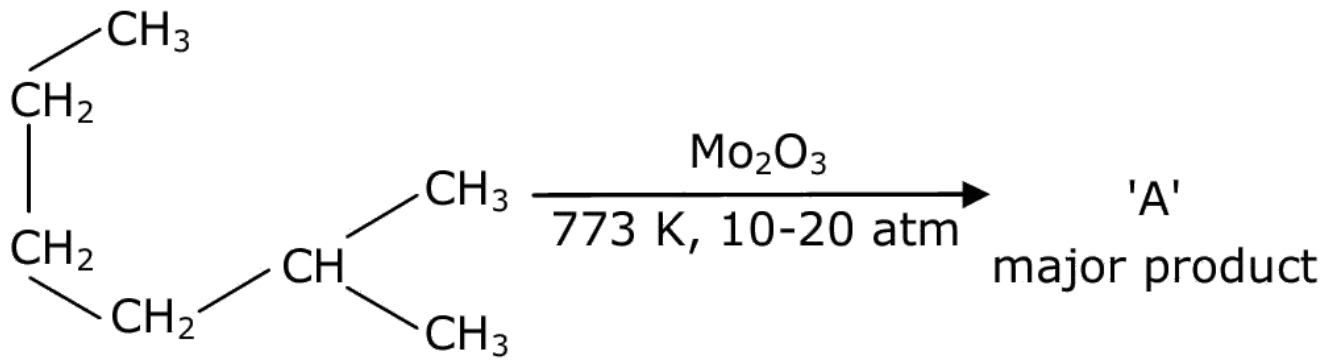
Source solution

Sol. 2



Question 105

Identify A in the given chemical reaction.



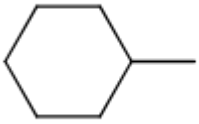
A.



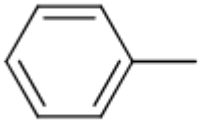
B.



C.



D.

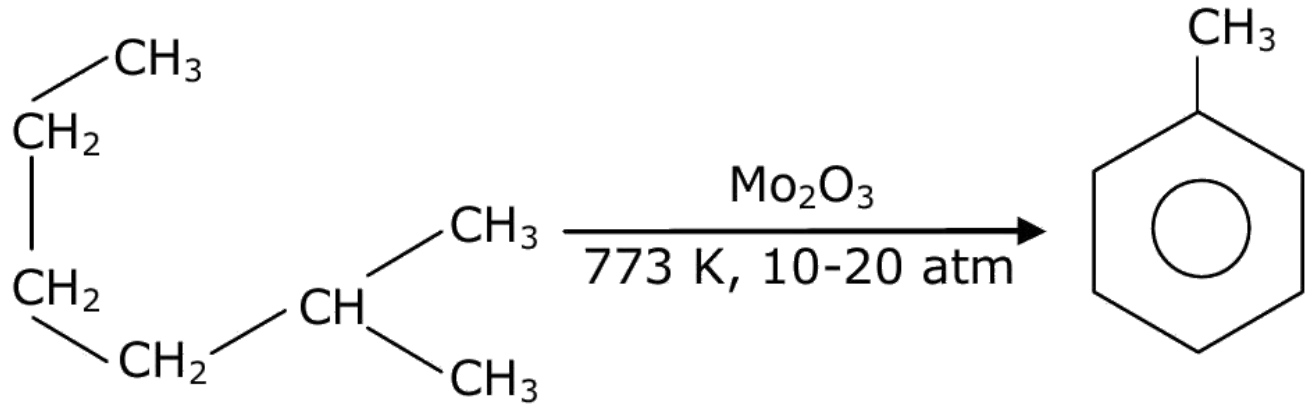


Correct answer: D

Source solution

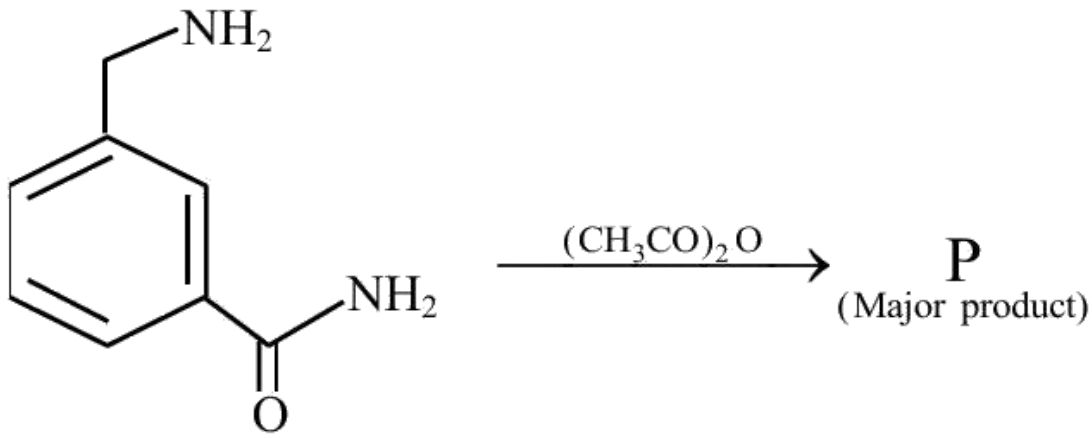
Sol. (4)}

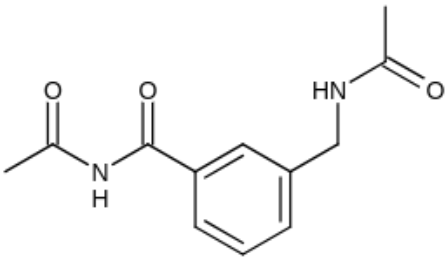
Aromatization reaction or hydroforming reaction.


CH3
CH2
CH2
CH2
CH
CH3
CH3
Mo2O3
773 K, 10-20 atm
CH3

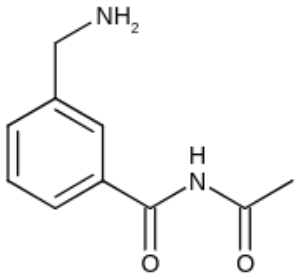
Question 106

The major product in the above reaction is :

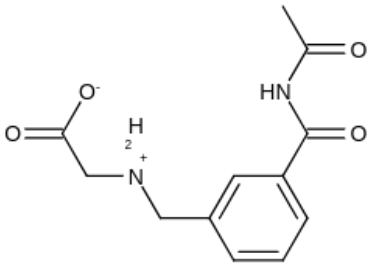




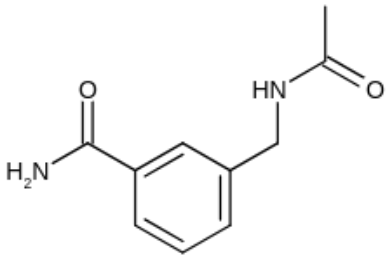
A.



B.



C.

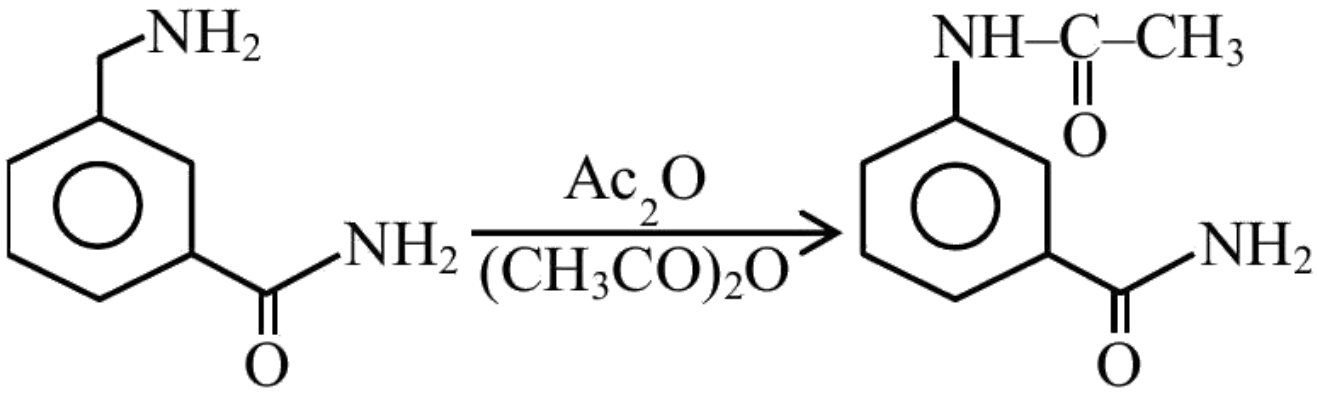


D.

Correct answer: D

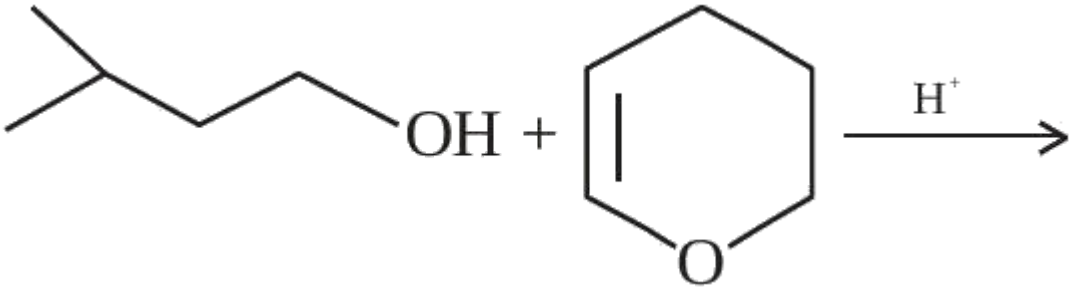
Source solution

Sol.

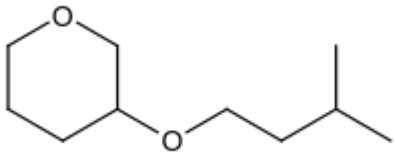

NH2
NH2
O
Ac2O
(CH3CO)2O
NH–C–CH3
O
NH2
O

Question 107

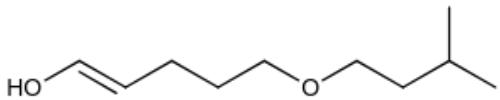
The major product formed in the following reaction, is



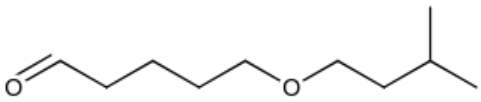
A.



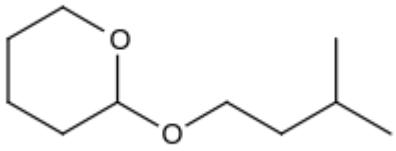
B.



C.



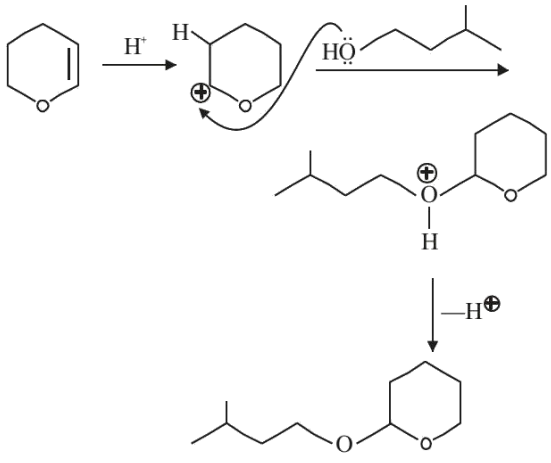
D.



Correct answer: D

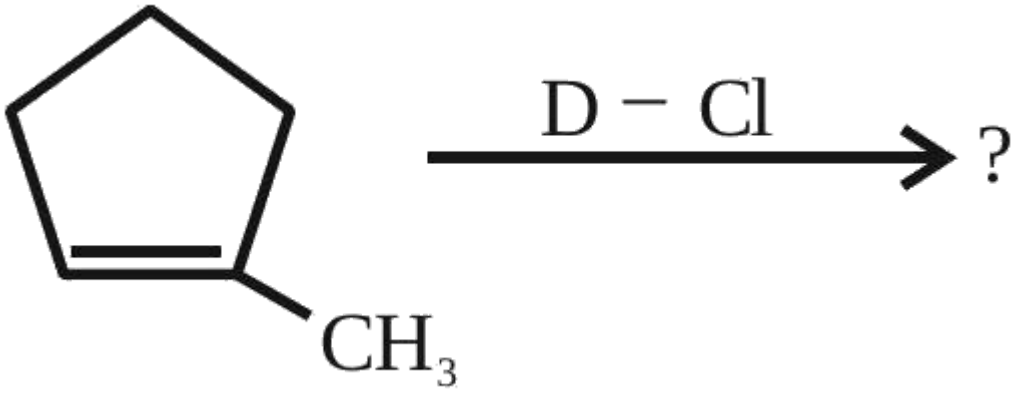
Source solution

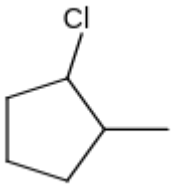
Sol.



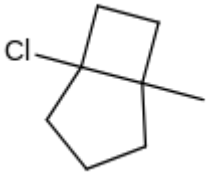
Question 108

Major product of the following reaction is -

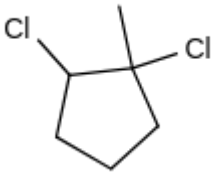




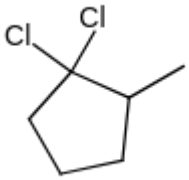
A.



B.



C.



D.

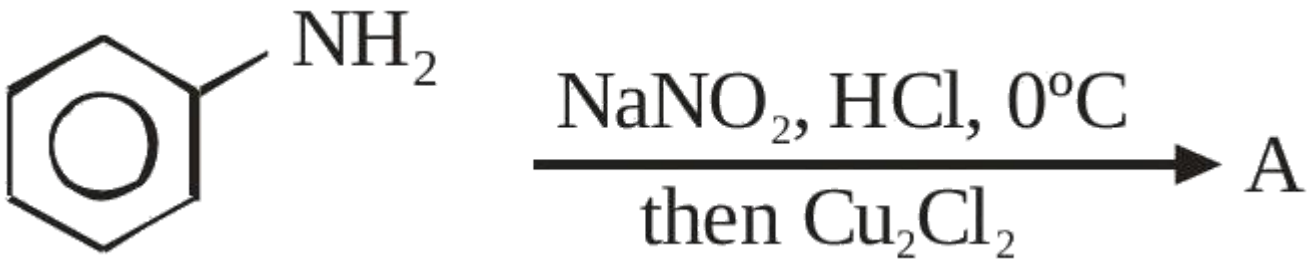
Correct answer: A

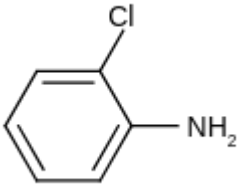
The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

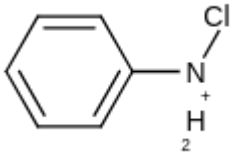
Question 109

The product A formed in the following reaction is:

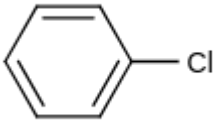




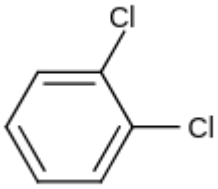
A.



B.



C.

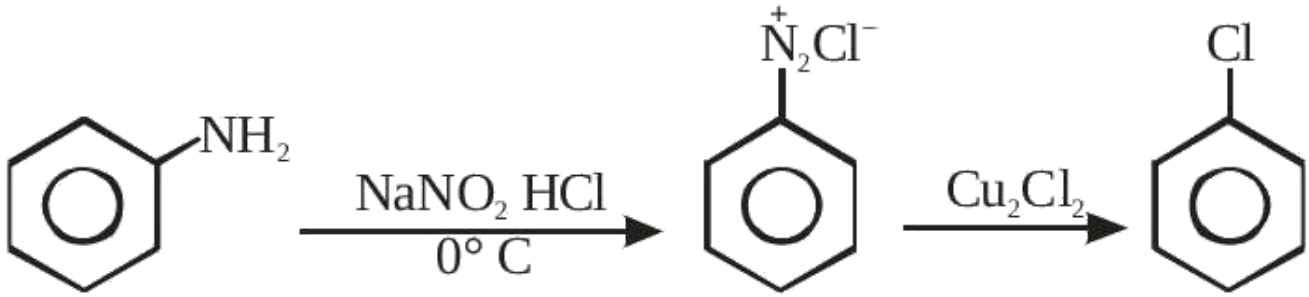


D.

Correct answer: C

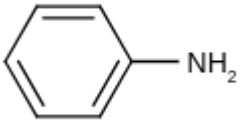
Source solution

Sol.

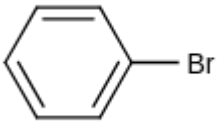


Question 110

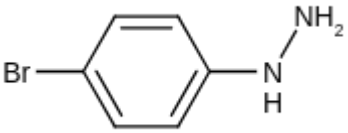
Identify the major product formed in the following sequence of reactions :



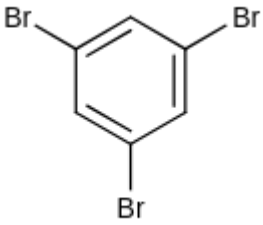
A.



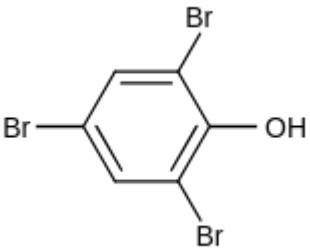
B.



C.



D.



Correct answer: C

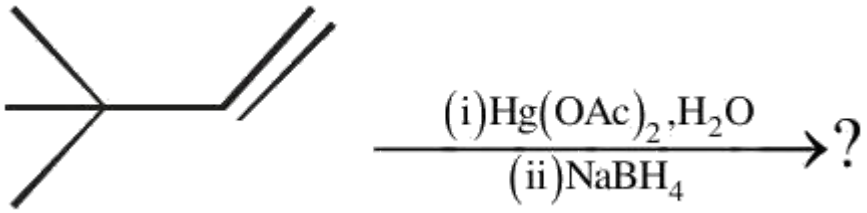
The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

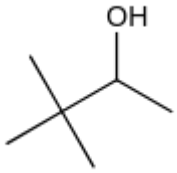
Sol.

Question 111

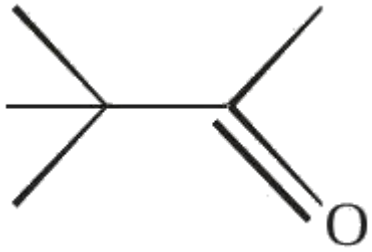
The major product in the following reaction



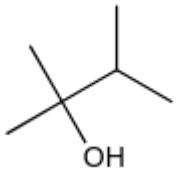
A.



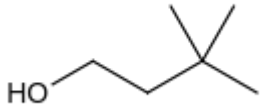
B.



C.



D.

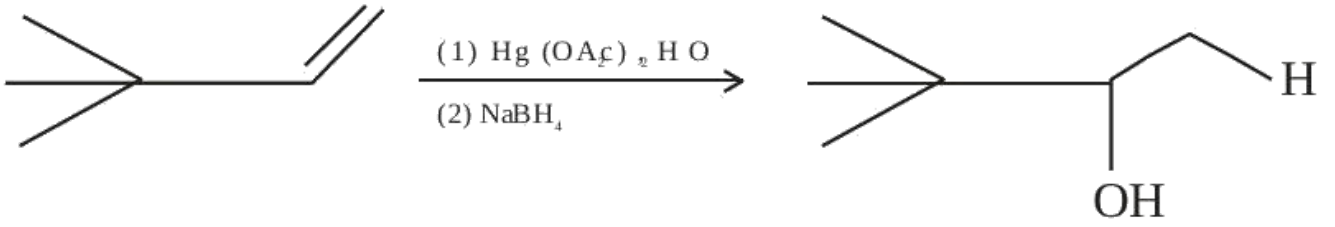


Correct answer: A

Source solution

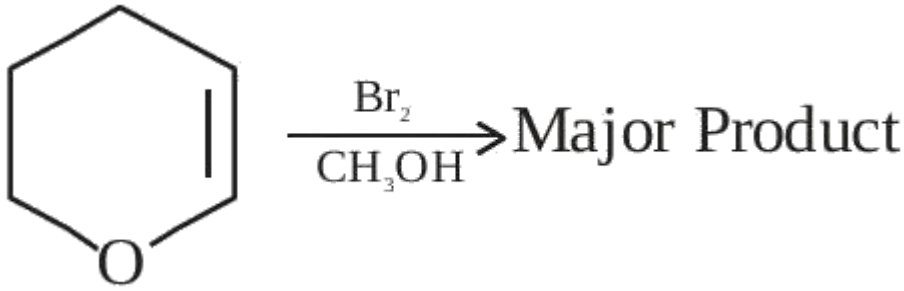
Sol.

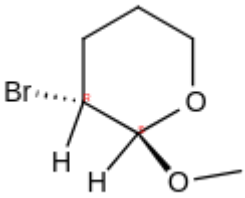
Oxymercuration - Demercuration
Addition of H_2O
Markovnikov's addition without rearrangement



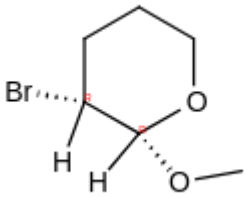
Question 112

Amongst the following, the major product of the given chemical reaction is

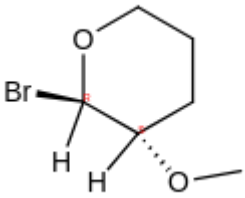




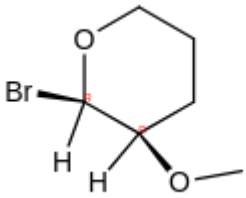
A.



B.



C.

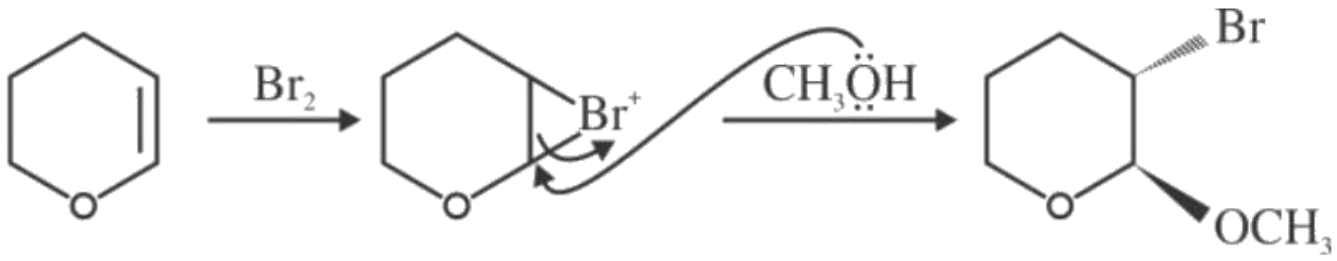


D.

Correct answer: A

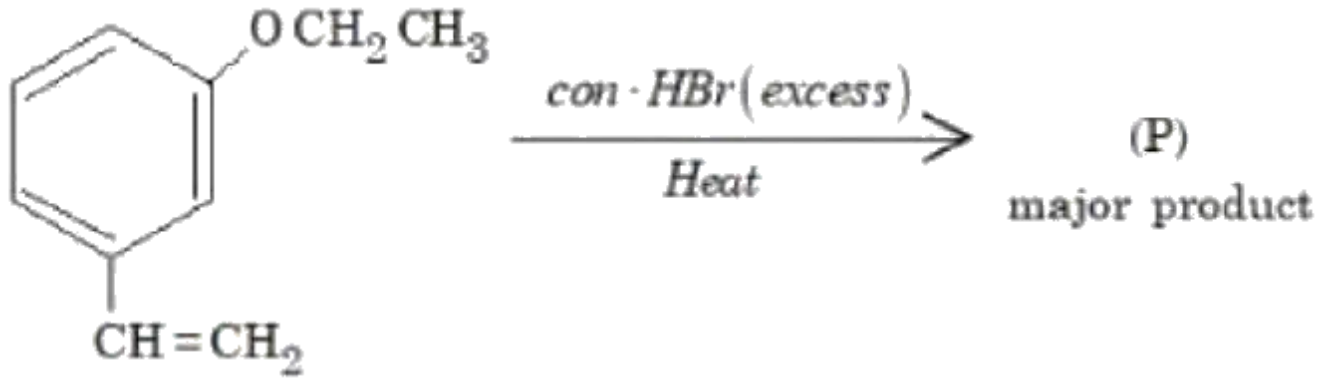
Source solution

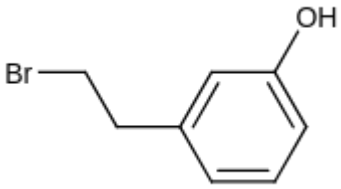
Sol.



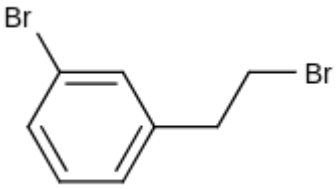
Question 113

The major product(P) in the following reaction is

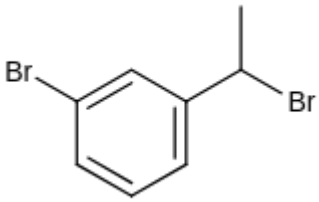




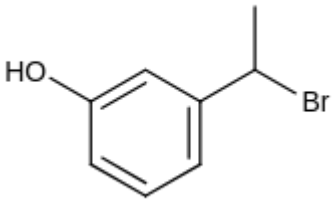
A.



B.



C.

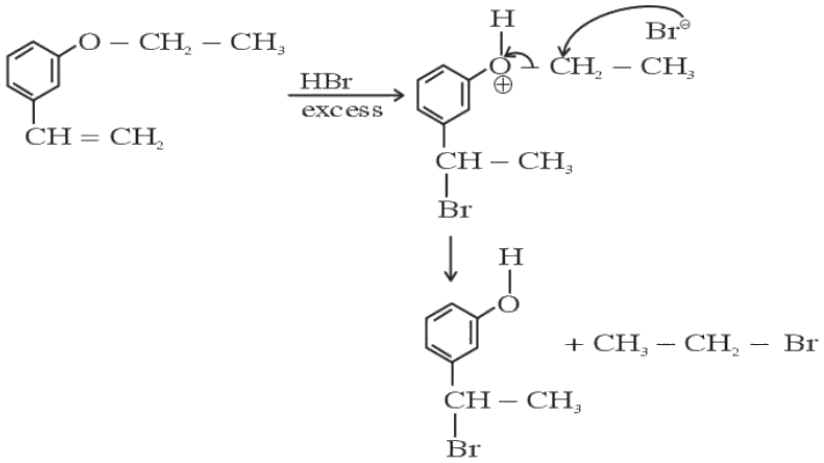


D.

Correct answer: D

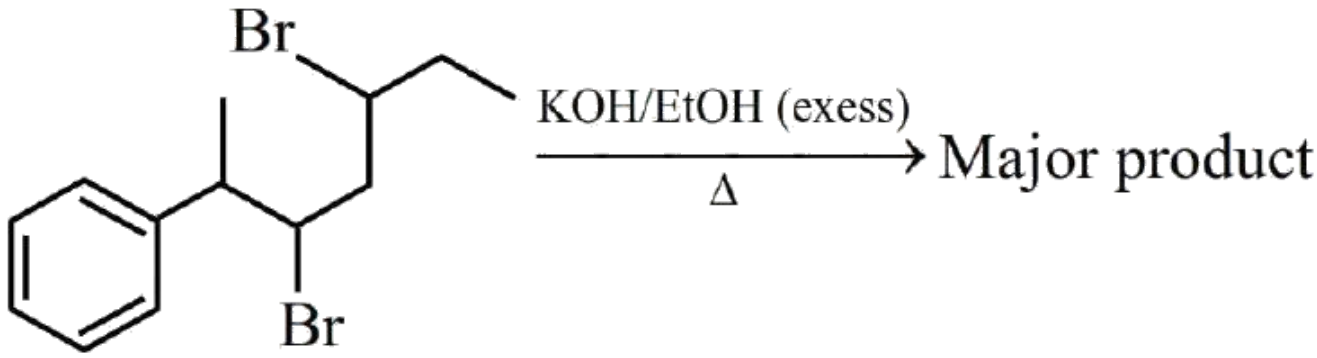
Source solution

Sol.


O − CH2 − CH3
CH = CH2
HBr
excess
H
O
Br⊖
CH2 − CH3
CH − CH3
Br
H
O
+ CH3 − CH2 − Br
CH − CH3
Br

Question 114

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

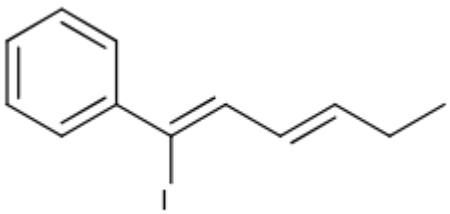
D. 2-Phenylhepta-2,4-diene

Correct answer: D

Source solution

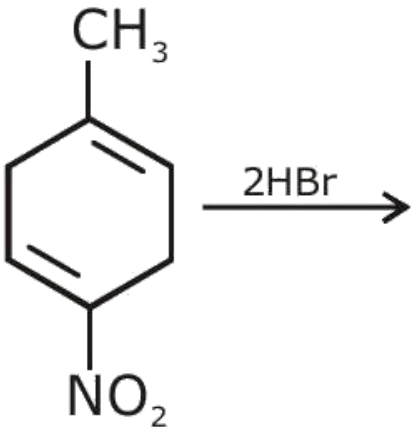
Sol.

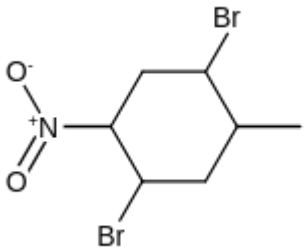
2-Phenylhepta-2,4-diene



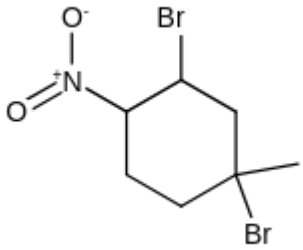
Question 115

The major product of the following reaction is:

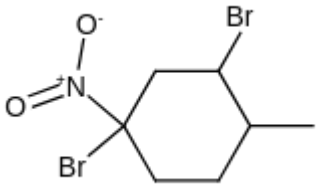




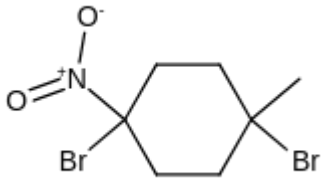
A.



B.



C.

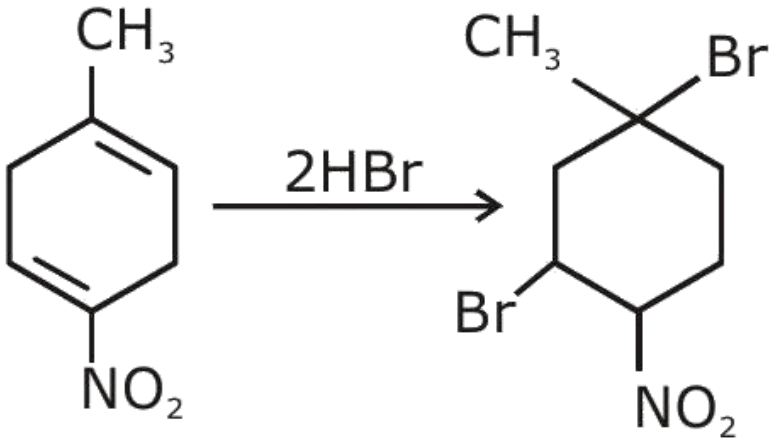


D.

Correct answer: B

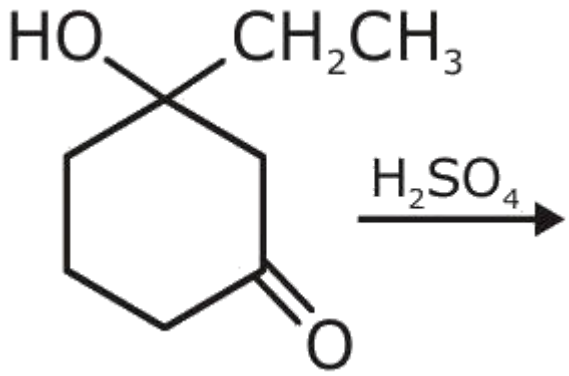
Source solution

Sol. 2}

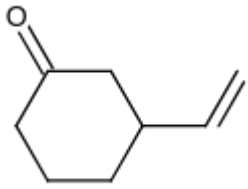

CH3
2HBr
NO2
CH3
Br
Br
NO2

Question 116

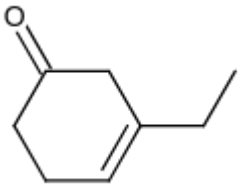
The major product of the following reaction is:



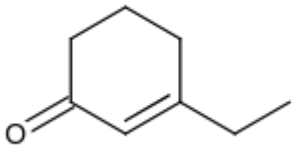
A.



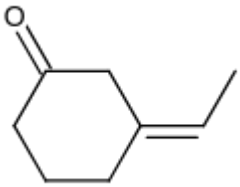
B.



C.



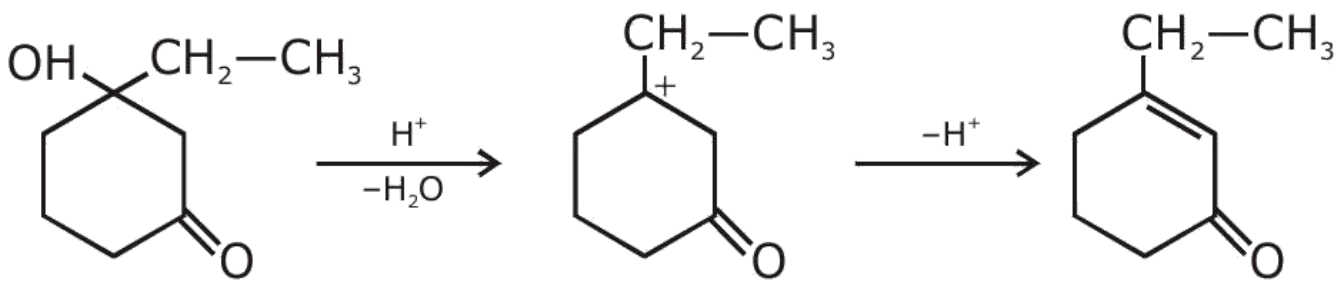
D.



Correct answer: C

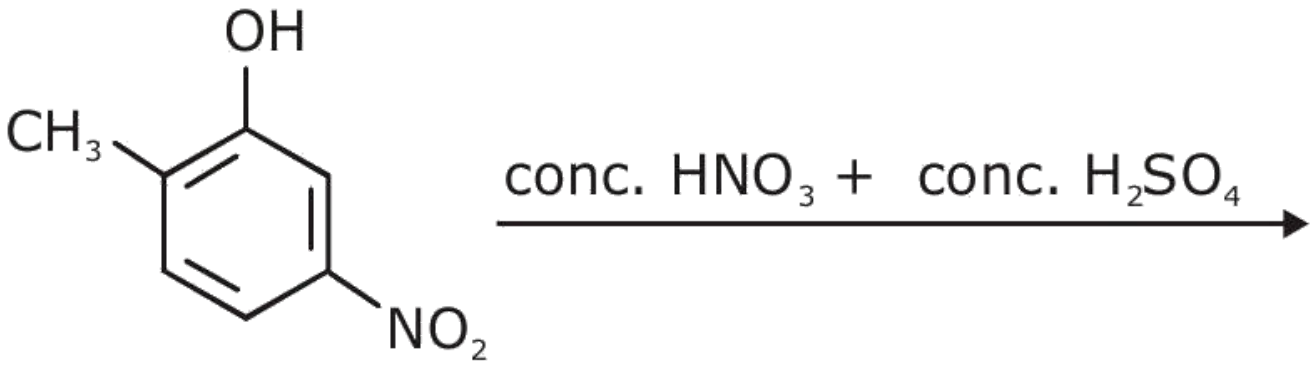
Source solution

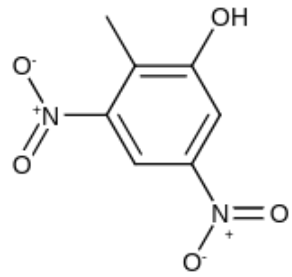
Sol. 3



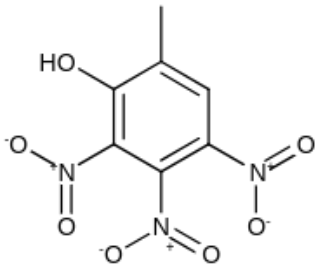
Question 117

The major product of the following reaction is :

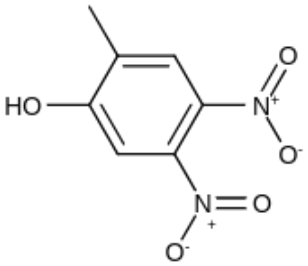




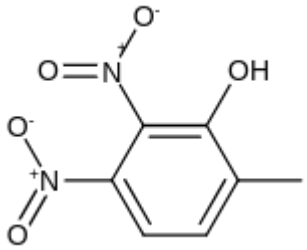
A.



B.



C.

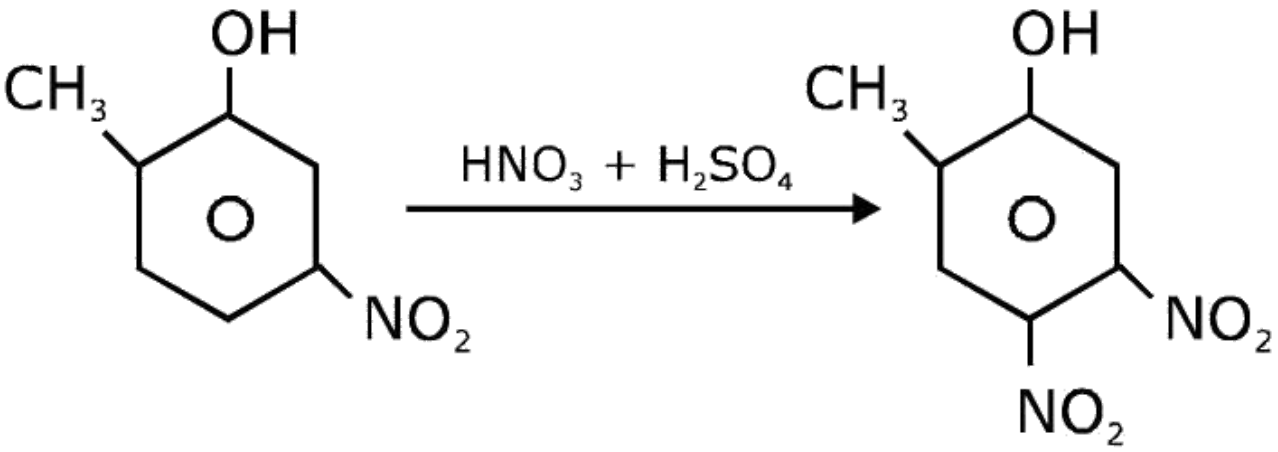


D.

Correct answer: C

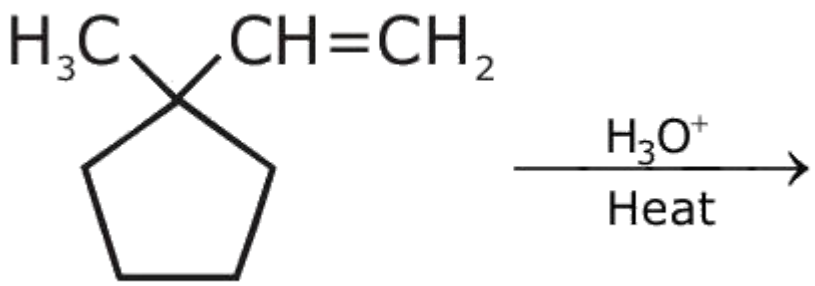
Source solution

Sol. 3}

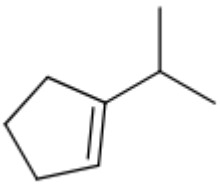

OH
CH3
O
NO2
HNO3 + H2SO4
OH
CH3
O
NO2
NO2

Question 118

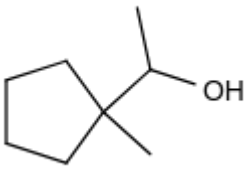
The major product in the following reaction is:



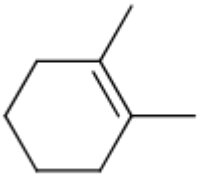
A.



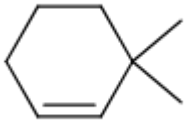
B.



C.



D.

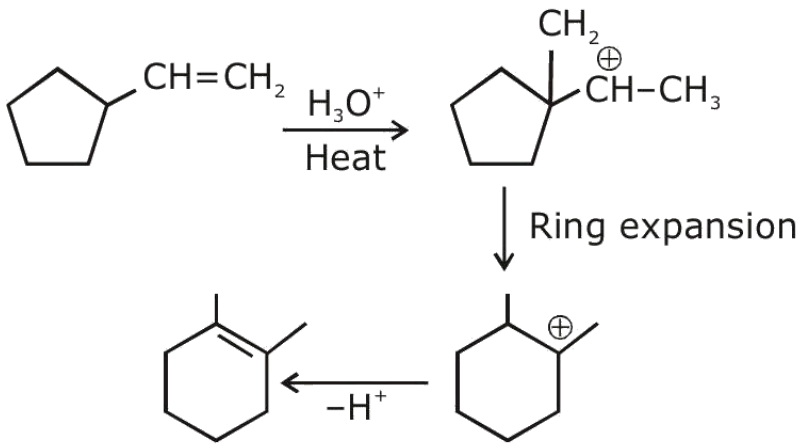


Correct answer: C

Source solution

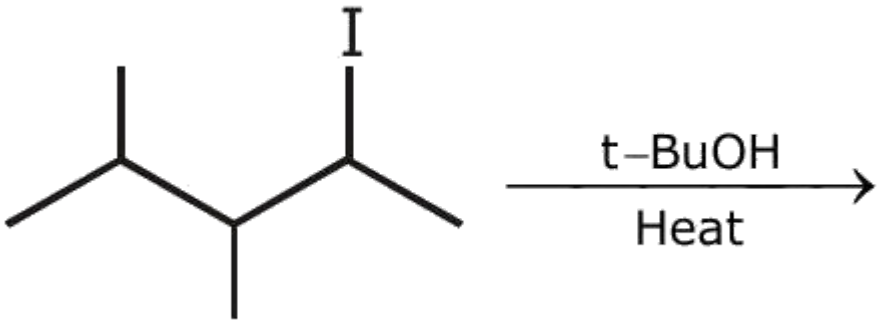
Sol.

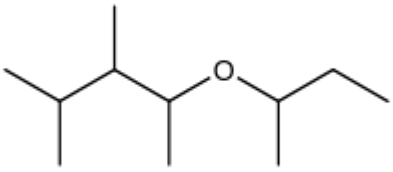
Option (3) is correct answer.


CH=CH2
H3O+
Heat
CH2
CH–CH3
Ring expansion
–H+

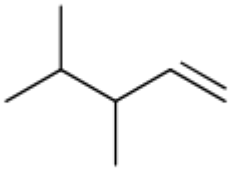
Question 119

The major product in the following reaction is:

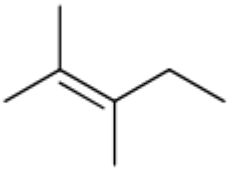




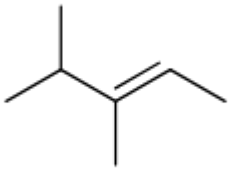
A.



B.



C.

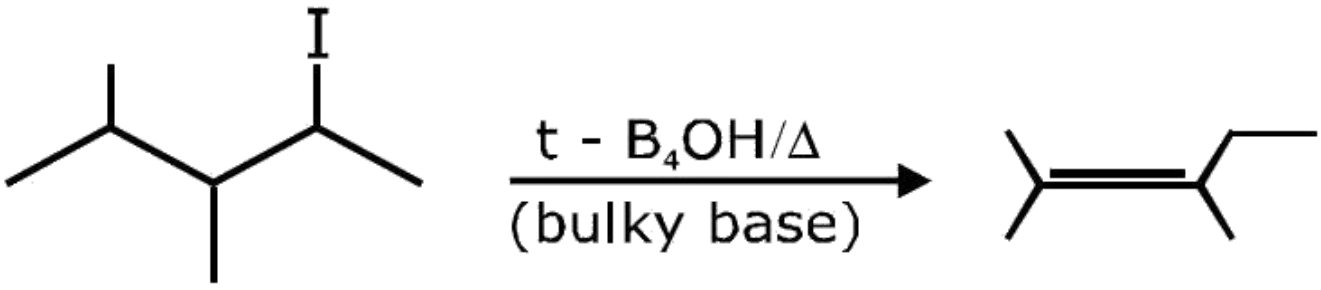


D.

Correct answer: C

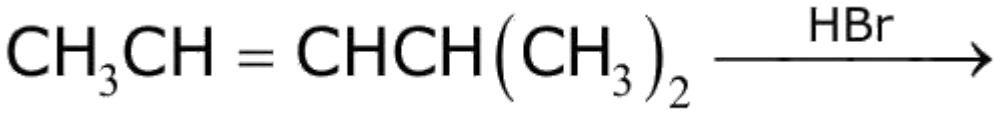
Source solution

Sol. 3}



Question 120

The major product formed in the following reaction is :



A. $CH_3CH(Br)CH_2CH(CH_3)_2$

B. $CH_3CH_2CH_2C(Br)(CH_3)_2$

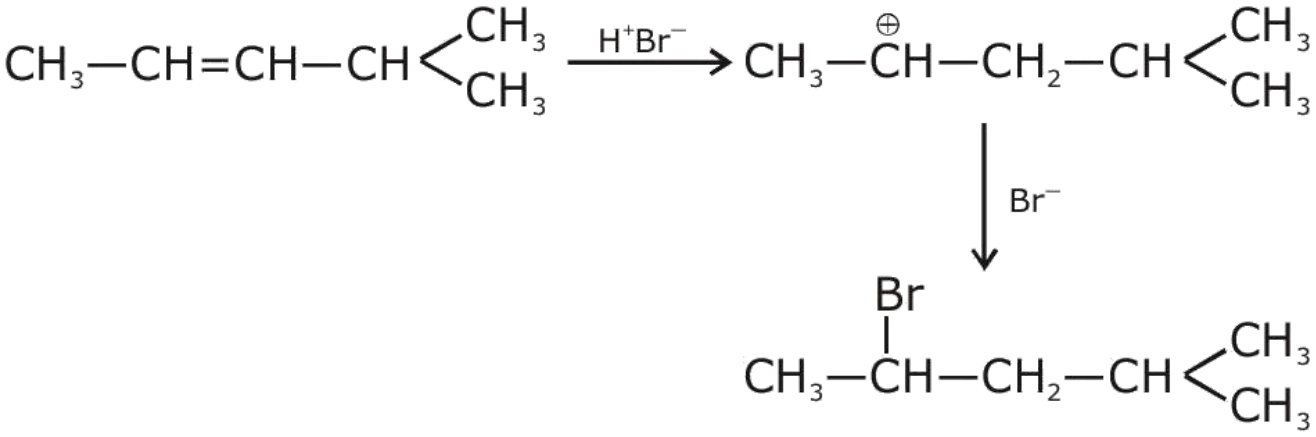
C. $CH_3CH_2CH(Br)CH(CH_3)_2$

D. $Br(CH_2)_3CH(CH_3)_2$

Correct answer: A

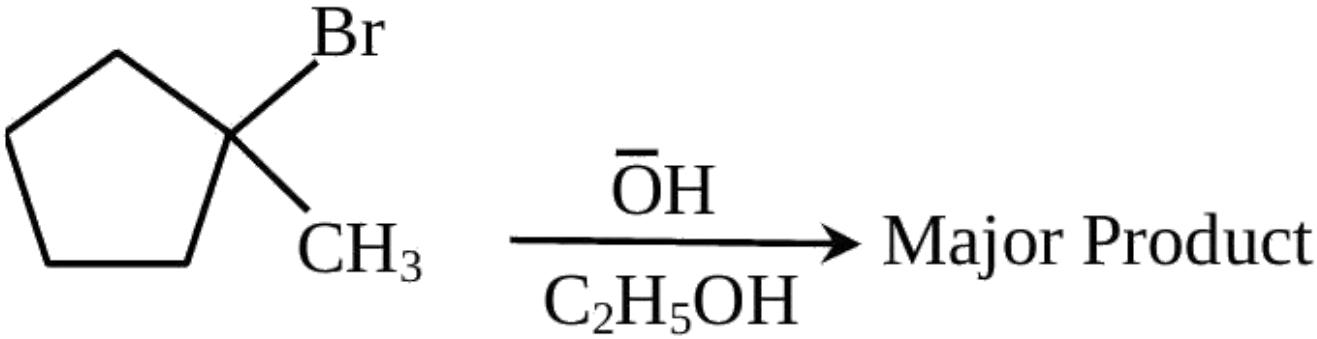
Source solution

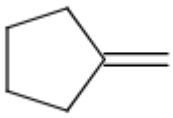
Sol. 1



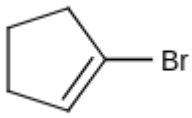
Question 121

Identify the major product in the following reaction.

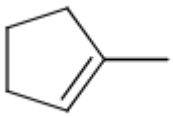




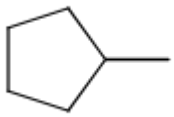
A.



B.



C.

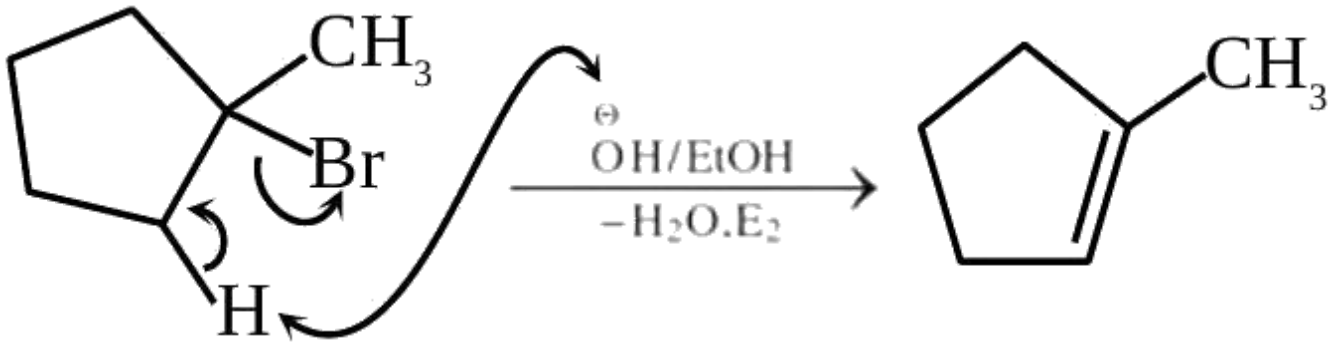


D.

Correct answer: C

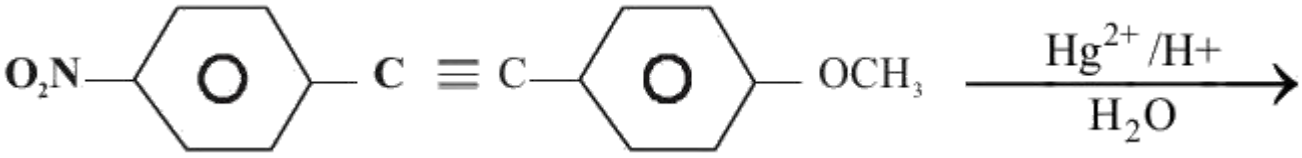
Source solution

Sol.

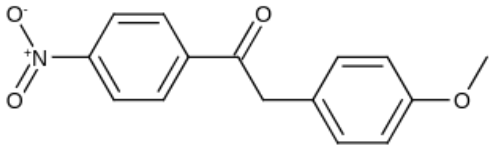


Question 122

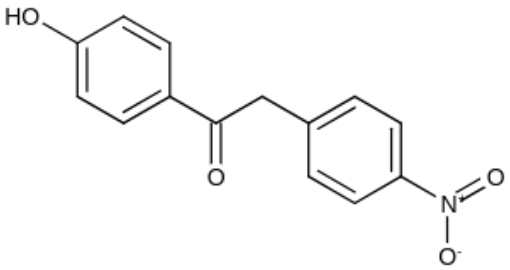
The major product obtained from the following reactions is :



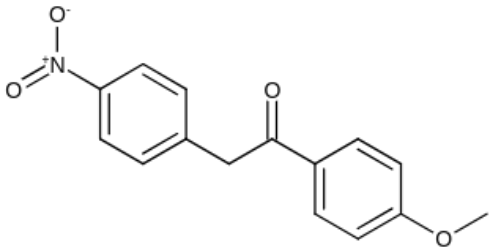
A.



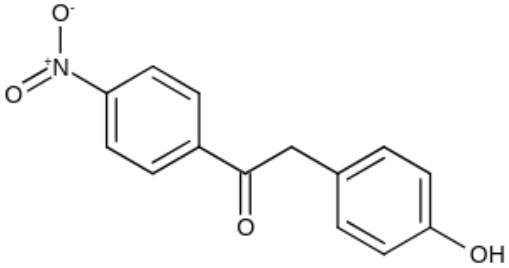
B.



C.



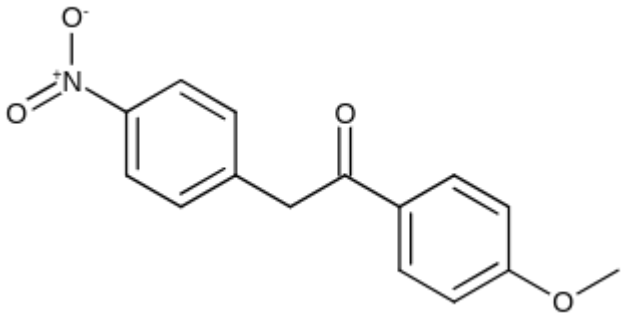
D.



Correct answer: C

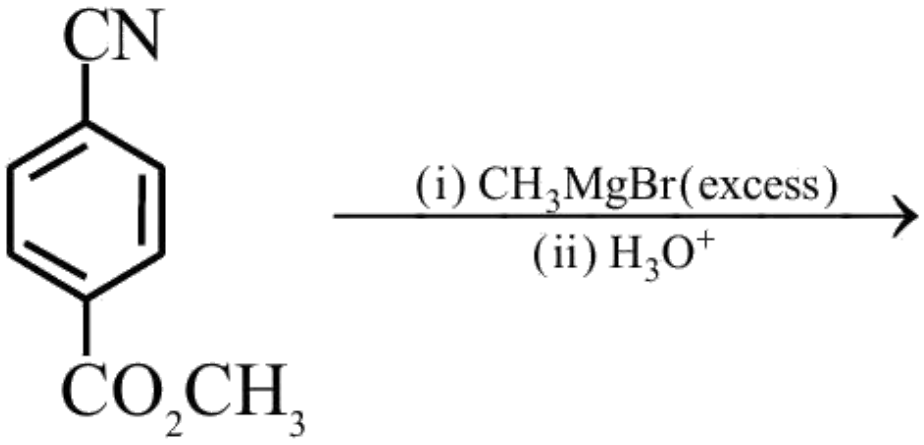
Source solution

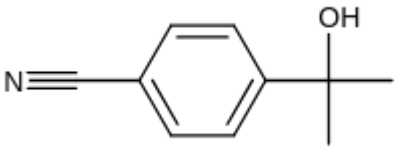
Sol. 3}



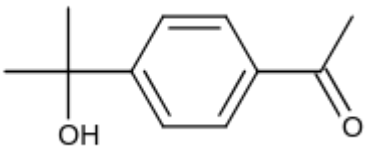
Question 123

Major product of the following reaction is

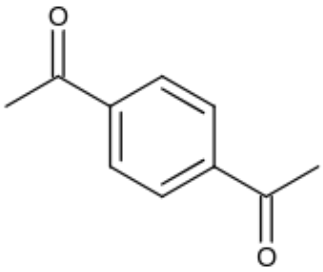




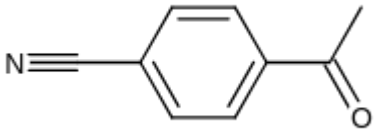
A.



B.



C.

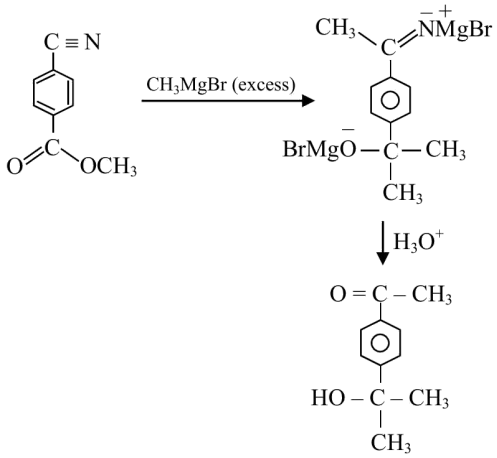


D.

Correct answer: B

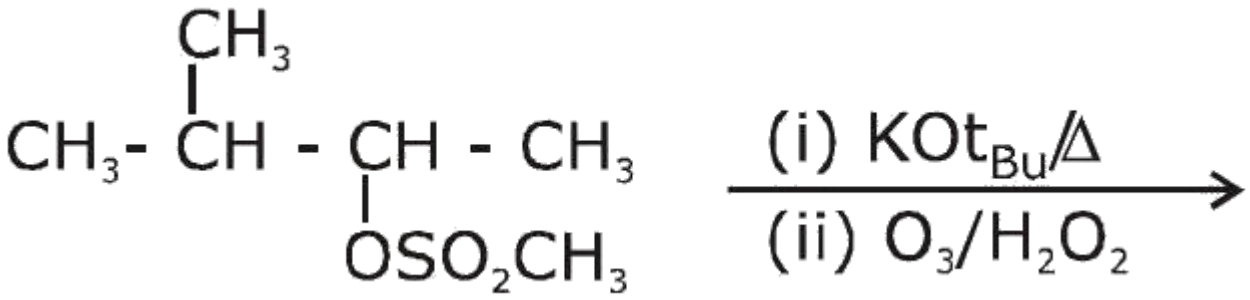
Source solution

Sol.

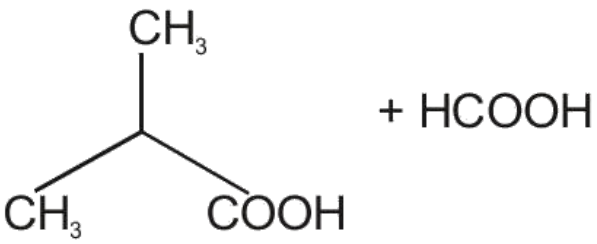

C ≡ N
O
C
OCH3
CH3MgBr (excess)
CH3
C
NMgBr
BrMgO
C
CH3
CH3
H3O+
O = C – CH3
HO – C – CH3
CH3

Question 124

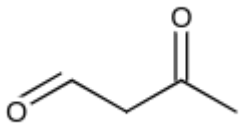
The major products of the following reactions are :



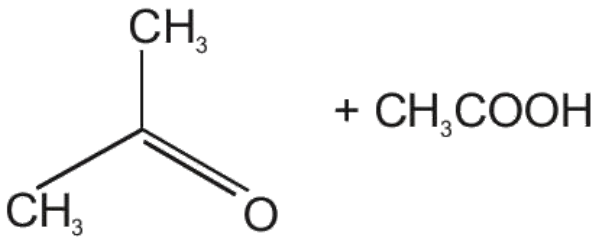
A.



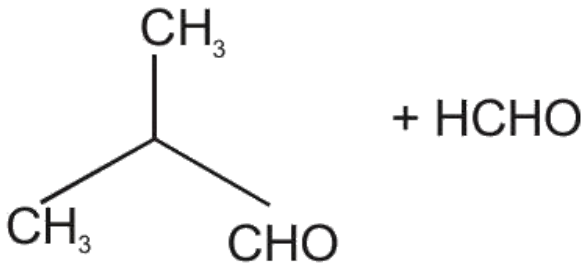
B.



C.



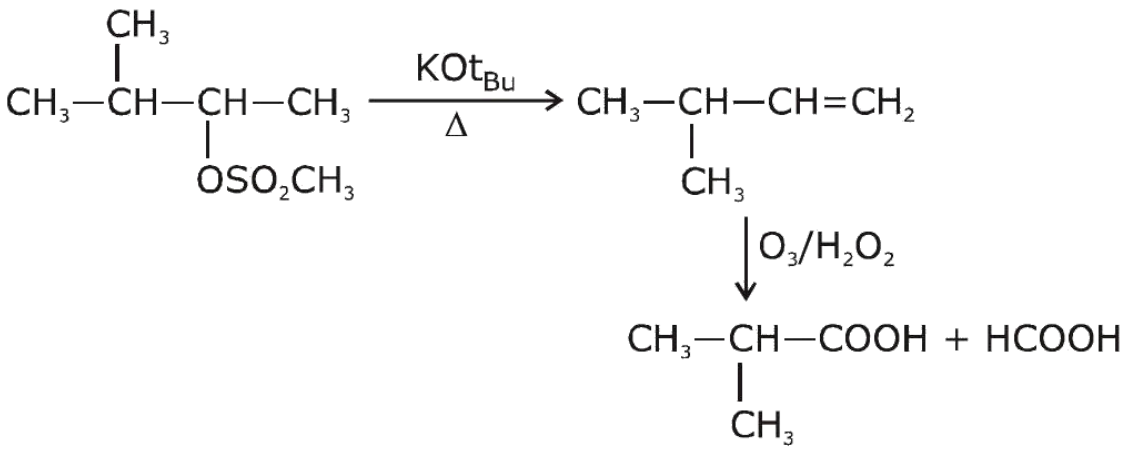
D.



Correct answer: A

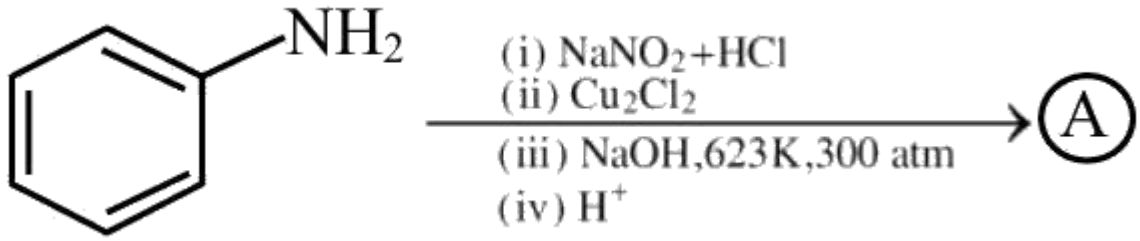
Source solution

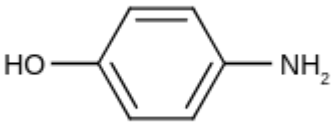
Sol. 1}


CH3
CH3—CH—CH—CH3
OSO2CH3
KOtBu
Δ
CH3—CH—CH=CH2
CH3
O3/H2O2
CH3—CH—COOH + HCOOH
CH3

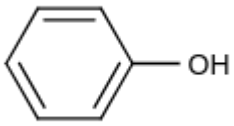
Question 125

Identify the product (A) in the following reaction.

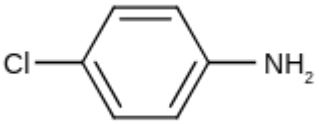




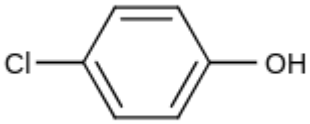
A.



B.



C.

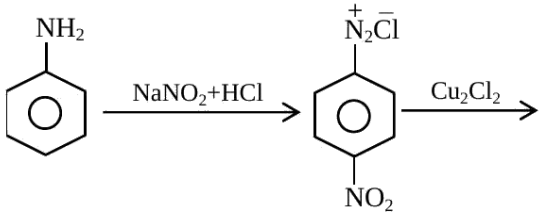


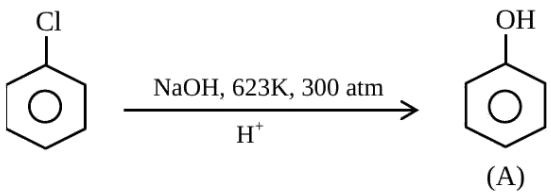
D.

Correct answer: B

Source solution

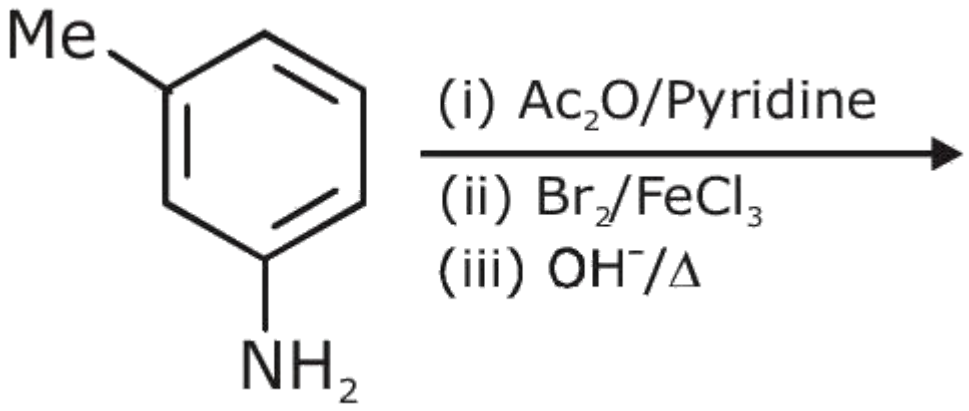
Sol.



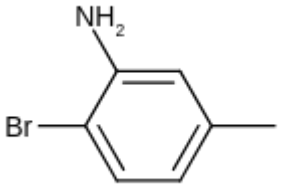


Question 126

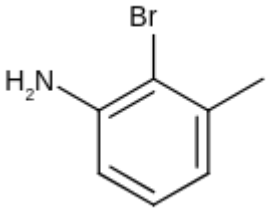
The final major product of the following reaction is :



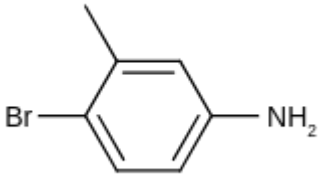
A.



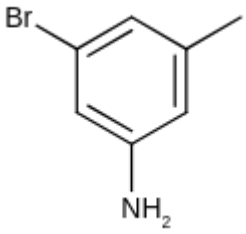
B.



C.



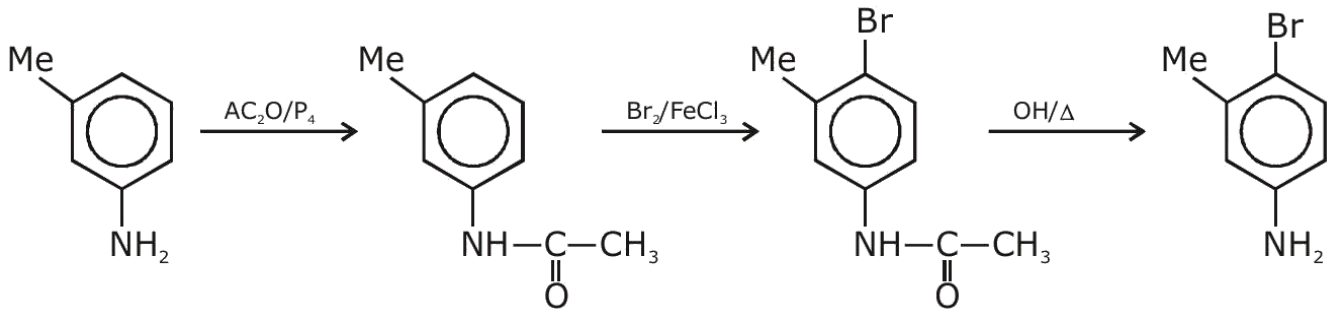
D.



Correct answer: C

Source solution

Sol. 3


Me
NH2
AC2O/P4
Me
NH—C—CH3
O
Br2/FeCl3
Br
Me
NH—C—CH3
O
OH/Δ
Br
Me
NH2

Question 127

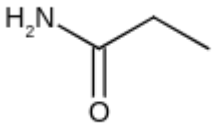
Consider the given reaction, identify the major product P .

$$CH_3-COOH \xrightarrow[(iv)\ H_2O/\bar{O}H,\Delta]{(i)\ LiAlH_4 \quad (ii)\ PCC \quad (iii)\ HCN/\bar{O}H} \text{"P"}$$

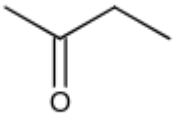
A.



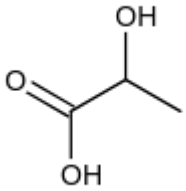
B.



C.



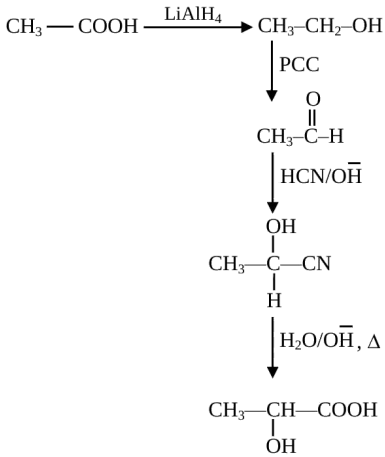
D.



Correct answer: D

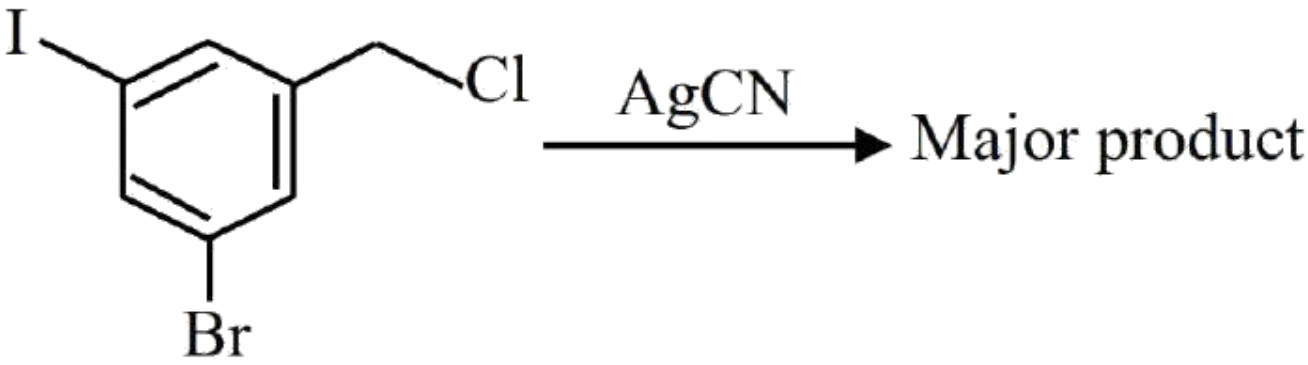
Source solution

Sol.

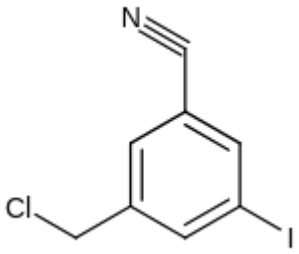


Question 128

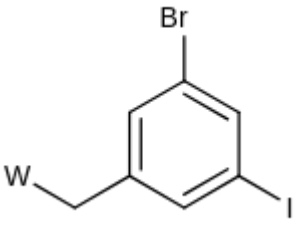
The structure of the major product formed in the following reaction is:



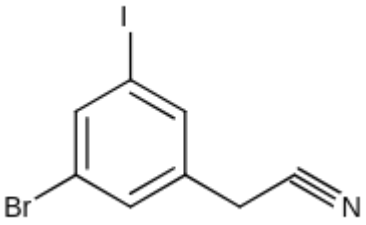
A.



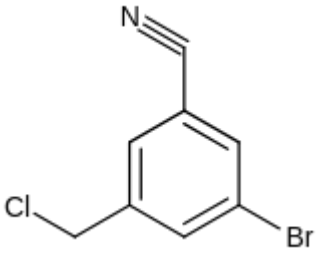
B.



C.



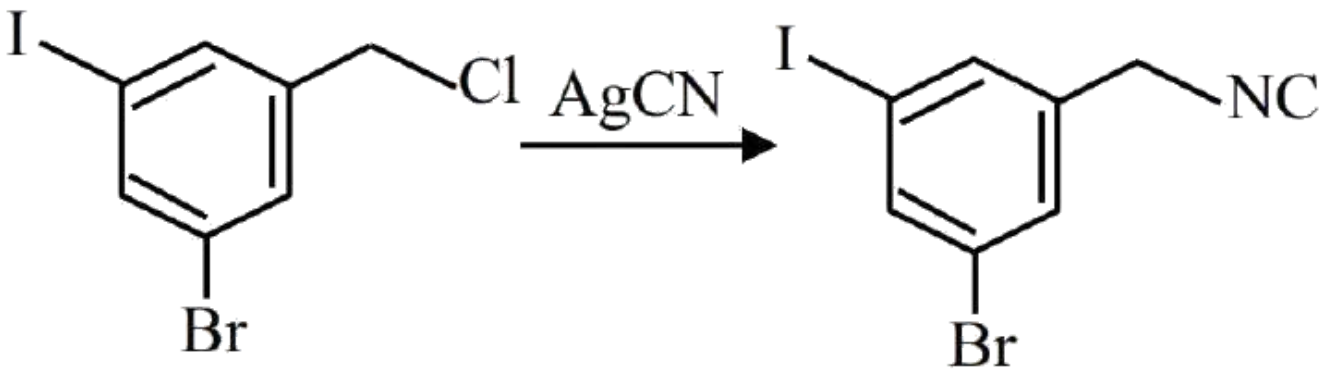
D.



Correct answer: B

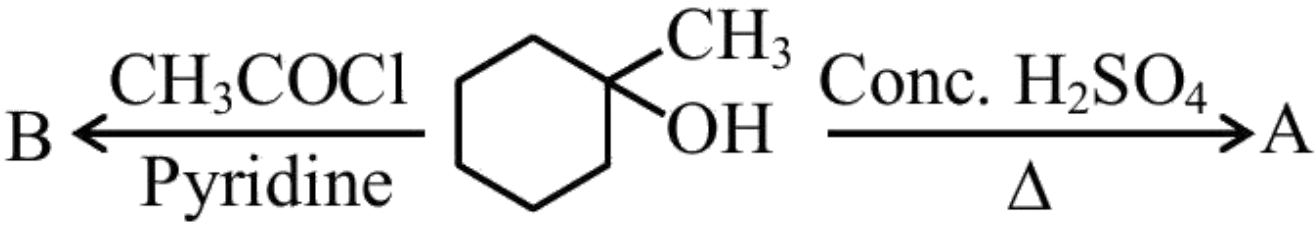
Source solution

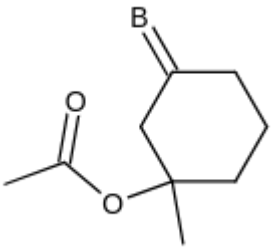
Sol.


I
Cl
AgCN
I
NC
Br
Br

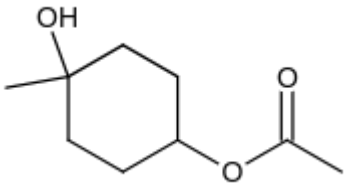
Question 129

Identify the major products A and B respectively in the following set of reactions.

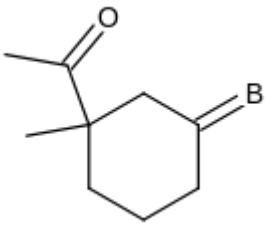




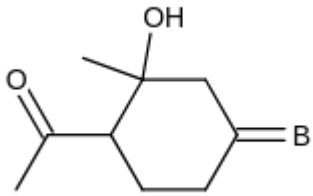
A.



B.



C.

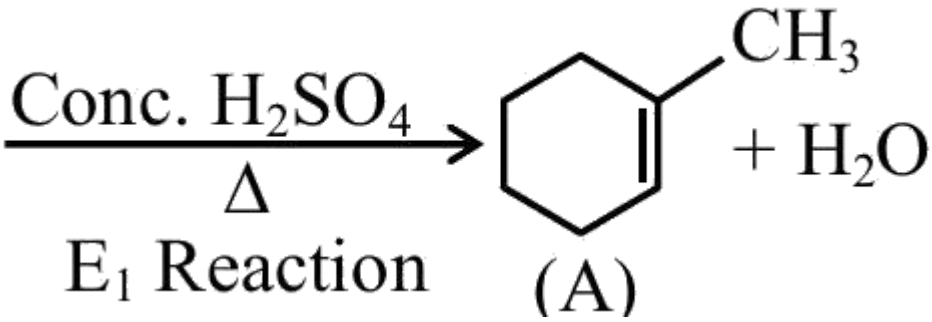


D.

Correct answer: A

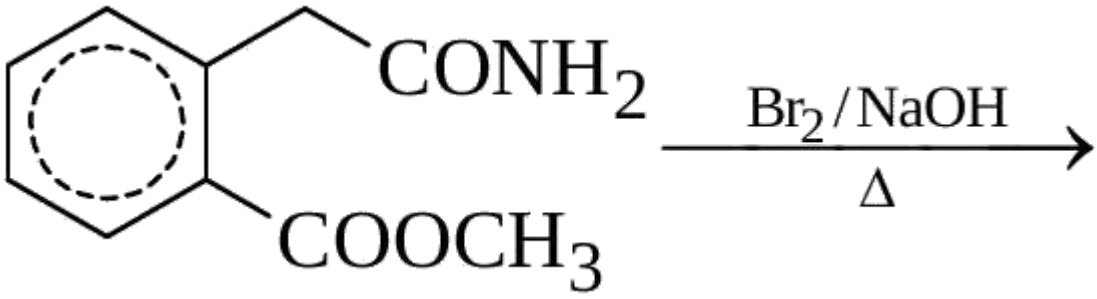
Source solution

Sol.

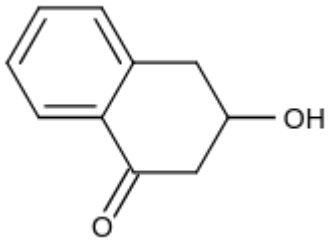


Question 130

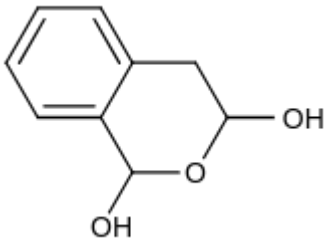
The major product formed in the following reaction is



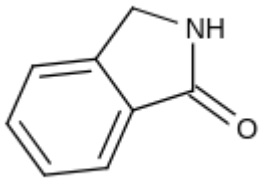
A.



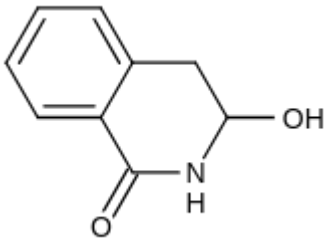
B.



C.



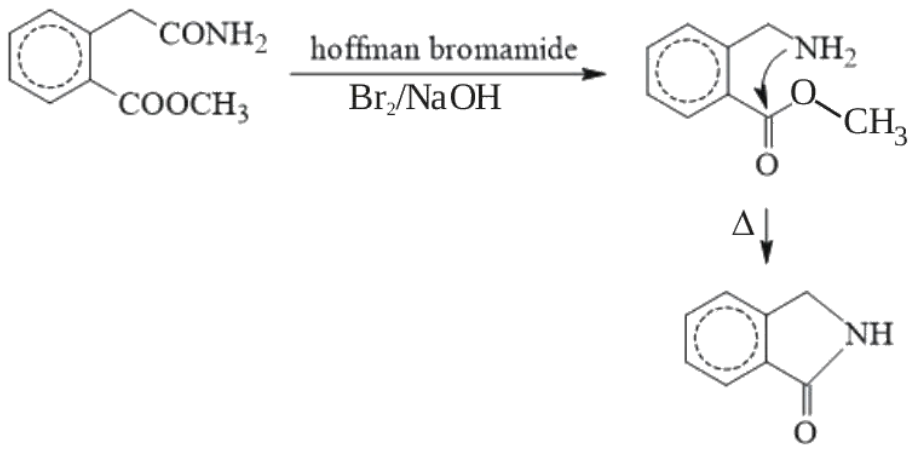
D.



Correct answer: C

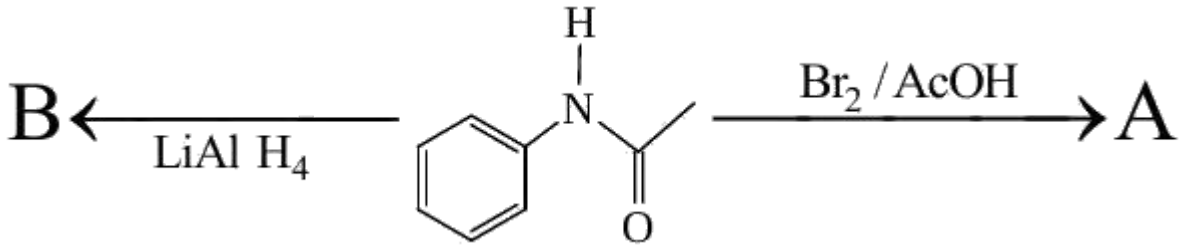
Source solution

Sol.

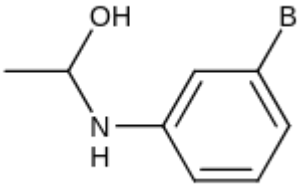

CONH2
COOCH3
hoffman bromamide
Br2/NaOH
NH2
O
CH3
O
Δ
NH
O

Question 131

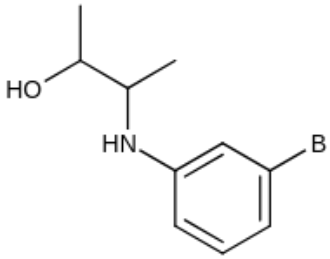
The major products A and B from the following reactions are:



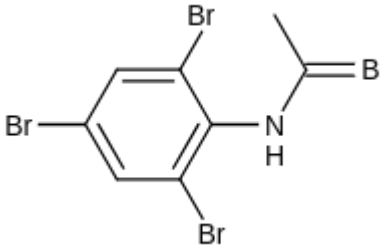
A.



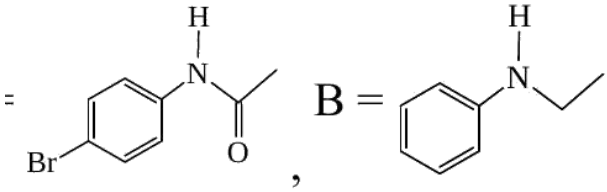
B.



C.



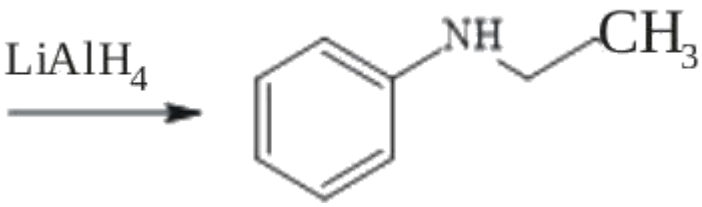
D.



Correct answer: D

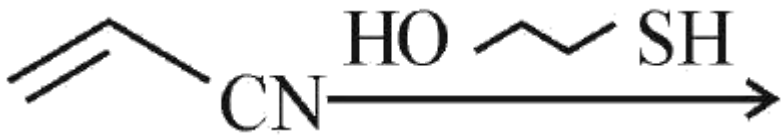
Source solution

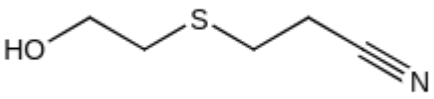
Sol.



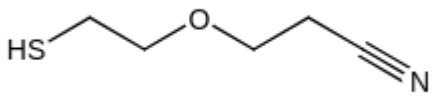
Question 132

The major product for the following reaction is:

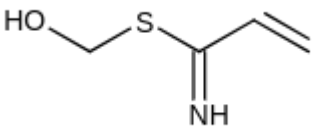




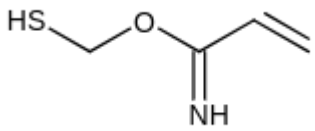
A.



B.



C.

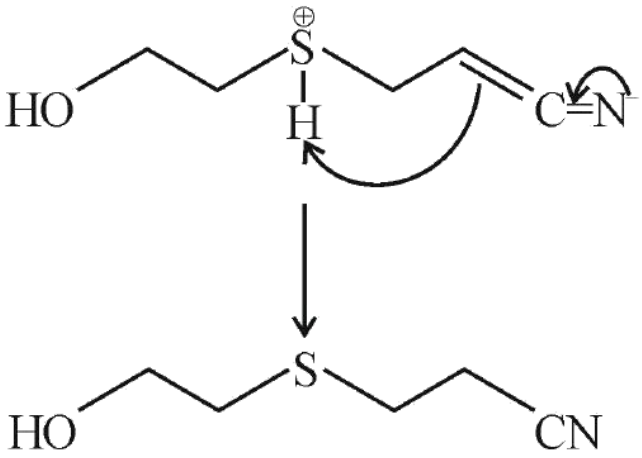


D.

Correct answer: A

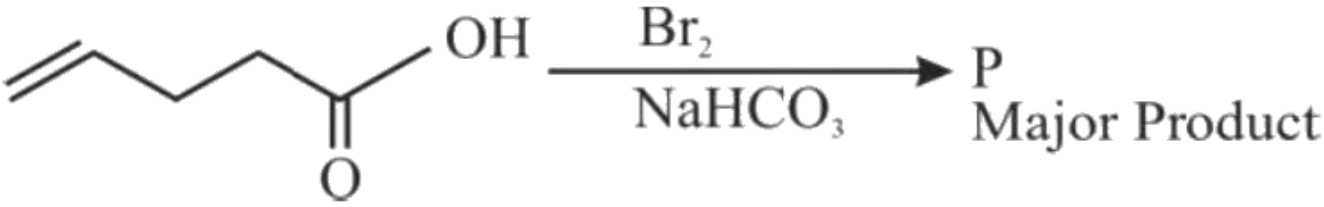
Source solution

Sol.

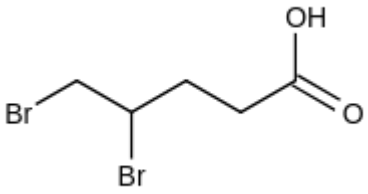


Question 133

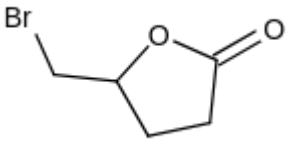
Major product ' P ' formed in the following reaction is :-



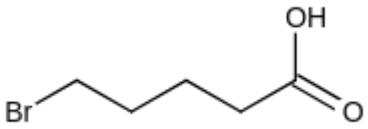
A.



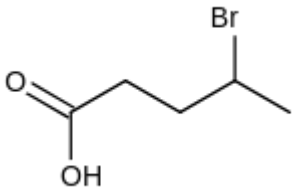
B.



C.



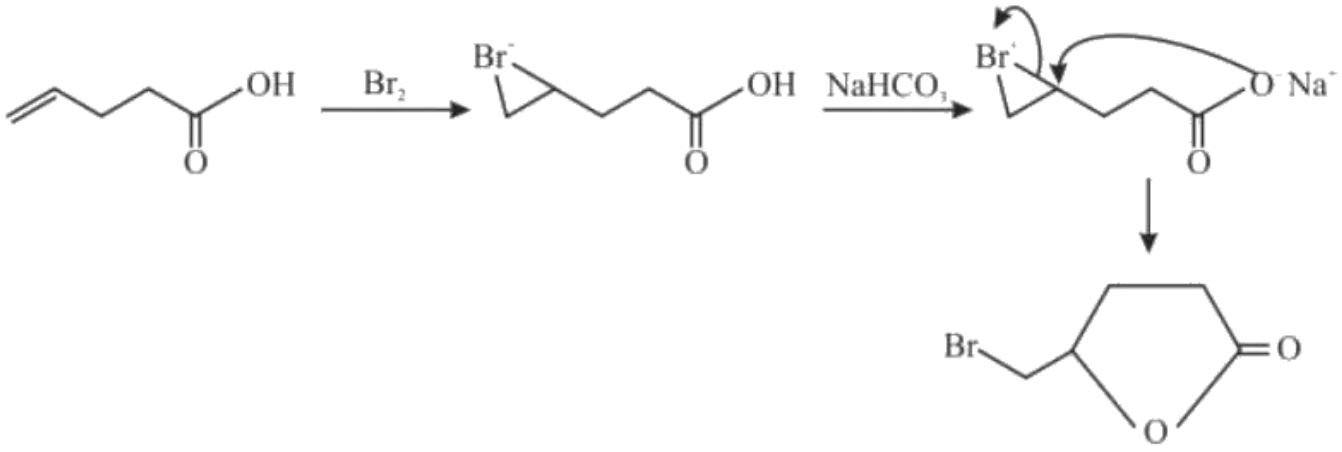
D.



Correct answer: B

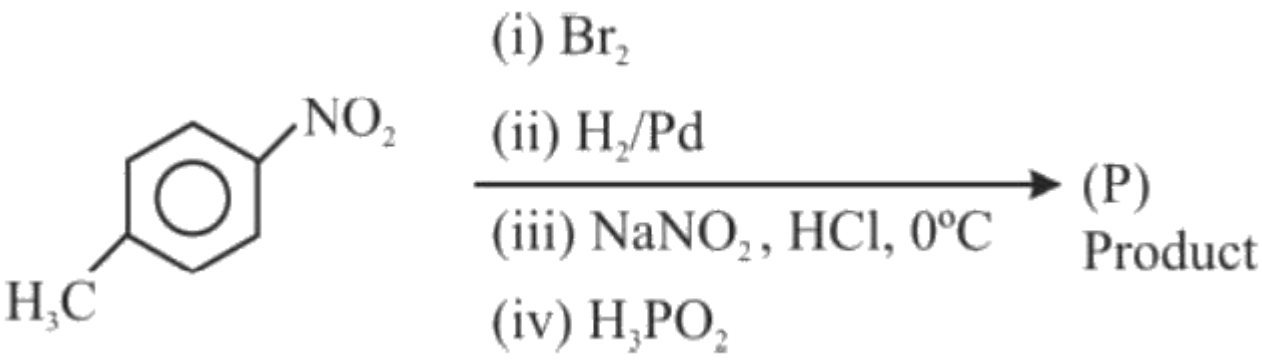
Source solution

Sol.

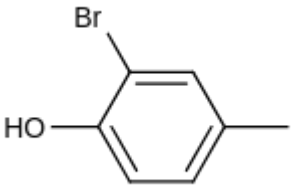


Question 134

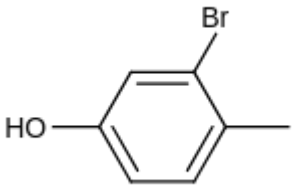
The product (P) formed from the following multistep reaction is :-



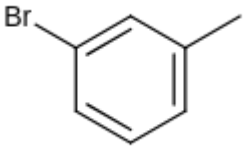
A.



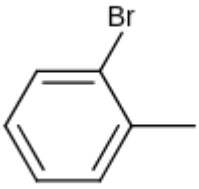
B.



C.



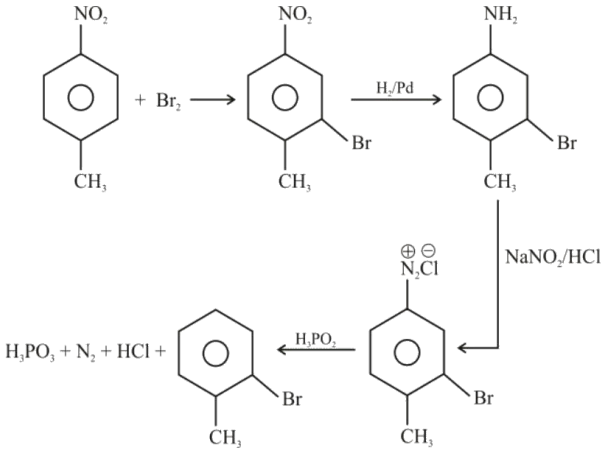
D.



Correct answer: D

Source solution

Sol.


NO2
+ Br2
NO2
Br
CH3
H2/Pd
NH2
Br
CH3
NaNO2/HCl
⊕ ⊖
N2Cl
Br
CH3
H3PO2
H3PO3 + N2 + HCl +
Br
CH3

Question 135

Decreasing order of reactivity towards electrophilie substitution for the following compounds is :

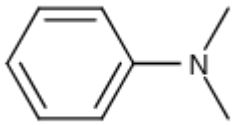
(a)

(b)

(c)

(d)

(e)



A. $c > b > a > d > e$

B. $e > d > a > b > c$

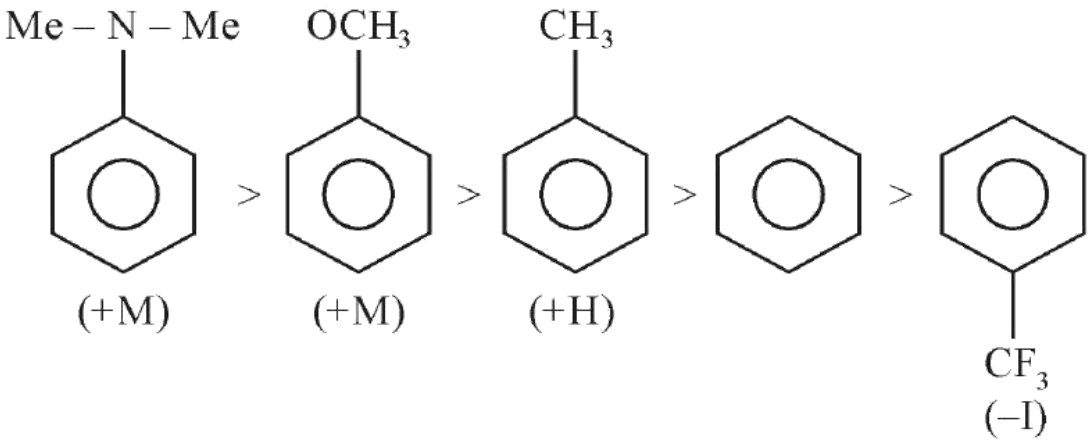
C. $a > d > e > b > c$

D. $d > a > e > c > b$

Correct answer: B

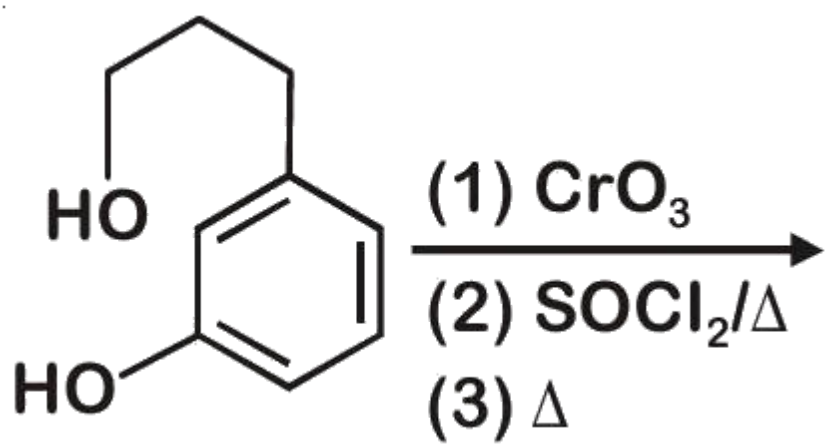
Source solution

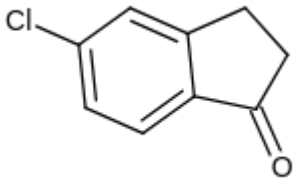
Sol. Higher the electron density on Benzene Ring, Higher its Reactivity towards electrophilic substitution Reaction



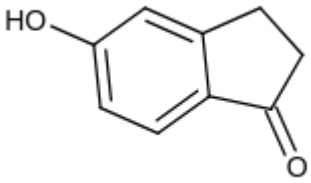
Question 136

The major product of the following reaction is

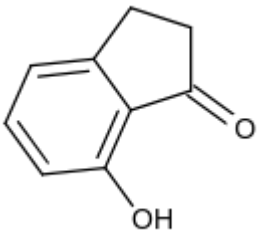




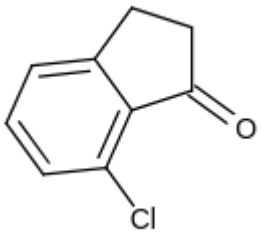
A.



B.



C.

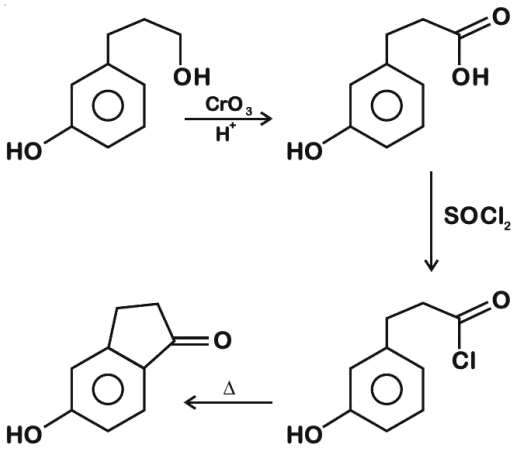


D.

Correct answer: B

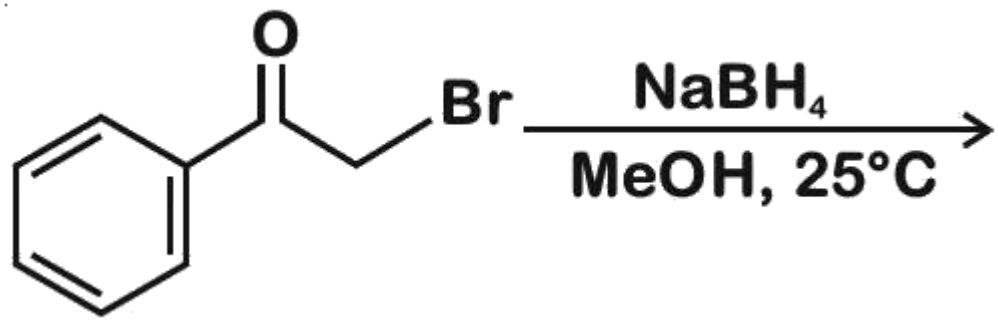
Source solution

Sol.

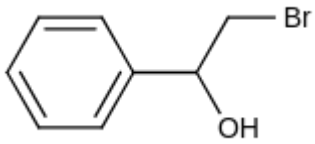

OH
HO
CrO3
H+
O
OH
HO
SOCl2
O
Cl
HO
Δ
O
HO

Question 137

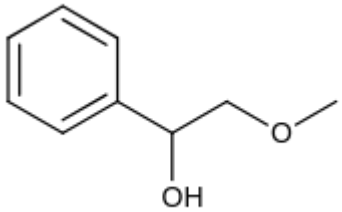
The major product of the following reaction is



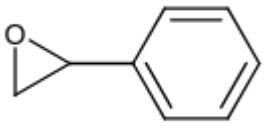
A.



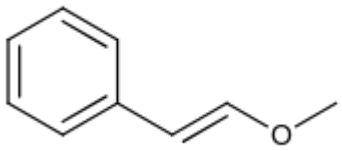
B.



C.



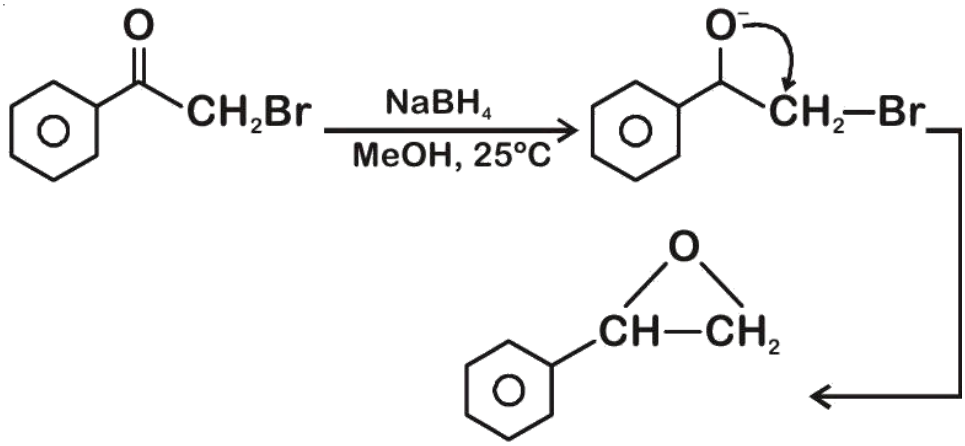
D.



Correct answer: C

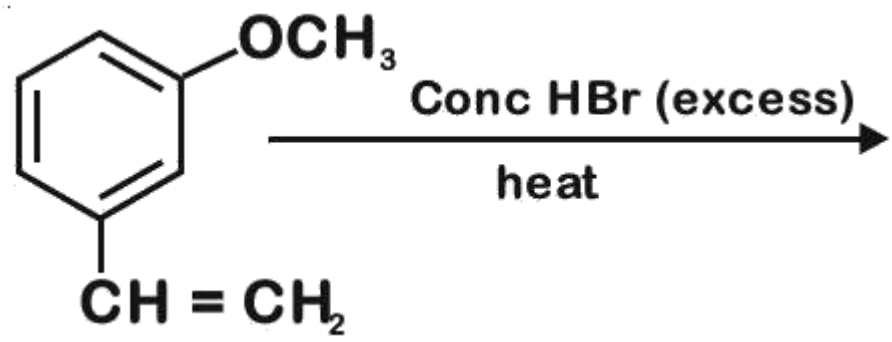
Source solution

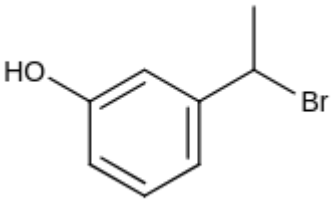
Sol.


O
CH2Br
NaBH4
MeOH, 25°C
O⁻
CH2—Br
O
CH—CH2

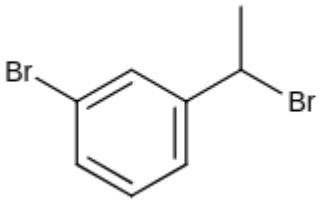
Question 138

The major product of the following reaction is

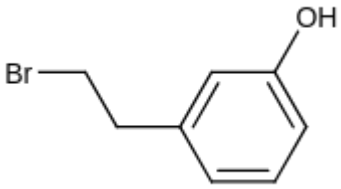




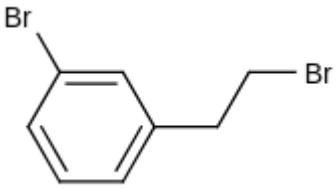
A.



B.



C.

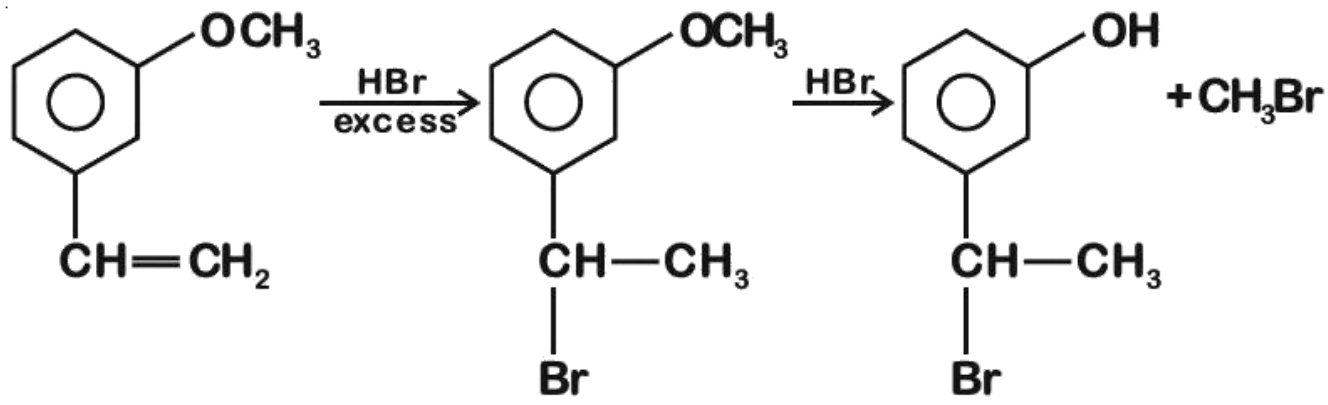


D.

Correct answer: A

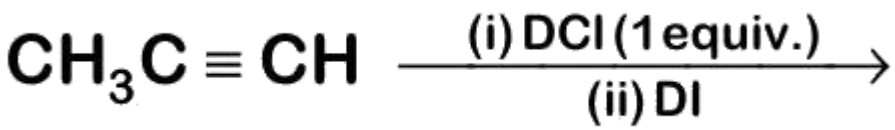
Source solution

Sol.


OCH3
HBr
excess
CH=CH2
OCH3
CH—CH3
Br
HBr
OH
+CH3Br
CH—CH3
Br

Question 139

The major product of the following reaction is



A. $CH_3C(I)(Cl)CHD_2$

B. $CH_3CD(I)CHD(Cl)$

C. $CH_3CD(Cl)CHD(I)$

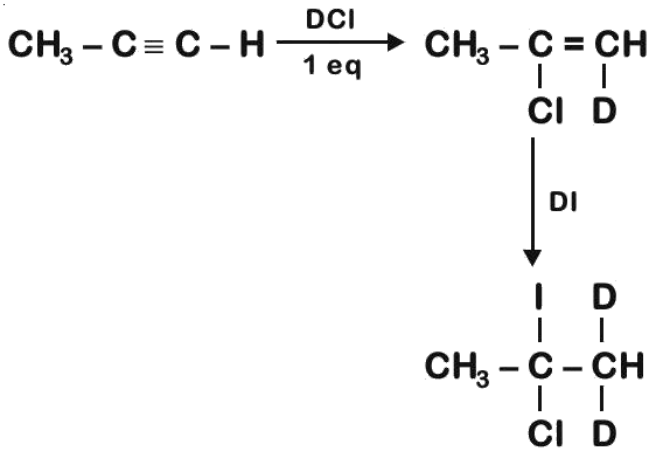
D. $CH_3CD_2CH(Cl)(I)$

Correct answer: A

Source solution

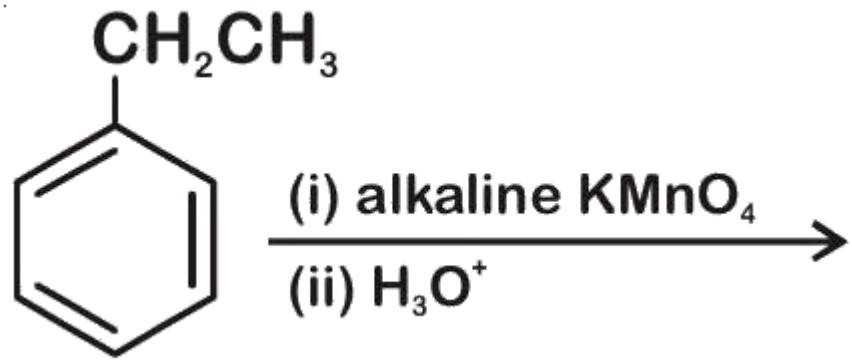
Sol.

Both addition follow Markownikov's rule.

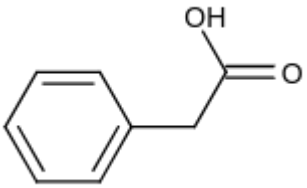


Question 140

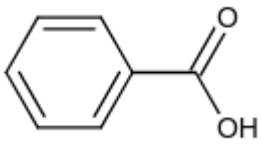
The major product of the following reaction is



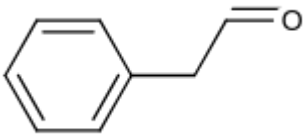
A.



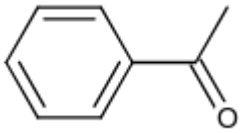
B.



C.



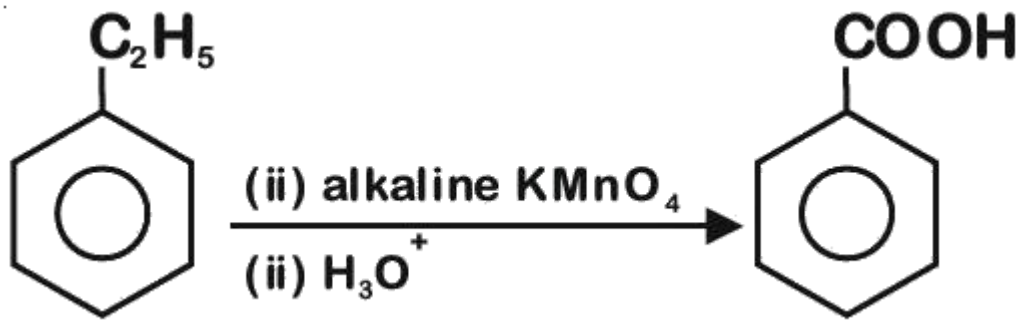
D.



Correct answer: B

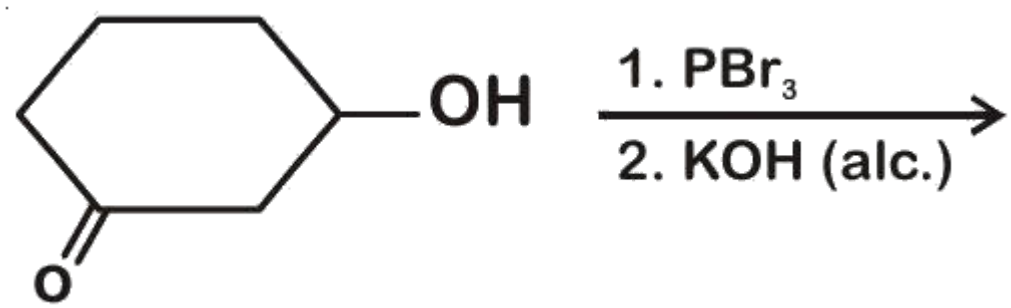
Source solution

Sol. Alkaline $\mathbf{KMnO_4}$ converts

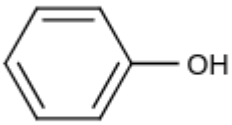


Question 141

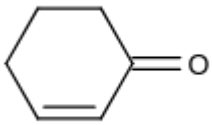
The major product of the following reaction is



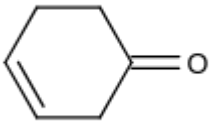
A.



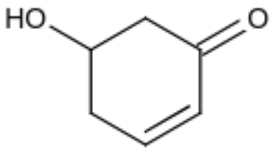
B.



C.



D.

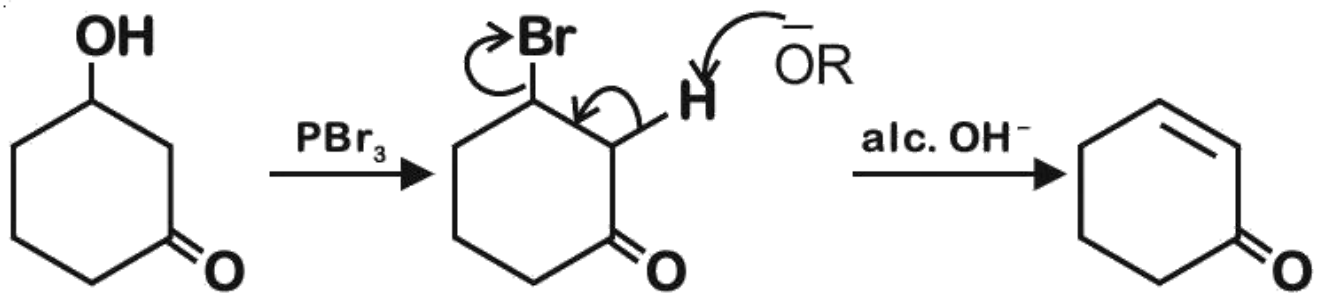


Correct answer: B

Source solution

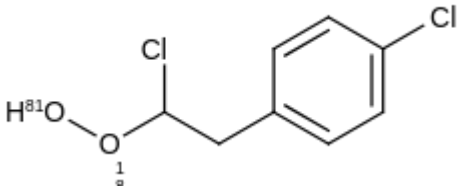
Sol.

More stable product due to conjugation .

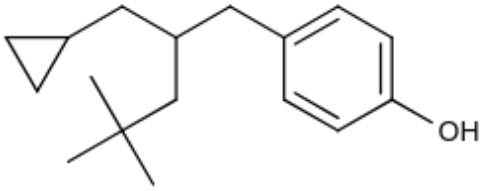


Question 142

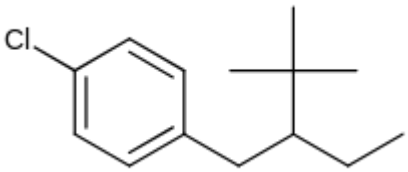
The major product of the following reaction is



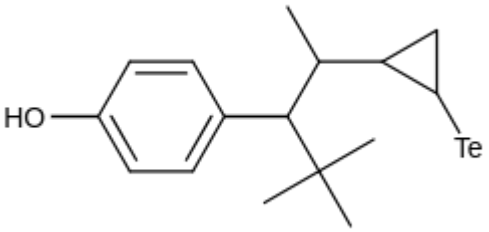
A.



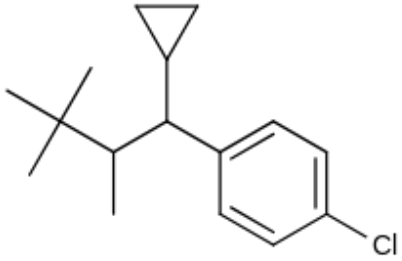
B.



C.



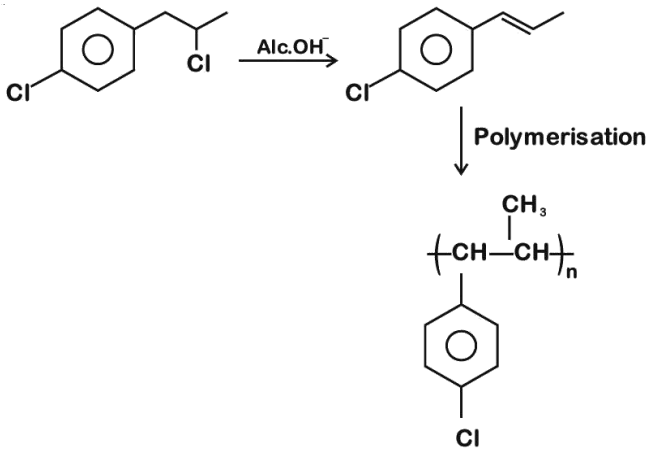
D.



Correct answer: D

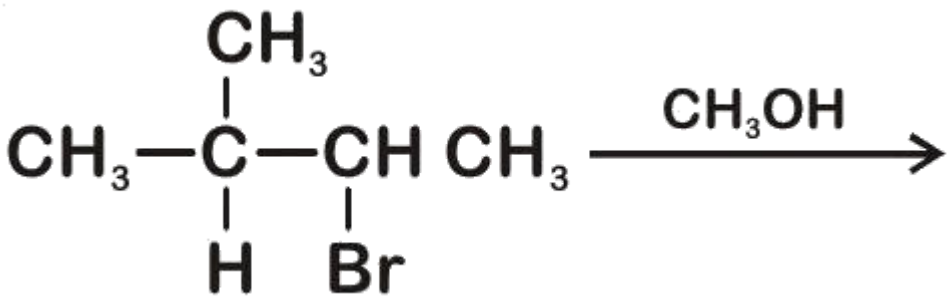
Source solution

Sol.



Question 143

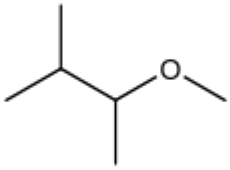
The major product of the following reaction is :



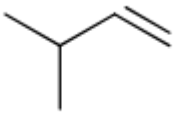
A.



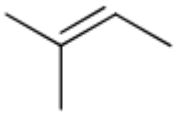
B.



C.



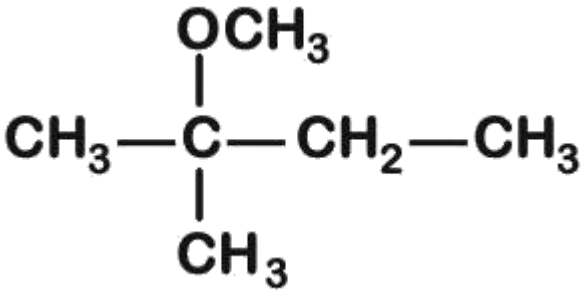
D.



Correct answer: A

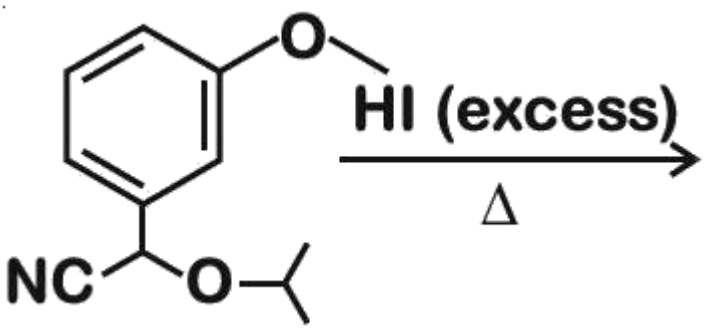
Source solution

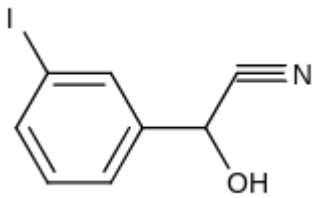
Sol.



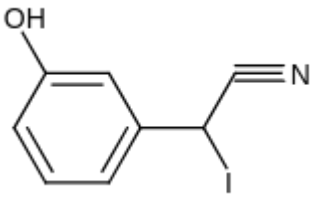
Question 144

The major product of the following reaction is:

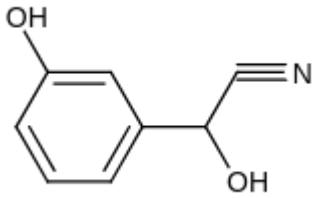




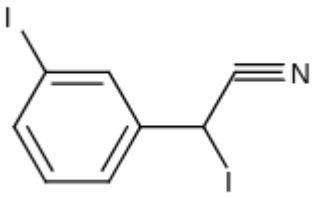
A.



B.



C.

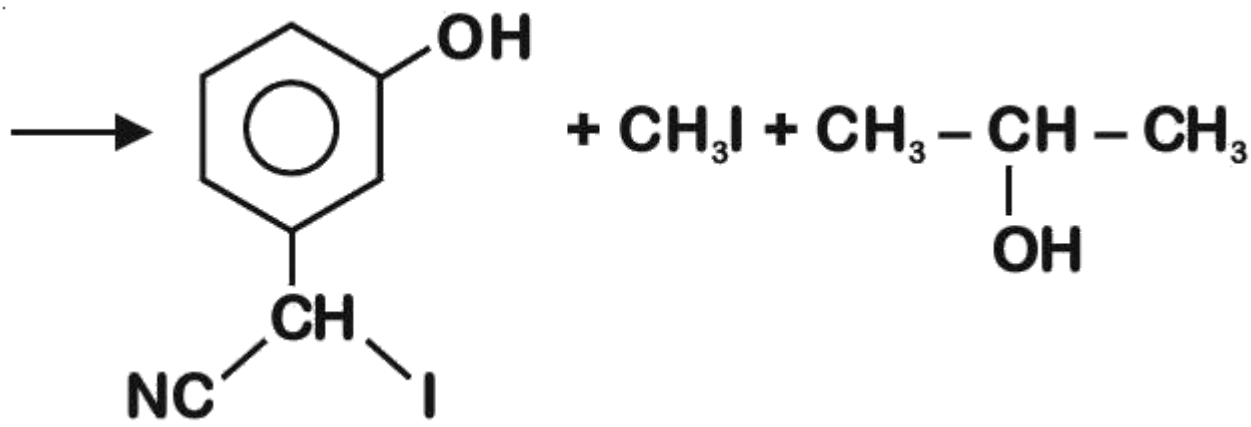


D.

Correct answer: B

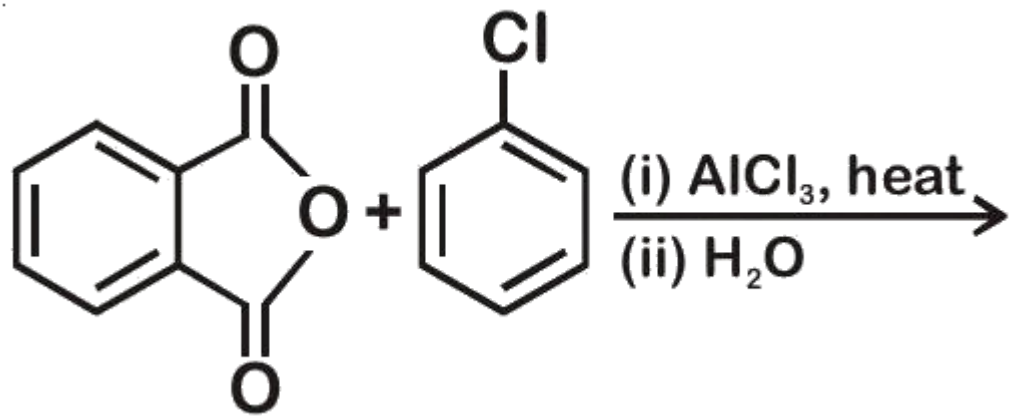
Source solution

Sol.

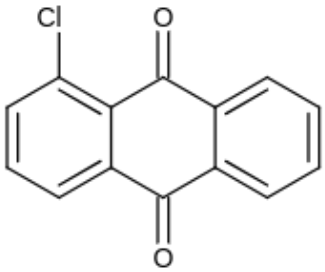

OH
CH
NC
I
+ CH3I + CH3 – CH – CH3
OH

Question 145

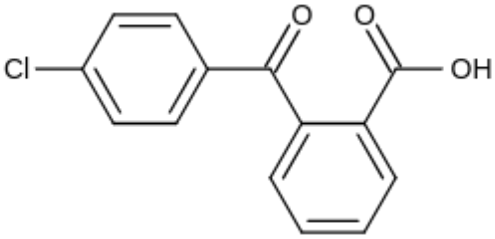
The major product of the following reaction is :



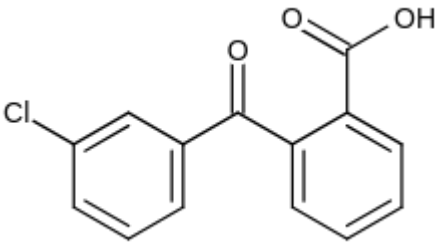
A.



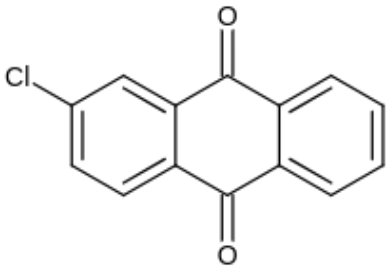
B.



C.



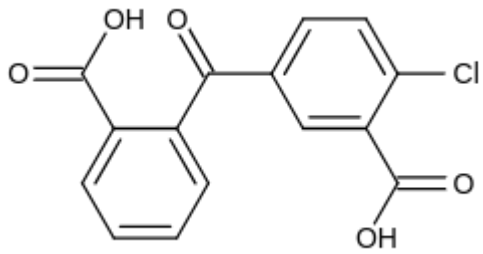
D.



Correct answer: B

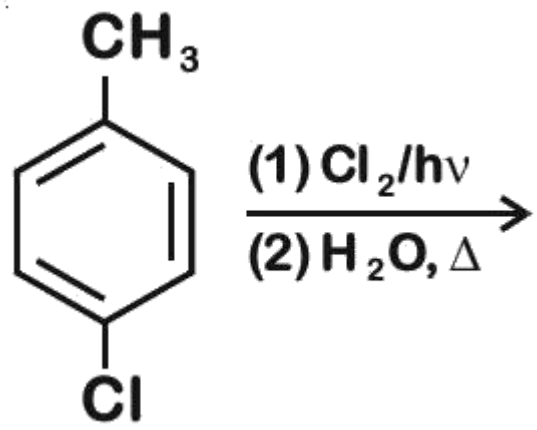
Source solution

Sol.

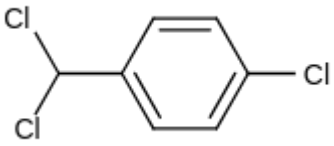

OH
O
O
Cl
O
OH

Question 146

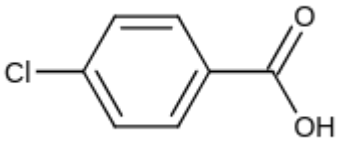
The major product of the following reaction is:



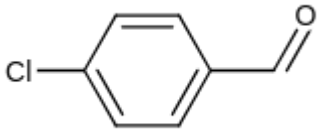
A.



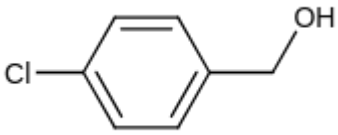
B.



C.



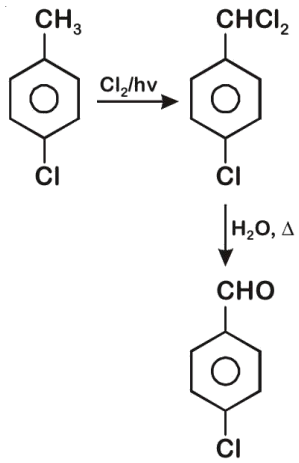
D.



Correct answer: C

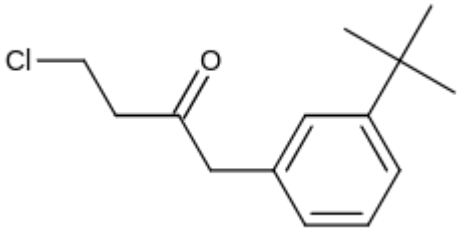
Source solution

Sol.

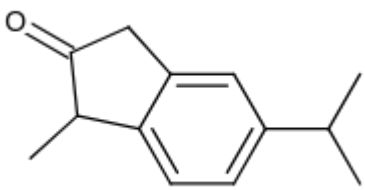

CH3
Cl2/hv
CHCl2
Cl
H2O, Δ
CHO
Cl

Question 147

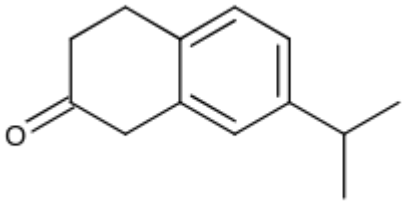
The major product of the following reaction is :



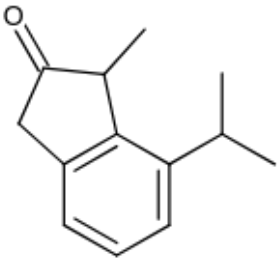
A. $\xrightarrow[(2)\ \text{Conc. } H_2SO_4/\Delta]{(1)\ t\ BuOK}$



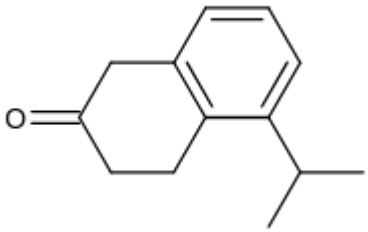
B.



C.



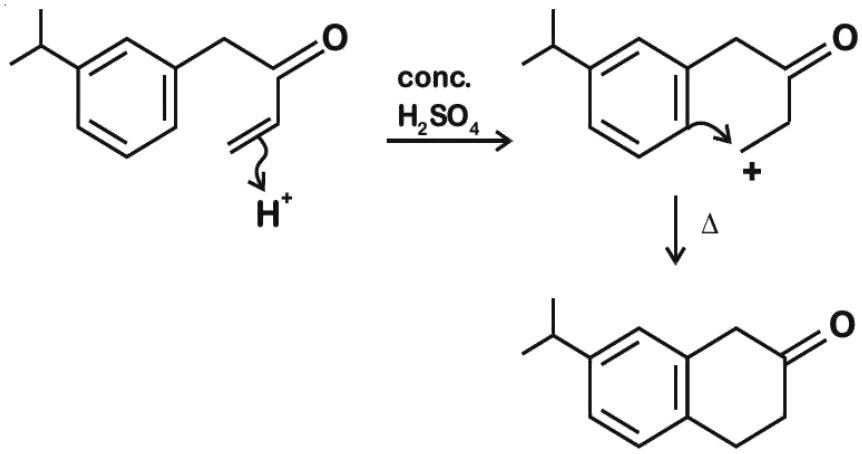
D.



Correct answer: B

Source solution

Sol.

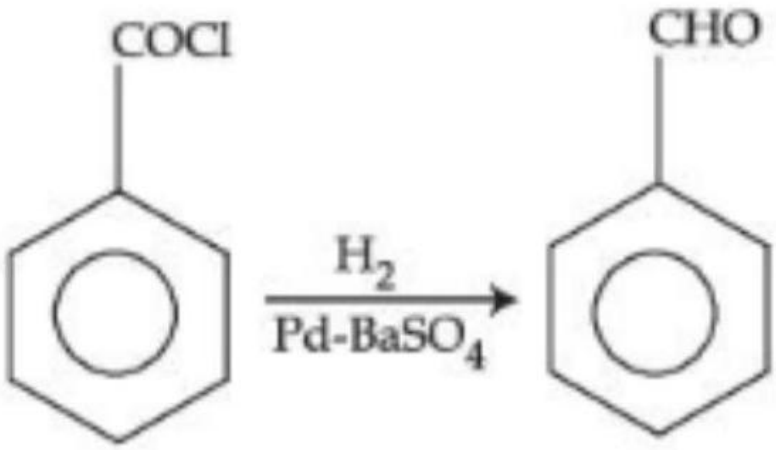

O
conc.
H_2SO_4
H^+
+
Δ
O
O

Question 148

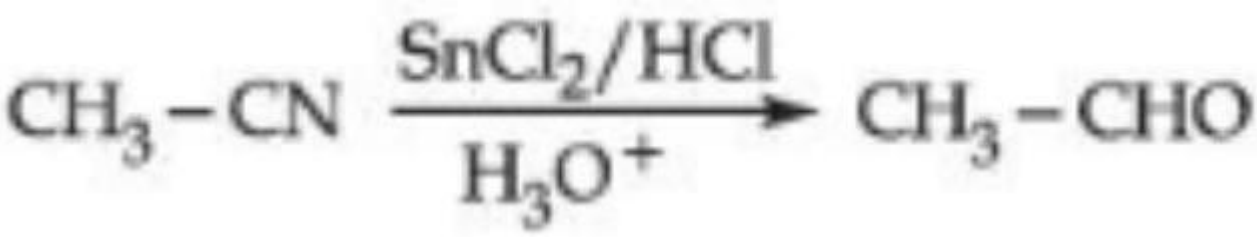
Match List-I with List-II.

List-I

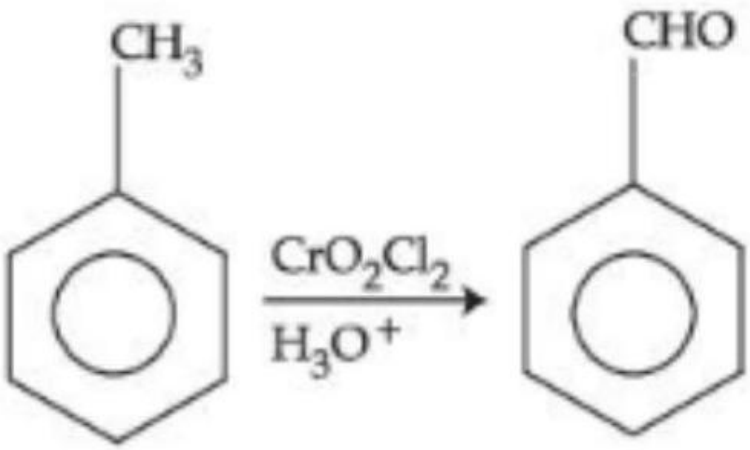
(A)



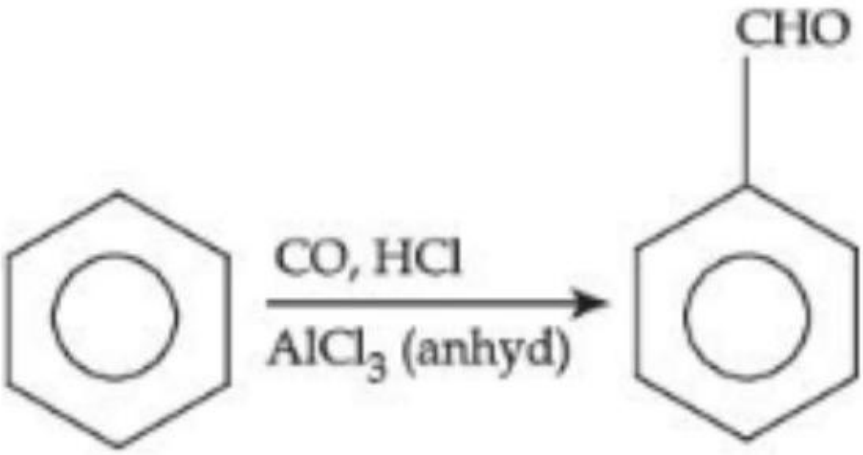
(B)



(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)

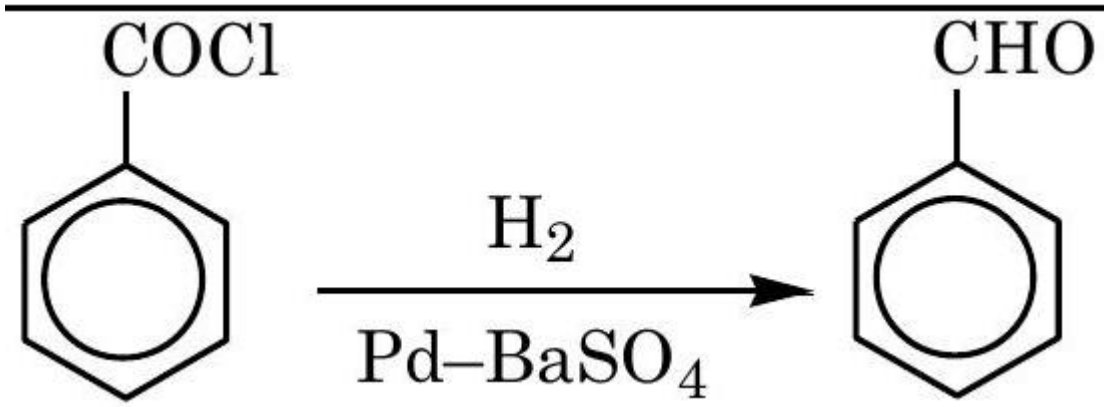
C. (A)-(II), (B)-(III), (C)-(IV), (D)-(I)

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

Correct answer: A

Source solution

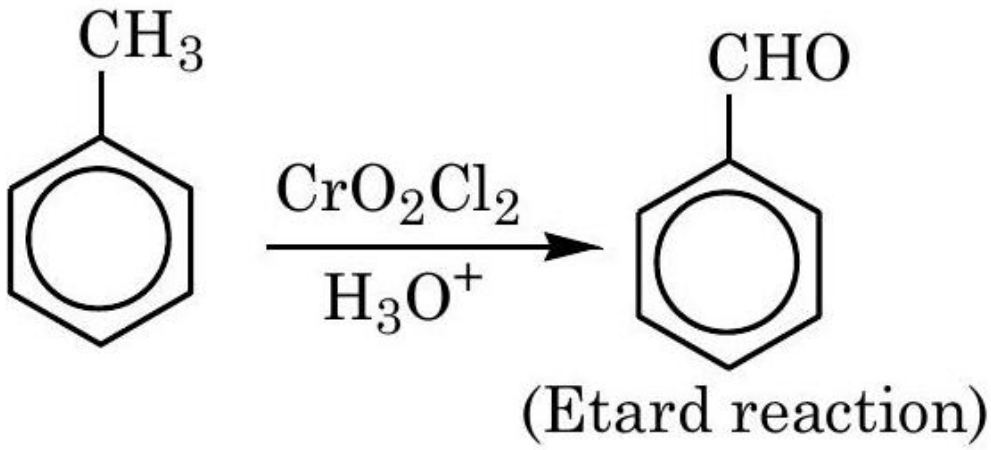
(A)



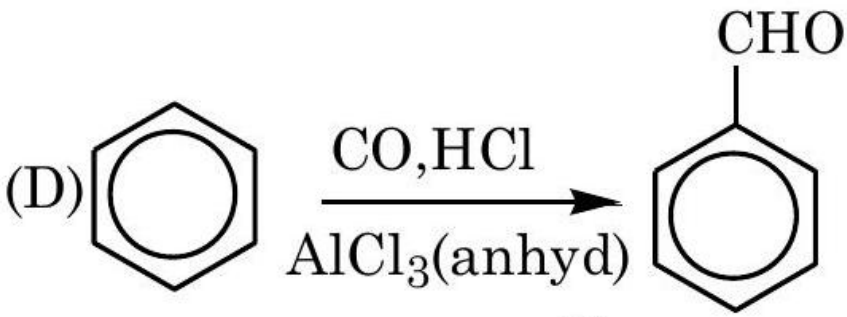
(Rosenmund reaction)

(B) $CH_3 - C \equiv N \xrightarrow[H_3O^+]{SnCl_2-HCl} CH_3 - CHO$

(C)

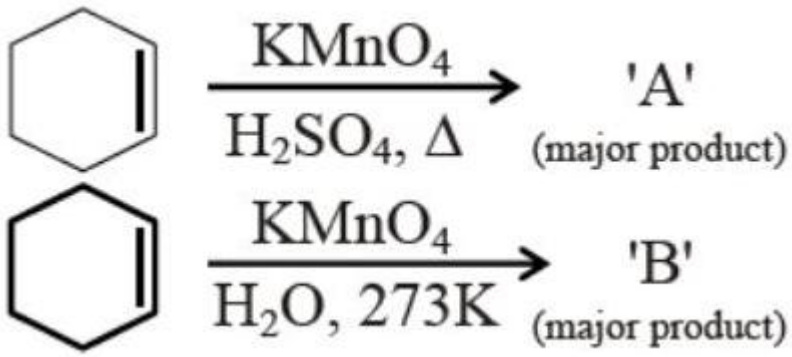


(Etard reaction)



(Gattermann Koch reaction)

Question 149



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

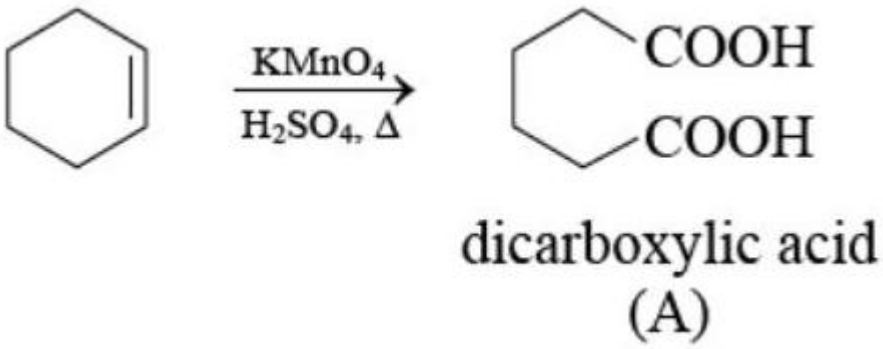
C. Compound 'A' is diol and compound 'B' is dicarboxylic acid

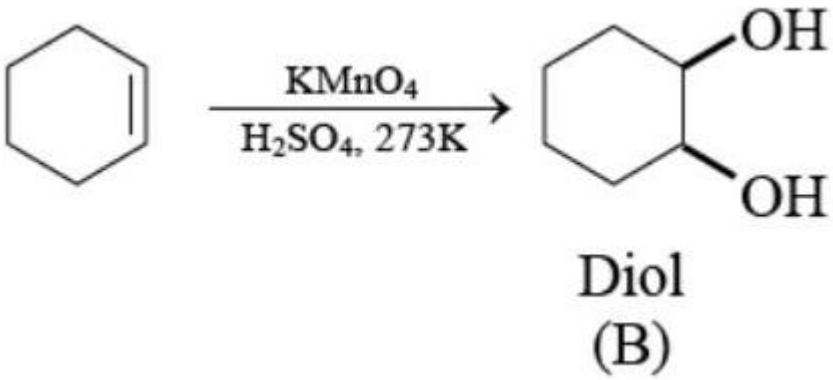
D. Compound 'A' is dicarboxylic acid and compound 'B' is diol

---

Correct answer: D

Source solution

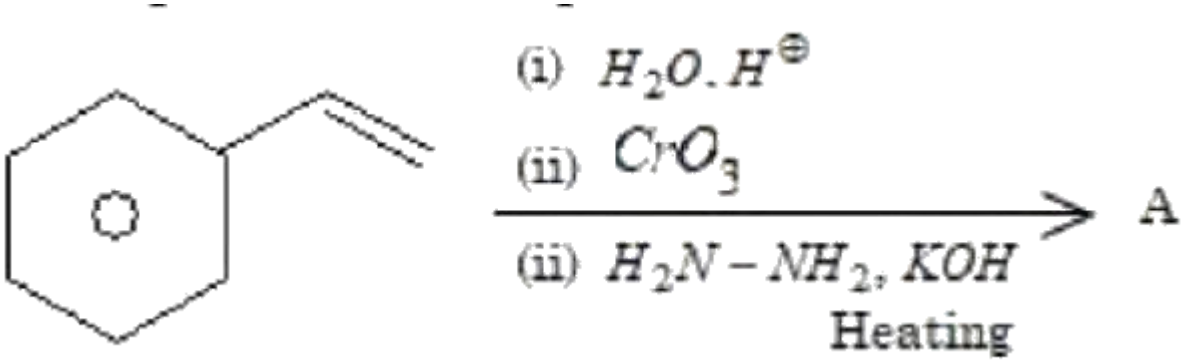




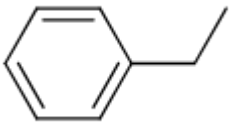
\textbackslash section*\{Section -B\}

Question 150

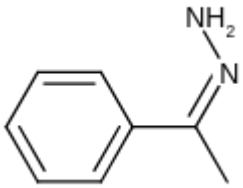
The final product A formed in the following multistep reaction sequence is



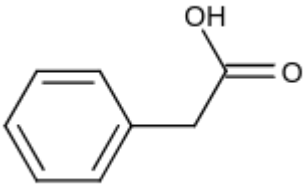
A.



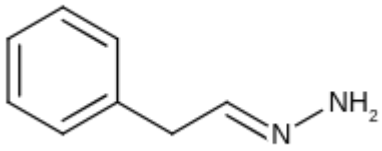
B.



C.



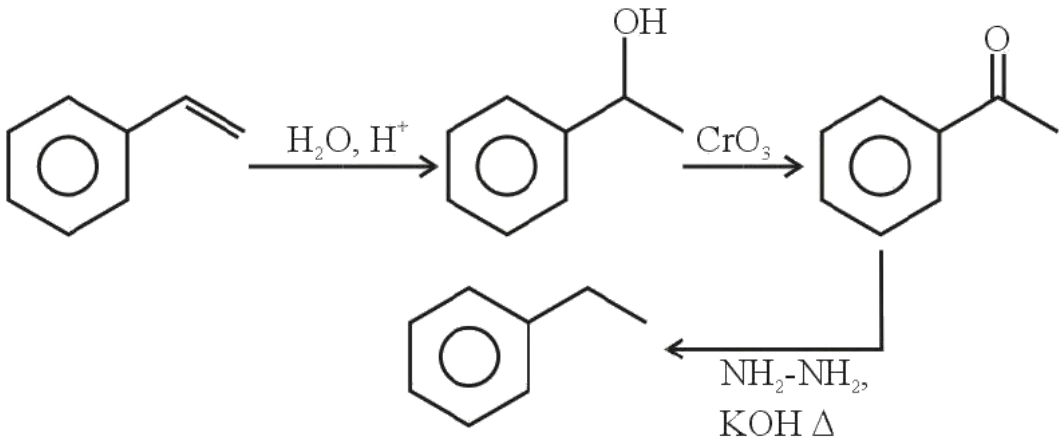
D.



Correct answer: A

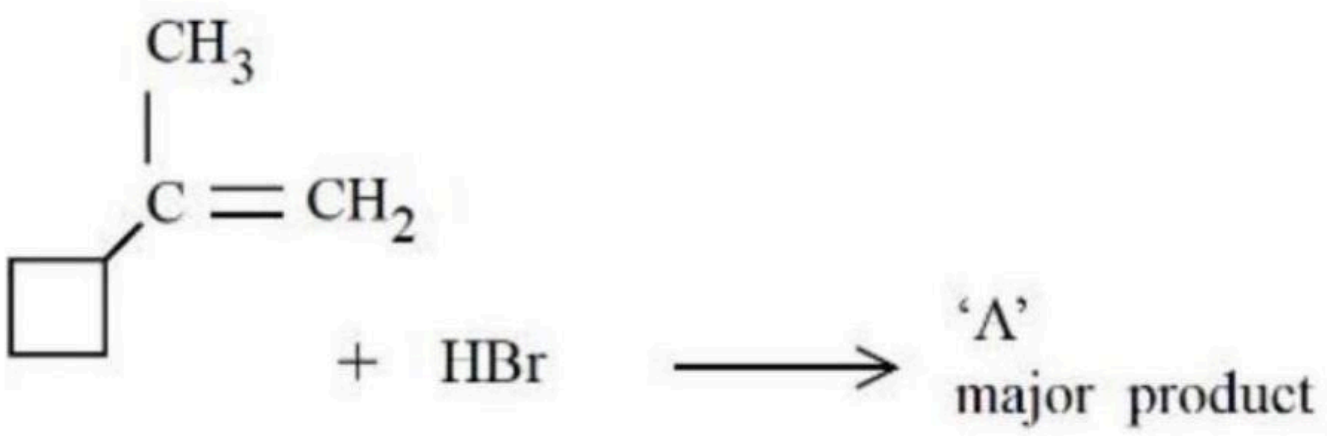
Source solution

Sol.

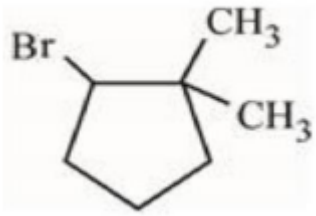

OH
O
H_2O, H^+
CrO_3
NH_2-NH_2,
KOH Δ

Question 151

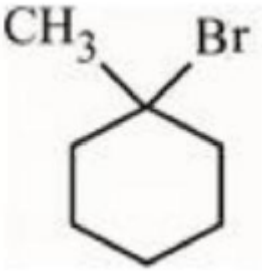
In the following given reaction, ' A ' is



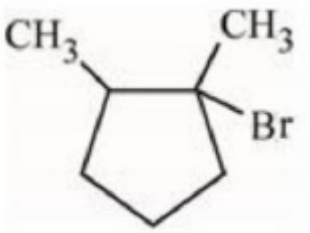
A.



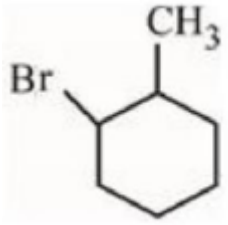
B.



C.

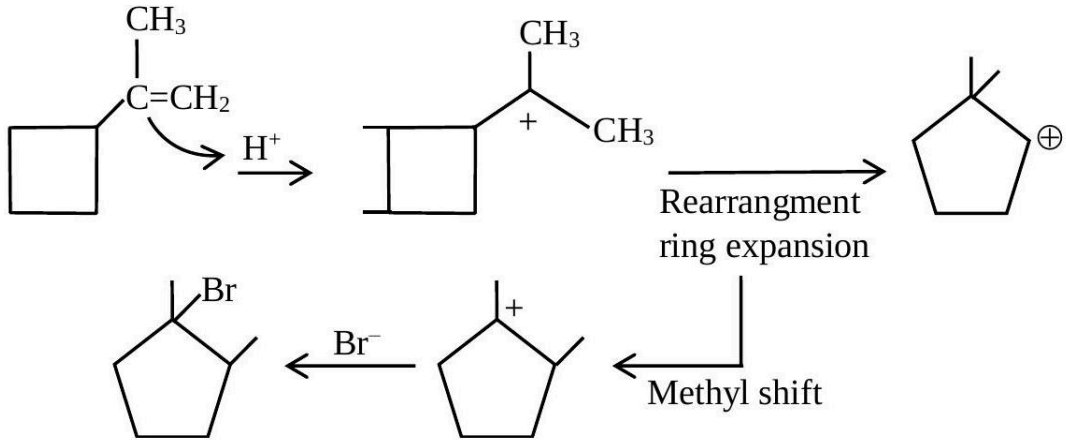


D.



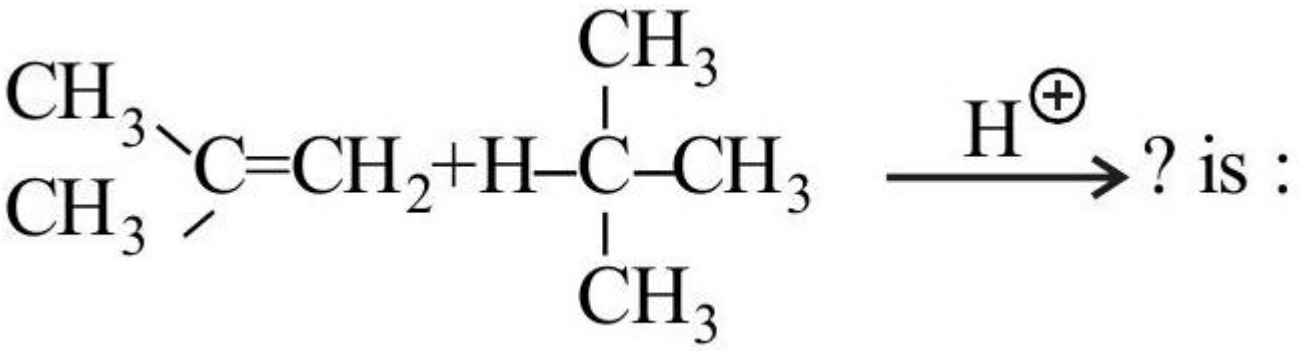
Correct answer: C

Source solution

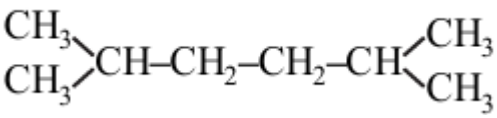


Question 152

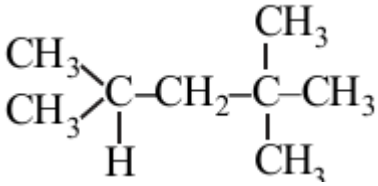
The products formed in the following reaction.



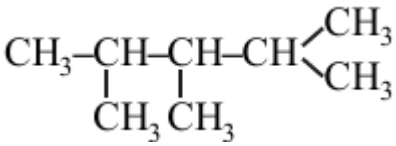
A.



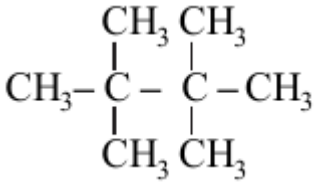
B.



C.



D.



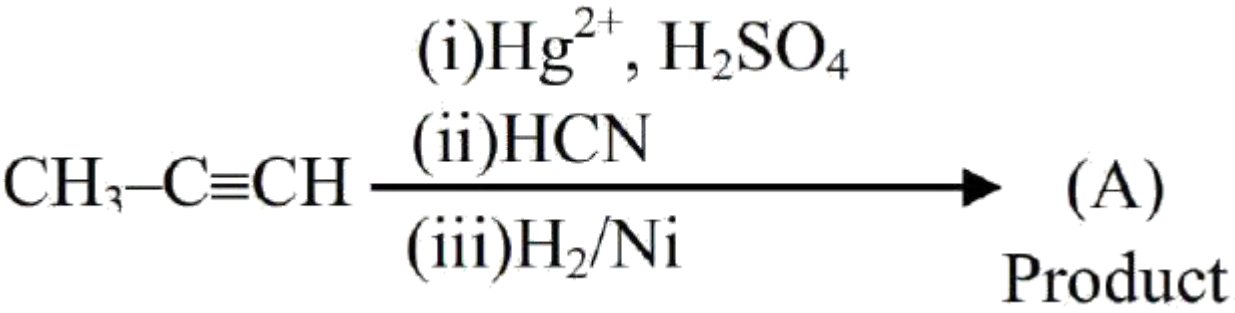
Correct answer: B

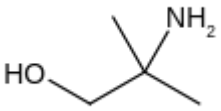
Source solution

Acid protonates the alkene, forming a tertiary carbocation. Addition to a second alkene and hydride transfer from isobutane give 2,2,4-trimethylpentane, the structure in option 2.

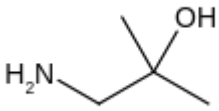
Question 153

The product (A) formed in the following reaction sequence is :

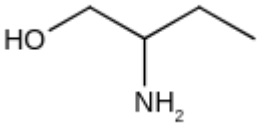




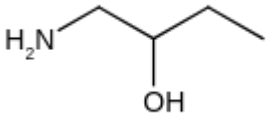
A.



B.



C.



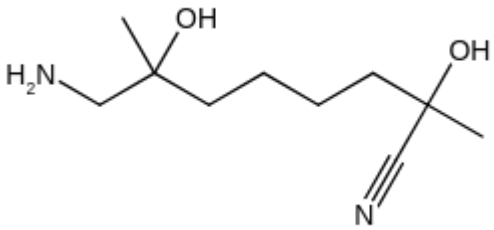
D.

Correct answer: B

Source solution

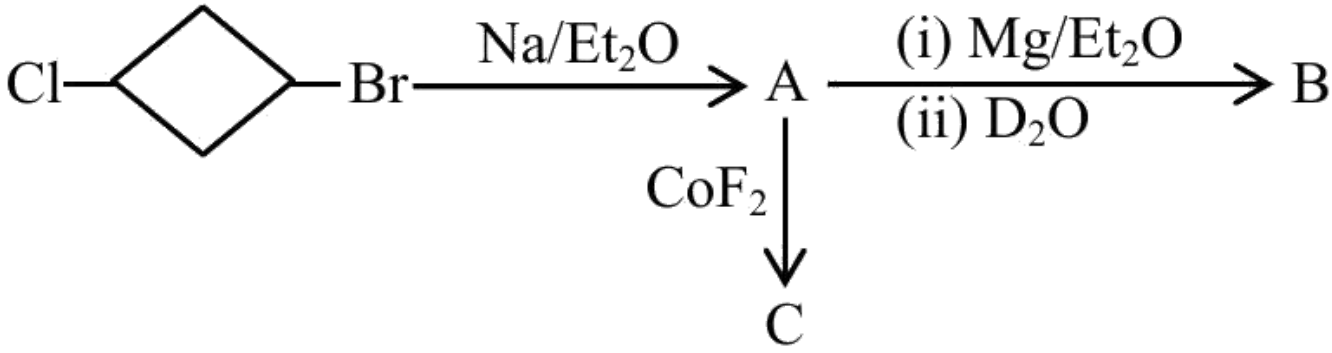
Sol.

SECTION-B}

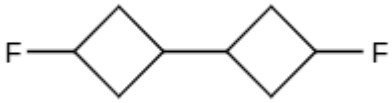


Question 154

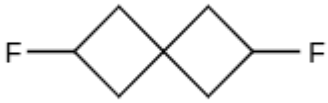
In the following sequence of reaction, the major products B and C respectively are :



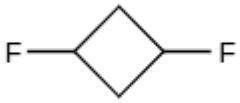
A.



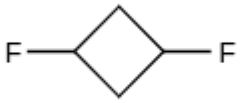
B.



C.



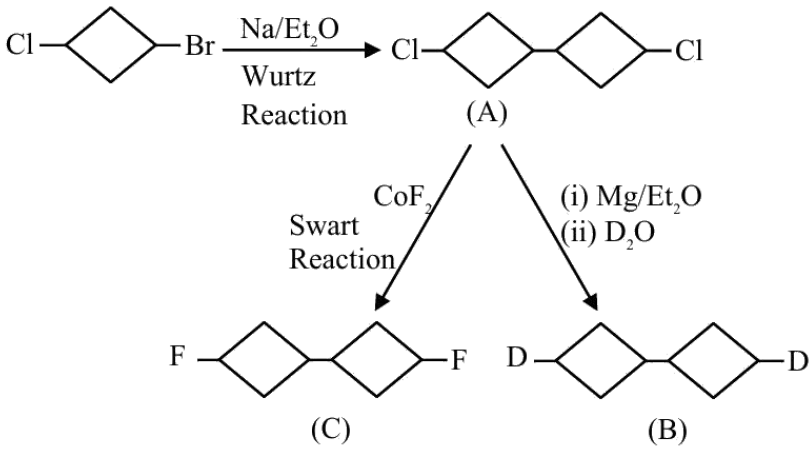
D.



Correct answer: A

Source solution

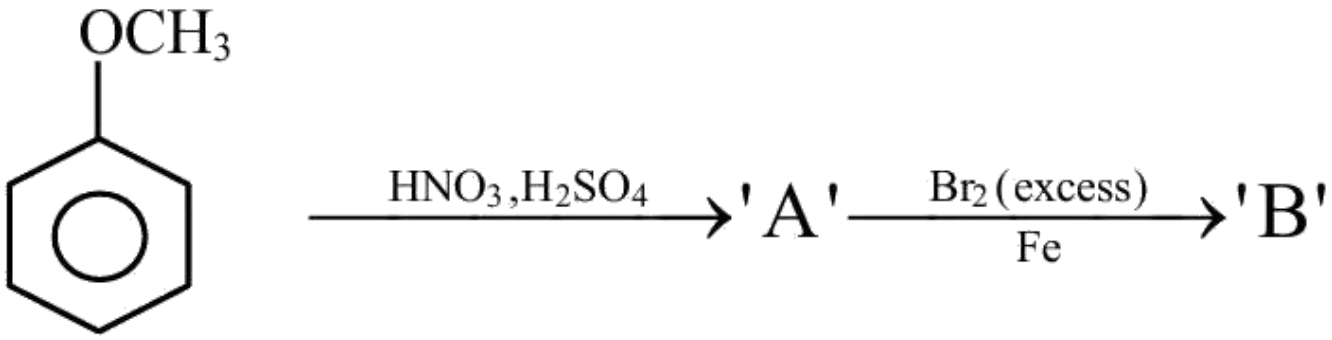
Sol.

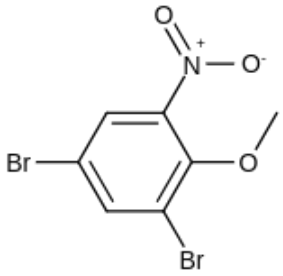


Question 155

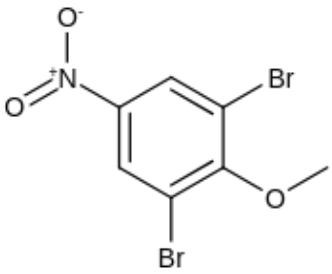
The major products formed:

A and B respectively are:

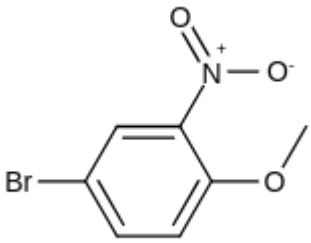




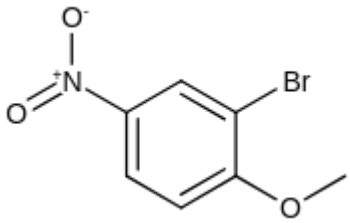
A.



B.



C.

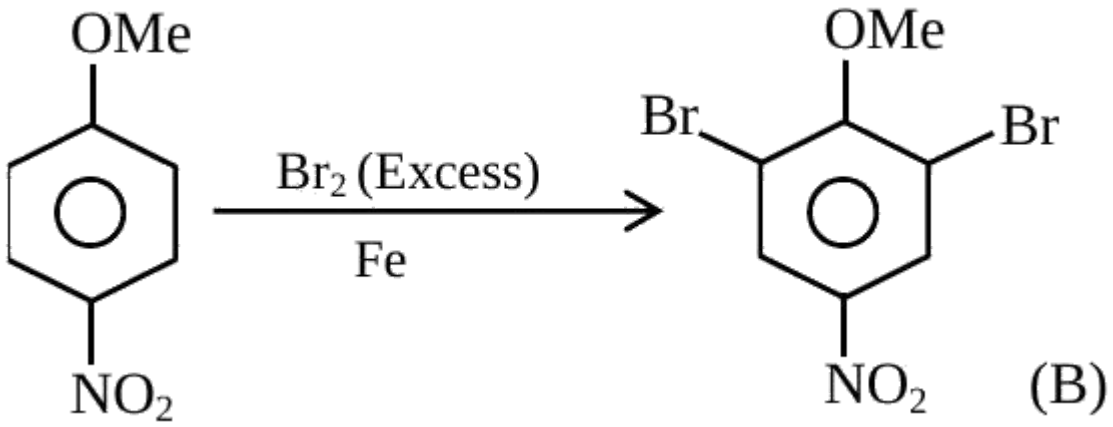


D.

Correct answer: B

Source solution

Sol.
(A)

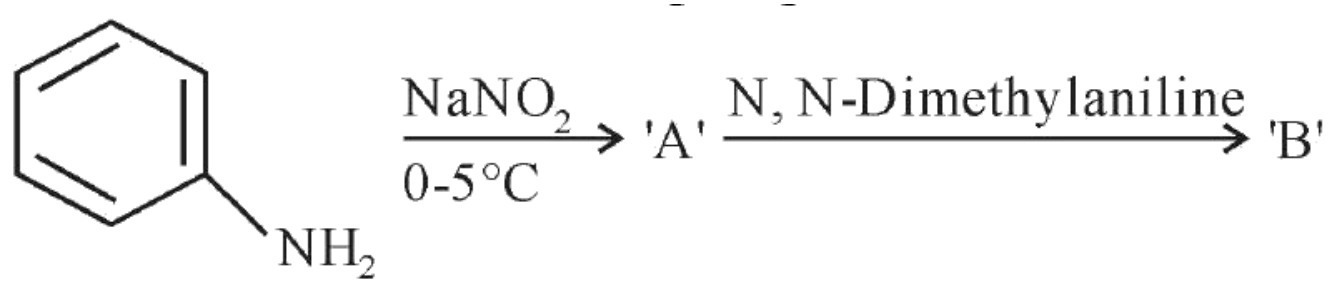


(B)

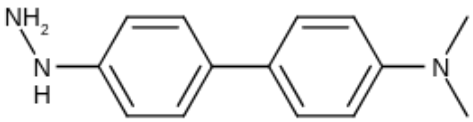
Question 156

Consider the following sequence of reactions:

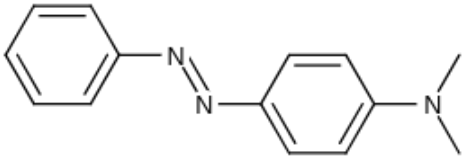
The product ' B ' is



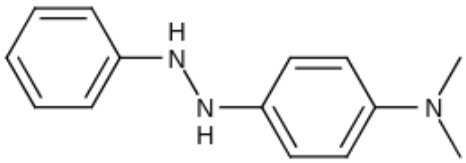
A.



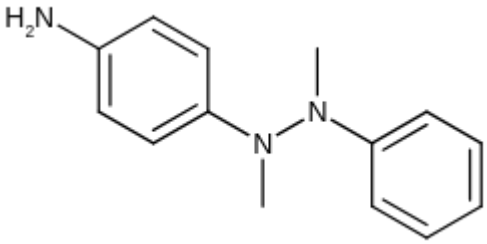
B.



C.



D.

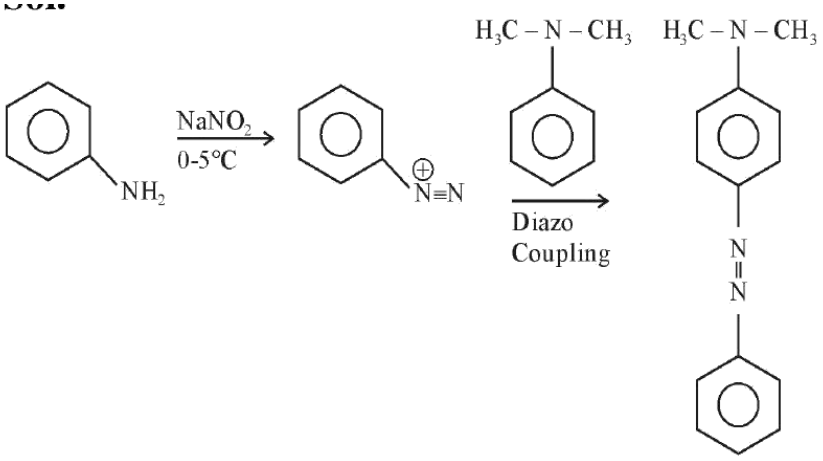


Correct answer: B

Source solution

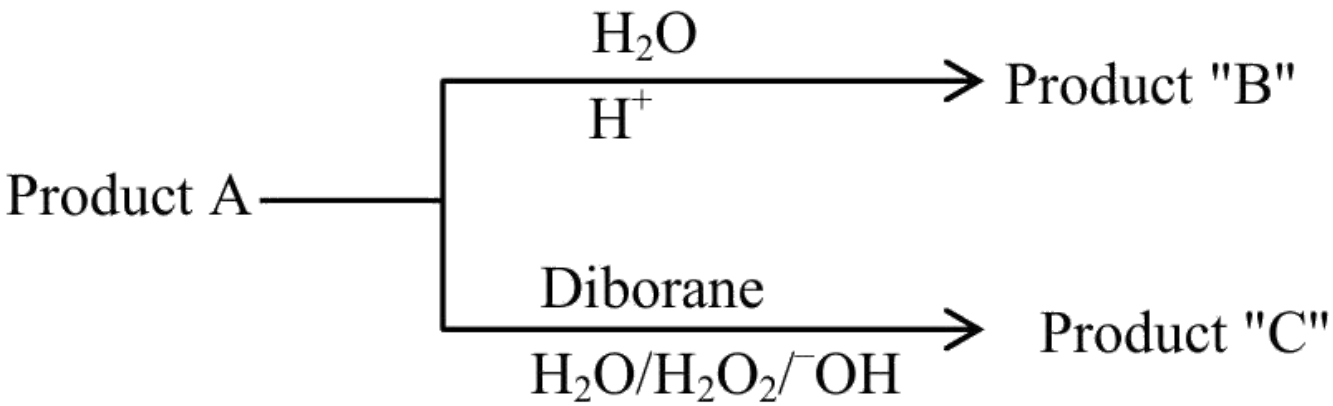
Sol.

Sol.



Question 157

Consider the above reactions, identify product B and product C .



A. $\mathbf{B = C =}$ 2-Propanol

B. $\mathbf{B =}$ 2-Propanol $\mathbf{C =}$ 1-Propanol

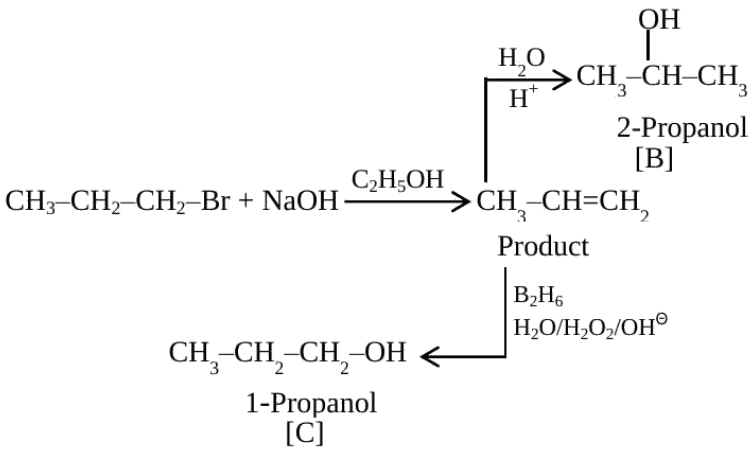
C. $\mathbf{B =}$ 1-Propanol $\mathbf{C =}$ 2-Propanol

D. $\mathbf{B = C =}$ 1-Propanol

Correct answer: B

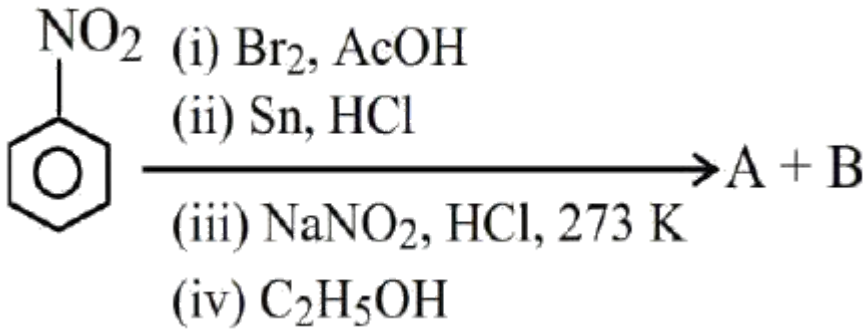
Source solution

Sol.

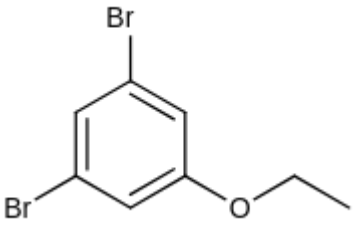


Question 158

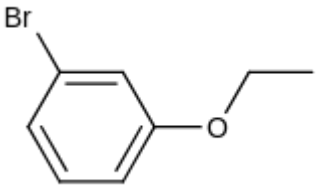
The products formed in the following reaction sequence are :



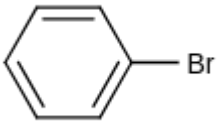
A.



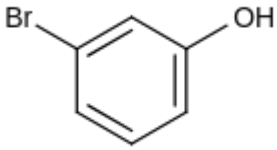
B.



C. $CH_3 - CHO$



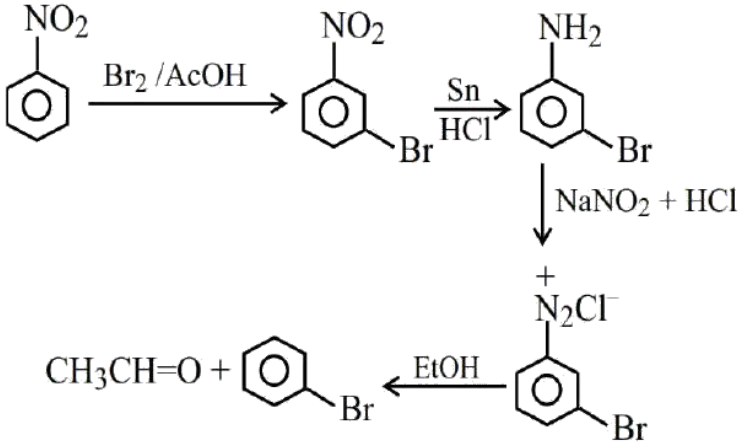
D.



Correct answer: C

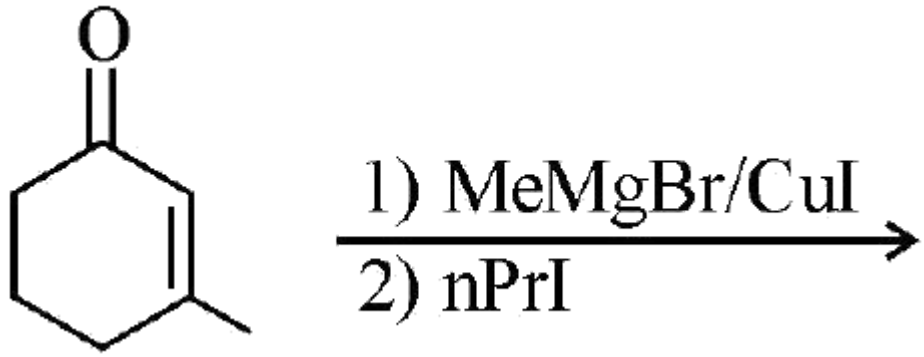
Source solution

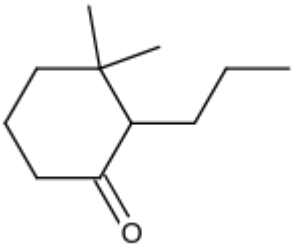
Sol.


NO2
Br2 /AcOH
NO2
Br
Sn
HCl
NH2
Br
NaNO2 + HCl
+
N2Cl⁻
Br
EtOH
CH3CH=O +
Br

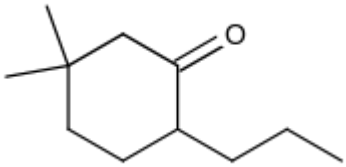
Question 159

Find out the major product from the following reaction

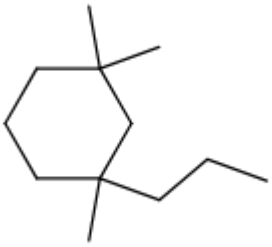




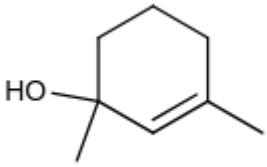
A.



B.



C.

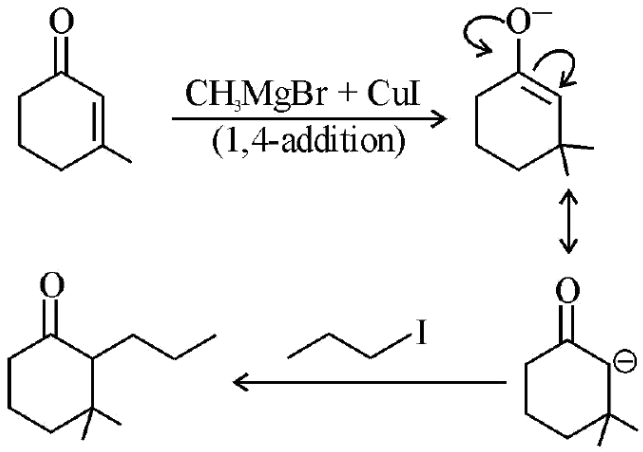


D.

Correct answer: A

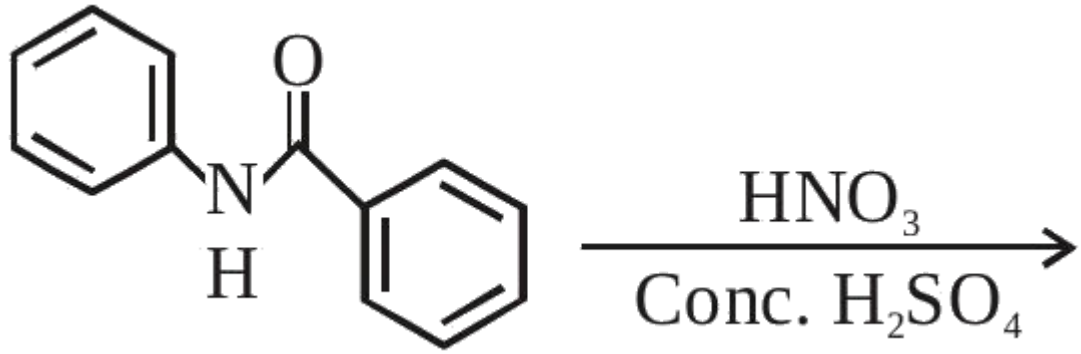
Source solution

Sol.

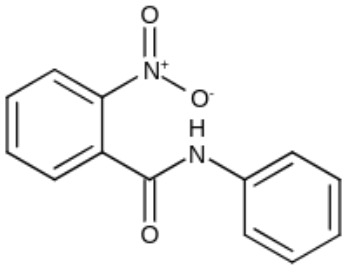

O
CH3MgBr + CuI
(1,4-addition)
O−
O
I
O
⊖

Question 160

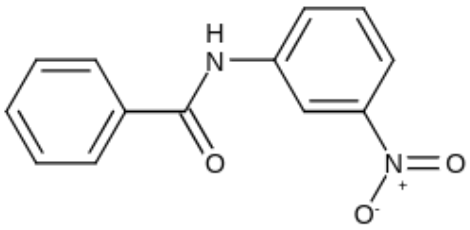
What will be the major product in the following mononitation reaction?



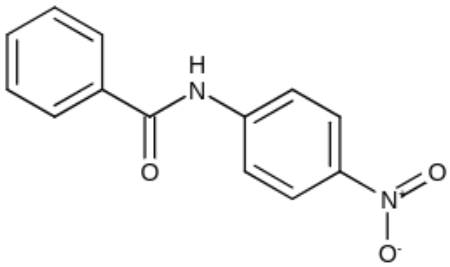
A.



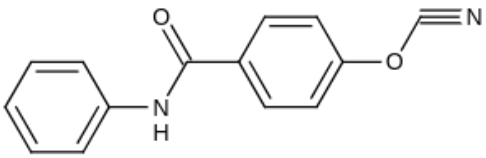
B.



C.



D.



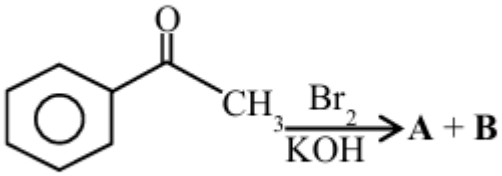
Correct answer: C

The source provides a brief answer only. A detailed worked solution is not available for this question.

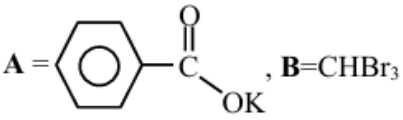
Source solution

Question 161

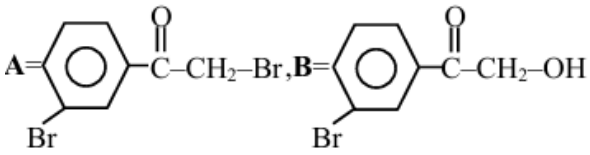
The major products formed in the following reaction sequence **A** and **B** are :



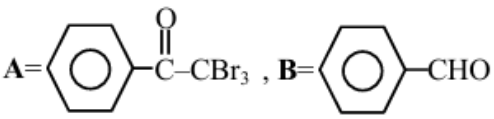
A.



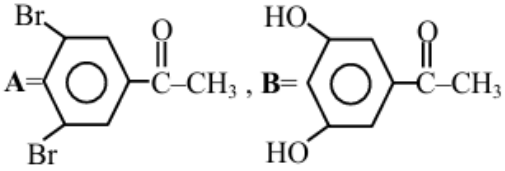
B. -2



C.



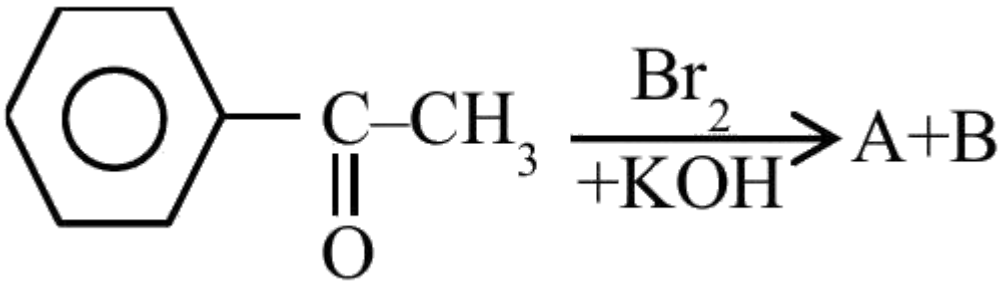
D.



Correct answer: A

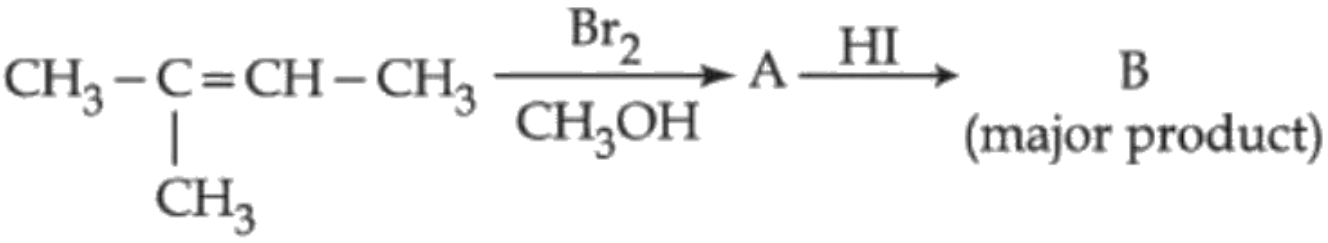
Source solution

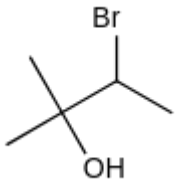
Sol.



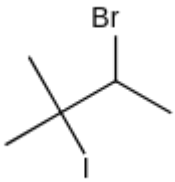
Question 162

Major product ' B ' of the following reaction sequence is:

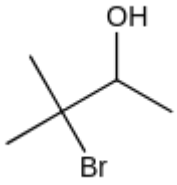




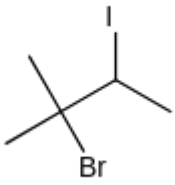
A.



B.



C.



D.

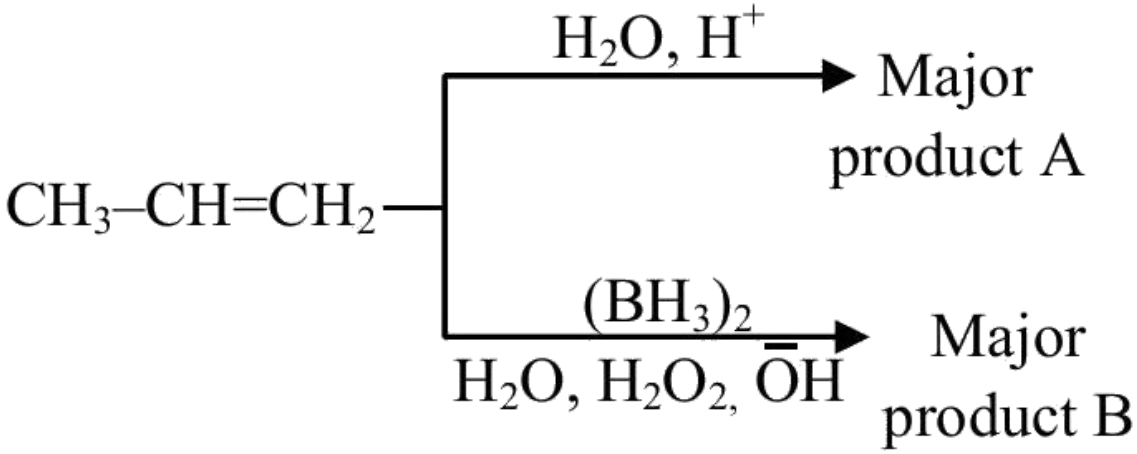
Correct answer: B

The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

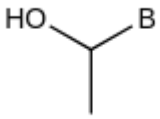
Question 163

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. $A - CH_3CH_2CH_2 - OH$,



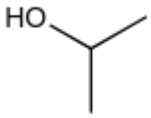
C. (2) Hydroboration Oxidation Reaction :}

(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)

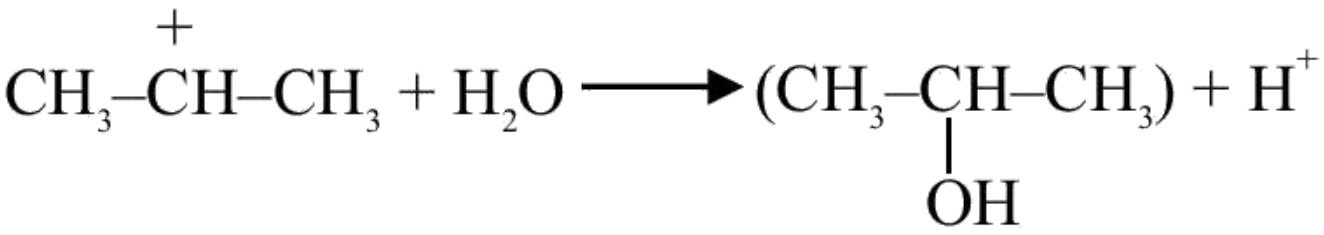


Correct answer: C

Source solution

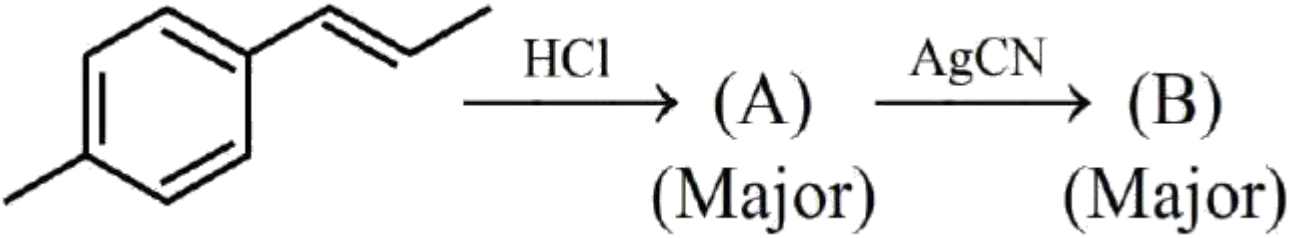
Sol. (1) Hydration Reaction :

(A)

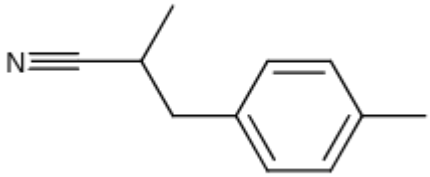


Question 164

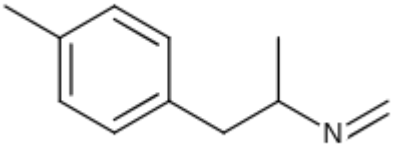
The product B formed in the following reaction sequence is :



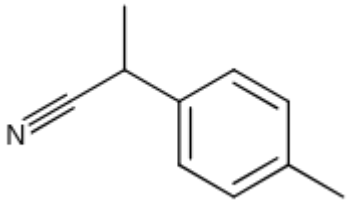
A.



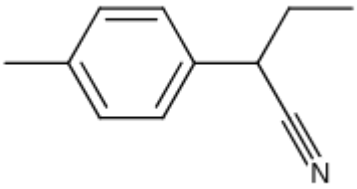
B.



C.



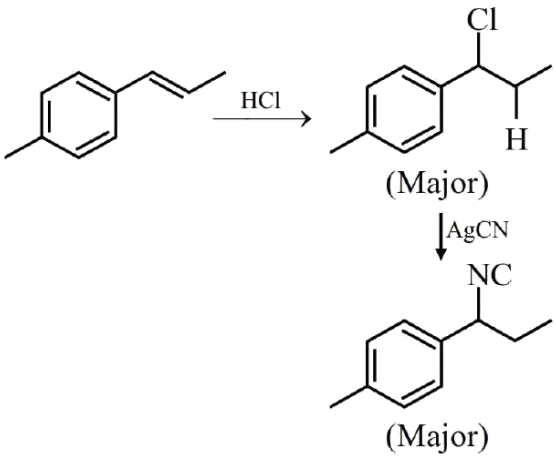
D.



Correct answer: D

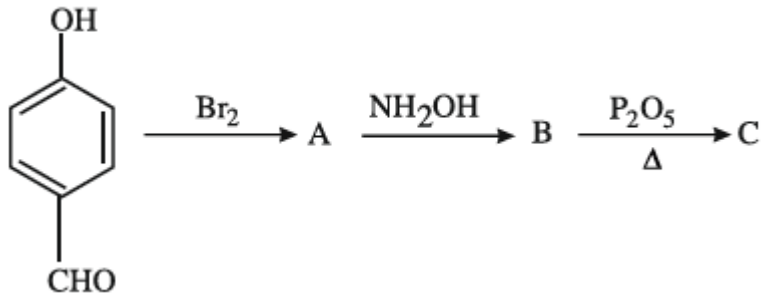
Source solution

Sol.

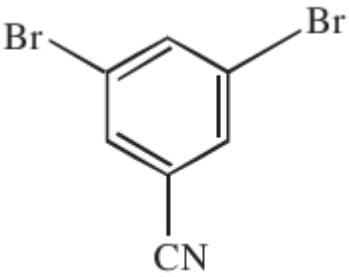


Question 165

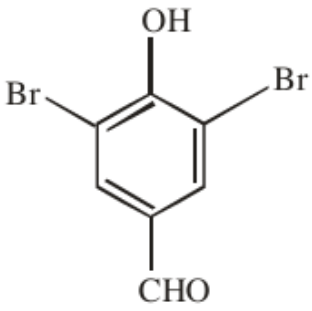
Consider the above reaction sequence, the Product ' C ' is :



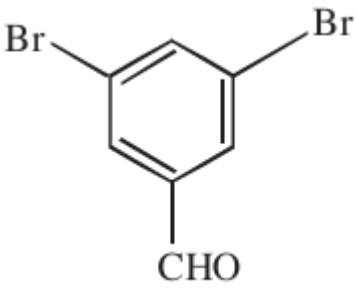
A.



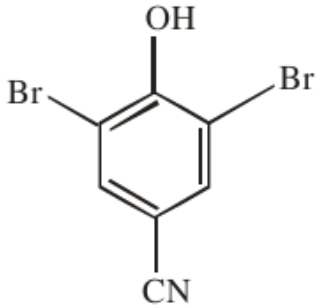
B.



C.



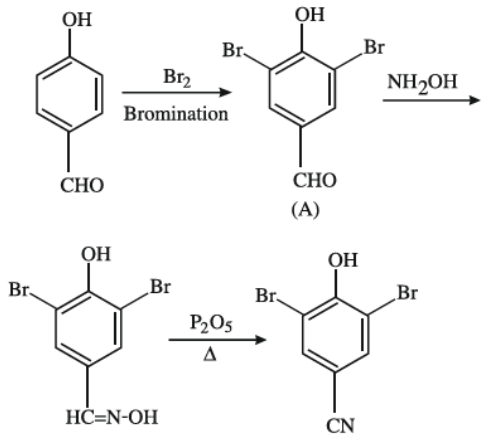
D.



Correct answer: D

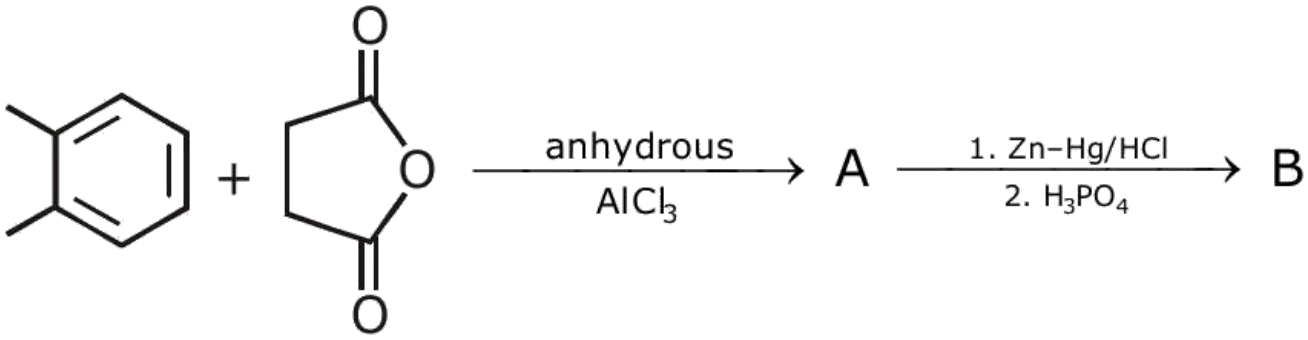
Source solution

Sol.

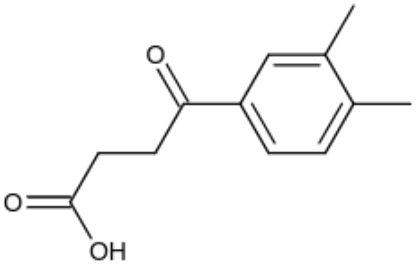

OH
CHO
Br_2
Bromination
OH
Br
Br
CHO
(A)
NH_2OH
OH
Br
Br
HC=N-OH
P_2O_5
Δ
OH
Br
Br
CN

Question 166

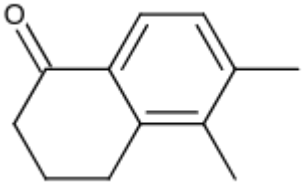
In the following reaction sequence the major products A and B are:



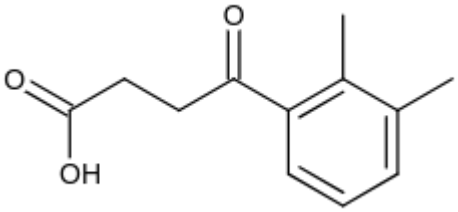
A. $A =$



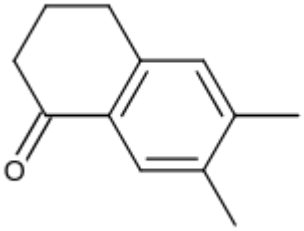
B. $A =$



C. $A =$



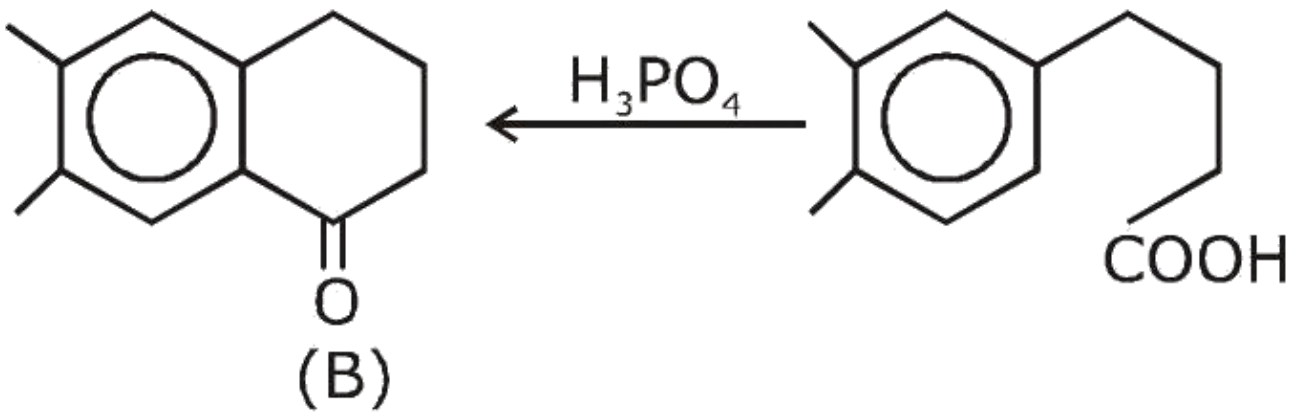
D. $A =$



Correct answer: D

Source solution

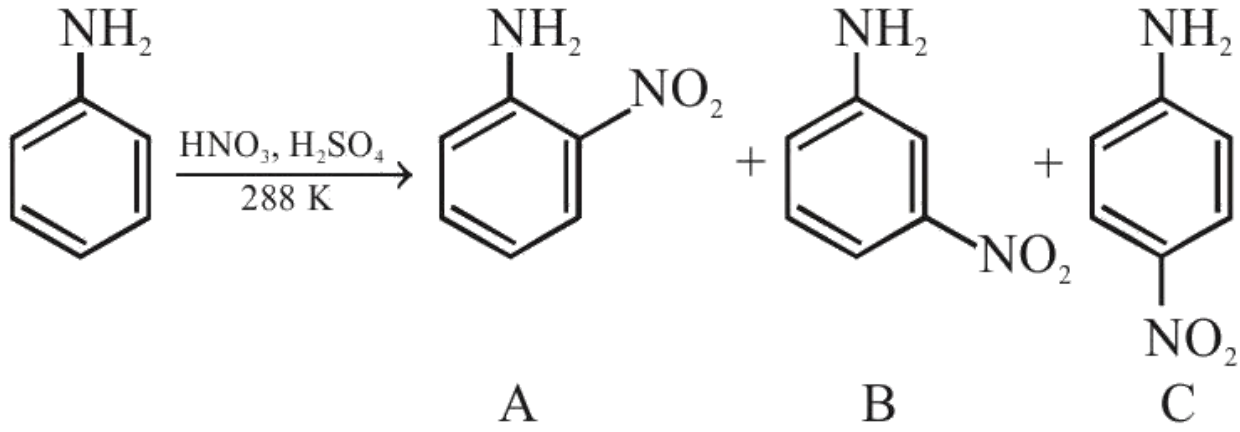
Sol. 4}



(B)

Question 167

Consider the given reaction, percentage yield of :



A. $\mathbf{C > A > B}$

B. $\mathbf{B > C > A}$

C. $\mathbf{A > C > B}$

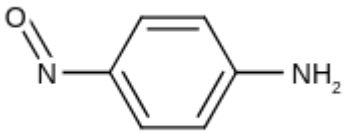
D. $\mathbf{C > B > A}$

Correct answer: D

Source solution

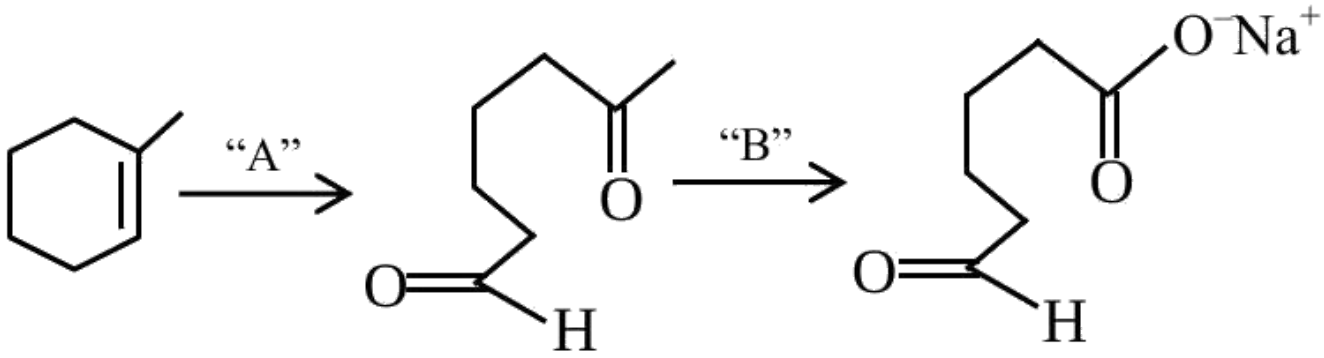
Sol.

Aniline
(B)
(A)
(47%)
(C)
(2%)
$\mathbf{> B > A}$
(51%)
% yield order $\Rightarrow \mathbf{C > B > A}$



Question 168

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

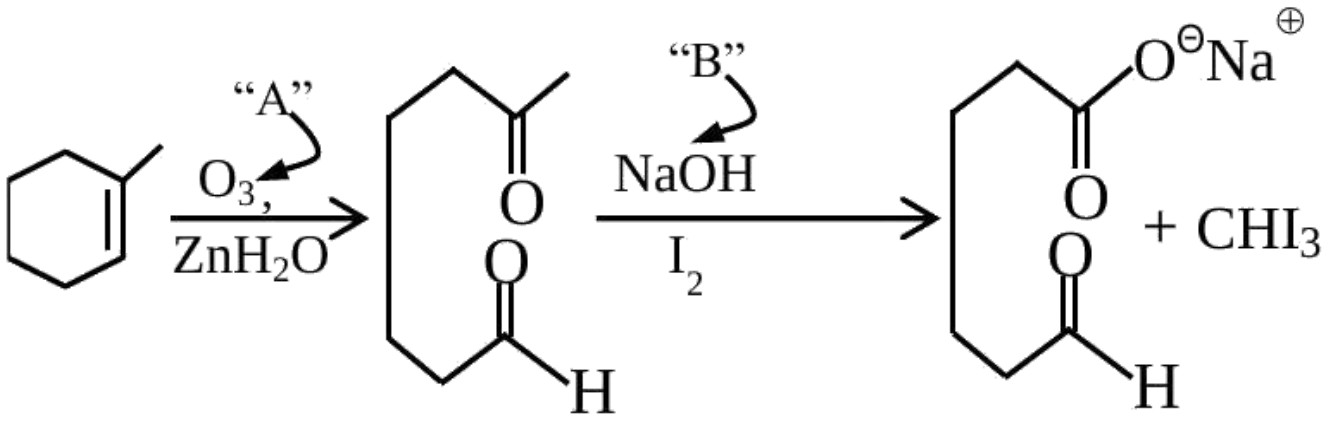
C. $H_2O, H^+$and $KMnO_4$

D. $O_3, Zn/H_2O$ and $KMnO_4$

Correct answer: A

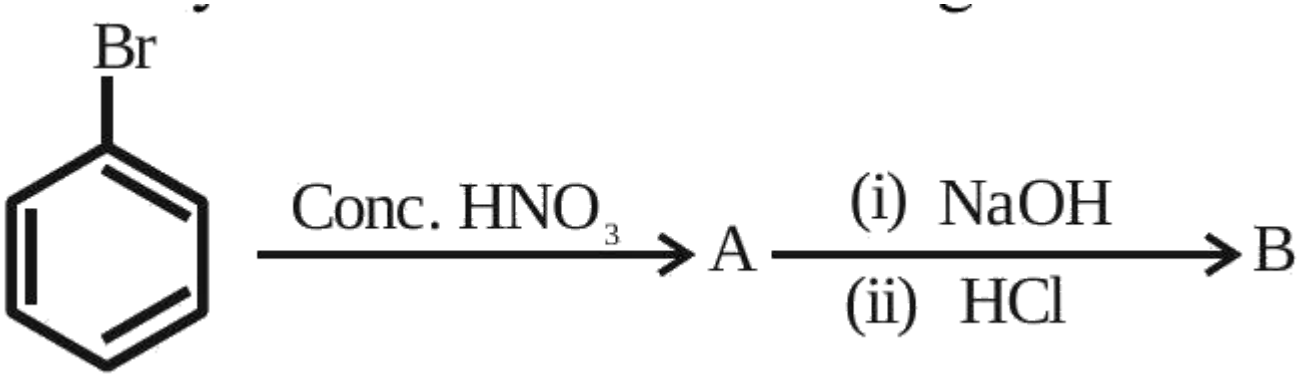
Source solution

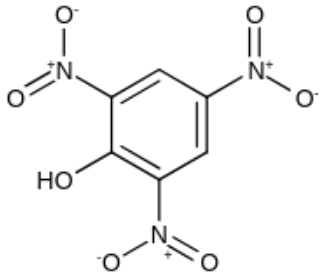
Sol.



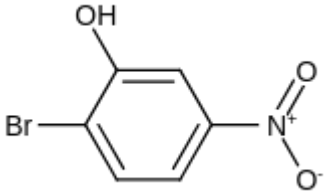
Question 169

Identify A and B in the following reaction sequence.



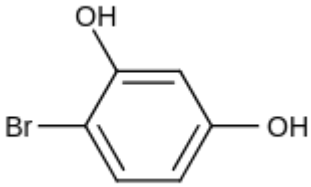


A.

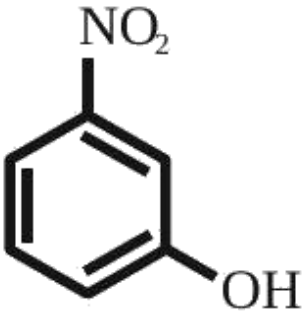


B.

C. B=



D. A =



Correct answer: A

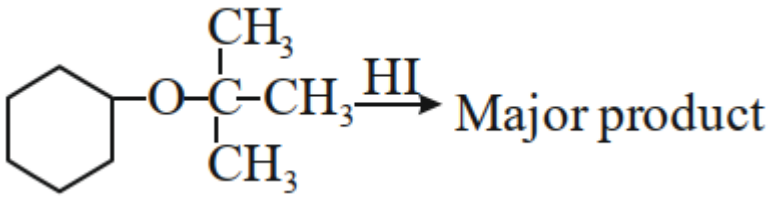
The source provides a brief answer only. A detailed worked solution is not available for this question.

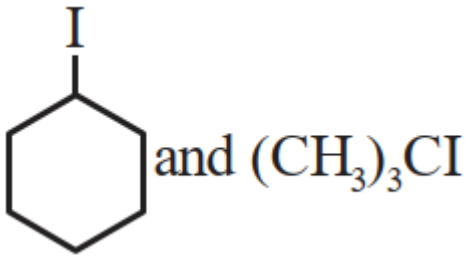
Source solution

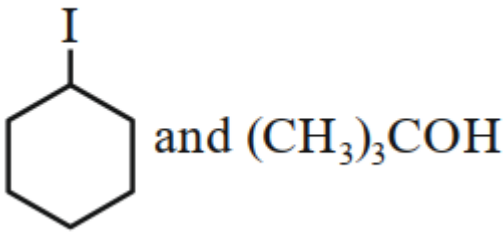
Sol:-

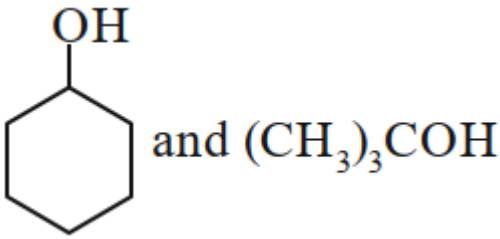
Question 170

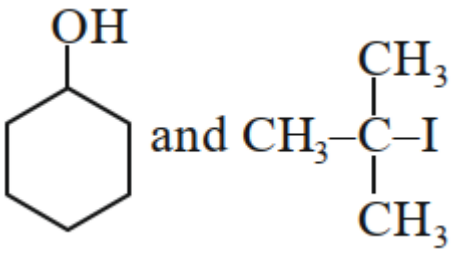
Major product formed in the following reaction is a mixture of:



A. 

B. 

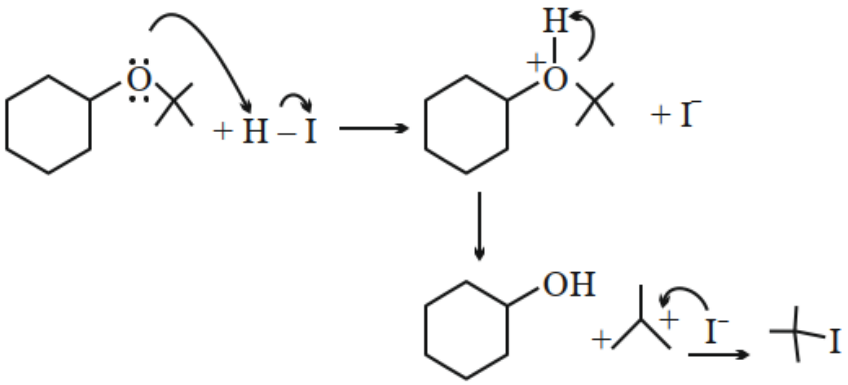
C. 

D. 

Correct answer: D

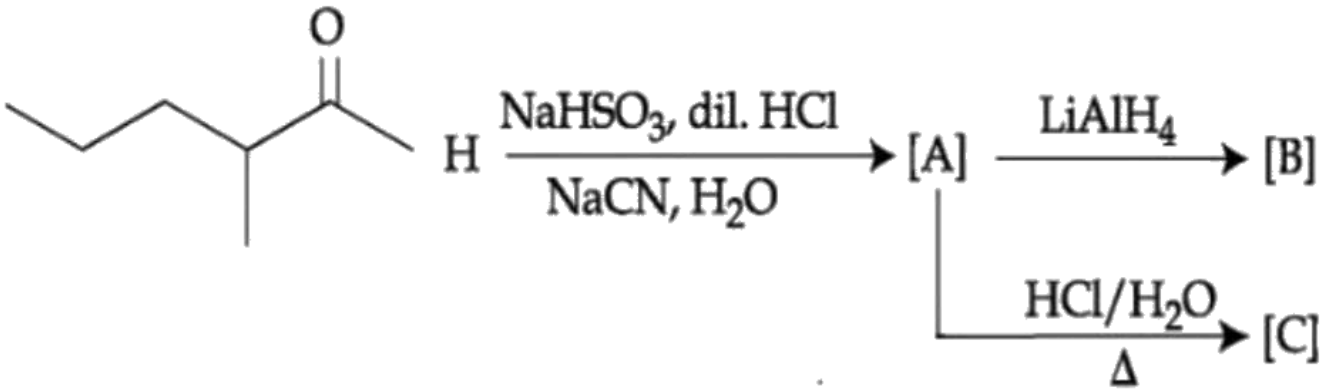
Source solution

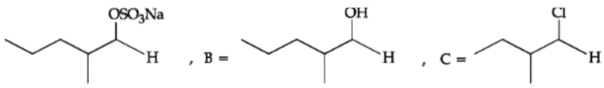
Sol.

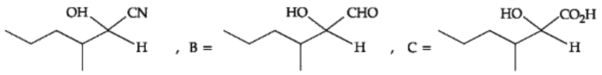


Question 171

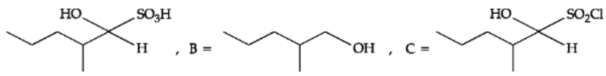
The structures of major products **A, B** and C in the following reaction are sequence.



A. 

B. 

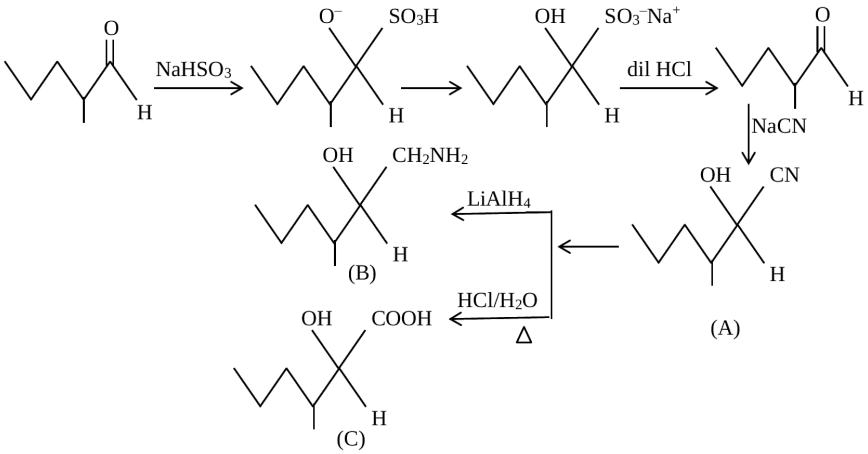
C.

D. 

Correct answer: D

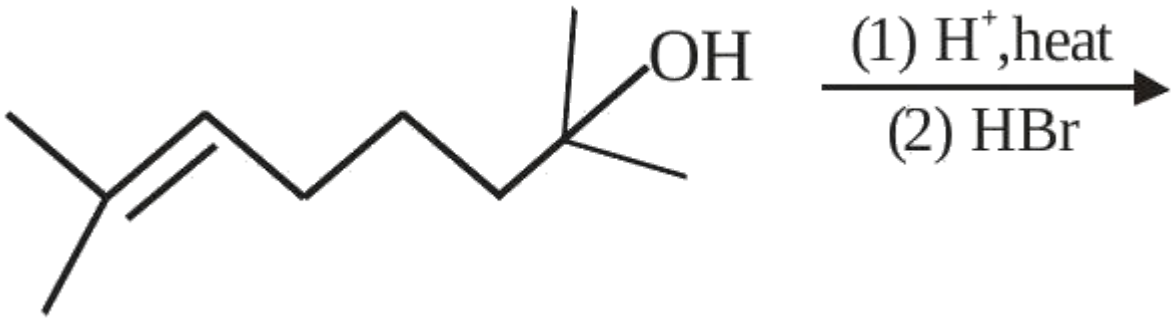
Source solution

Sol.

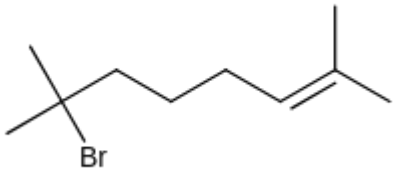


Question 172

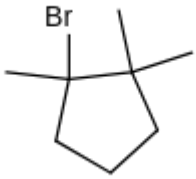
The major product in the given reaction is



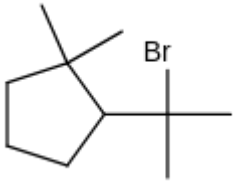
A.



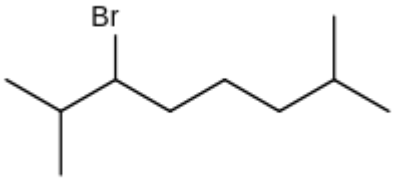
B.



C.



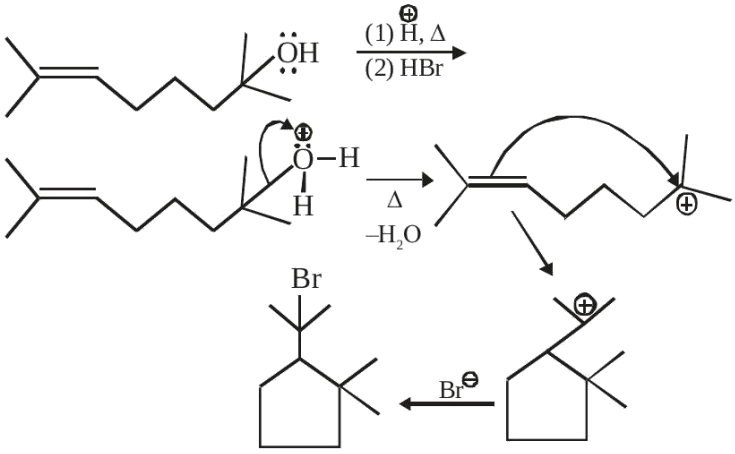
D.



Correct answer: C

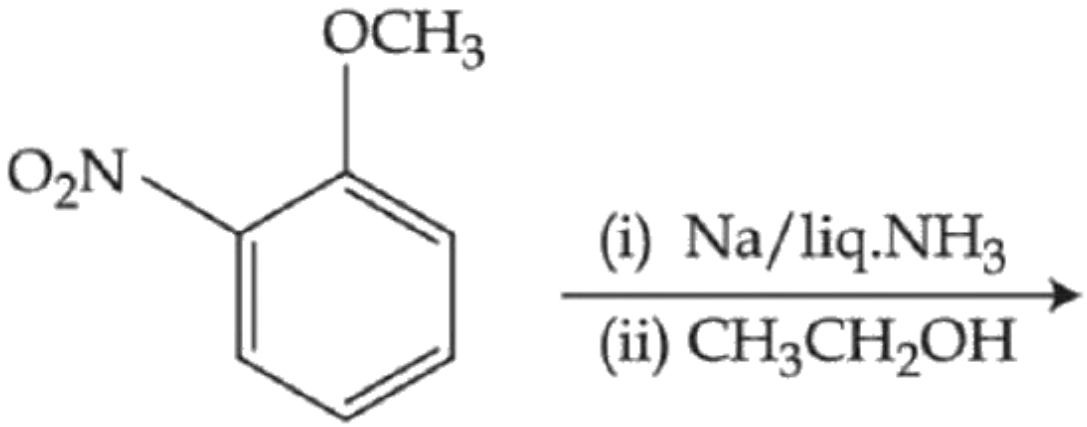
Source solution

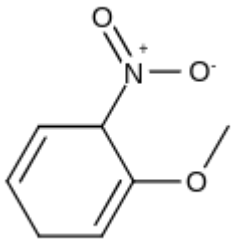
Sol.


OH
(1) H, Δ
(2) HBr
O–H
H
Δ
–H2O
Br
Br

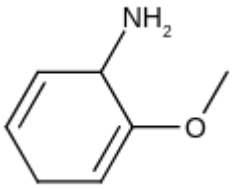
Question 173

The major product of the following reaction is

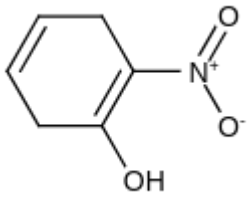




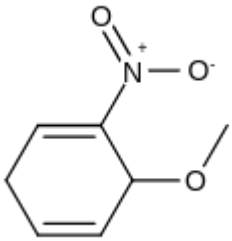
A.



B.



C.



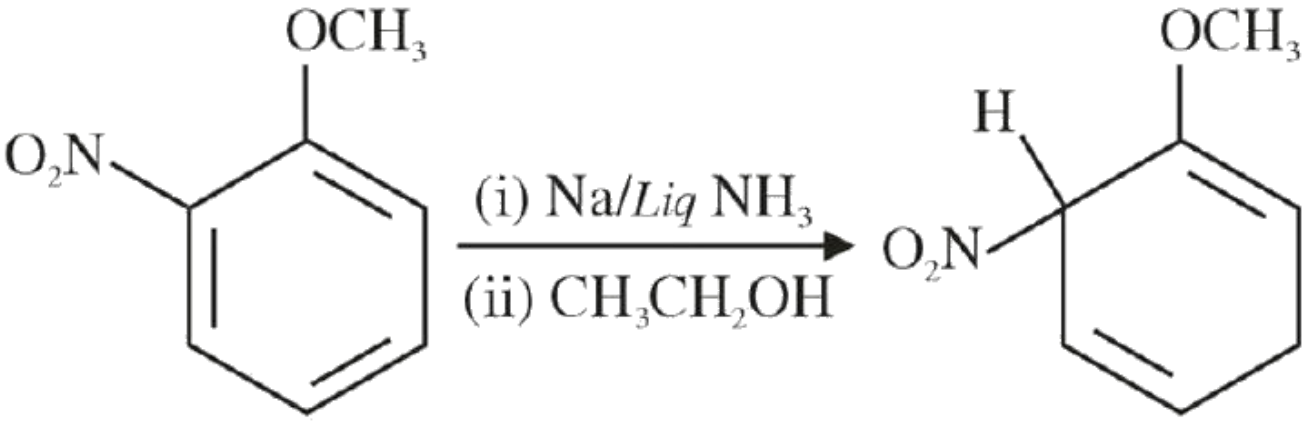
D.

Correct answer: A

Source solution

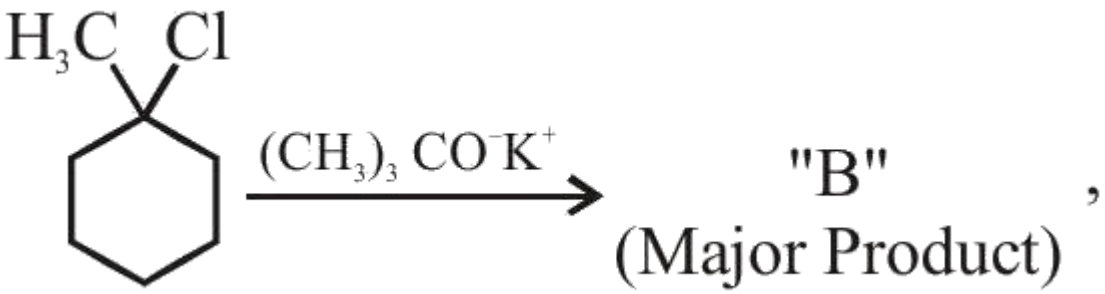
Sol.

Given reaction is an example of birch reduction.

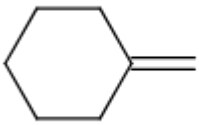

OCH3
O2N
(i) Na/Liq NH3
(ii) CH3CH2OH
OCH3
H
O2N

Question 174

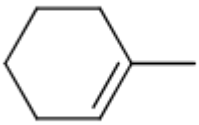
The product " A " and " B " formed in above reactions are :

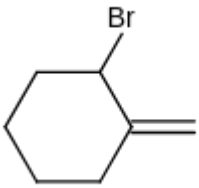


A. B-

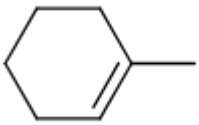


B. B-





C.

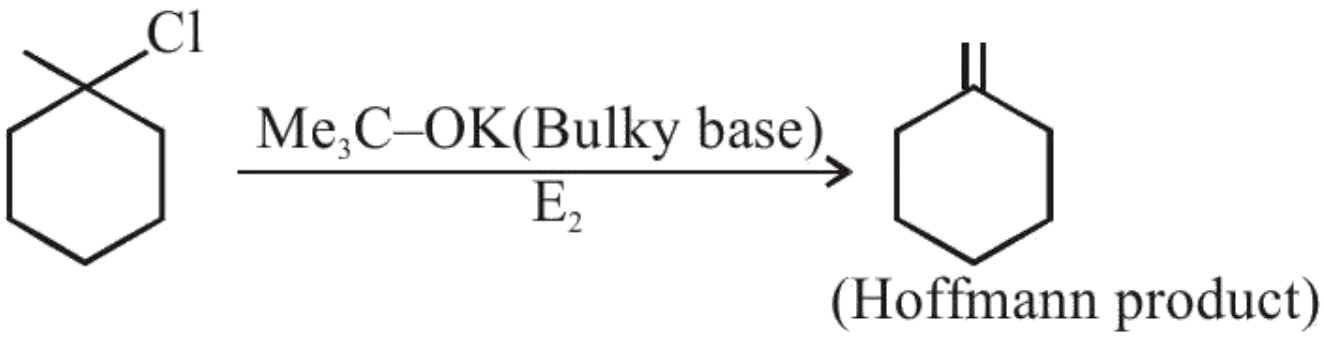


D.

Correct answer: C

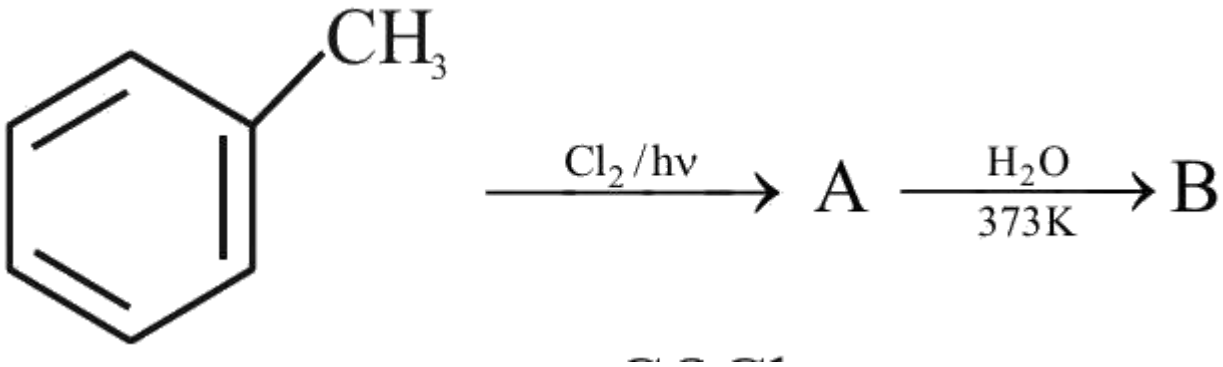
Source solution

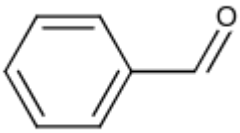
Sol.



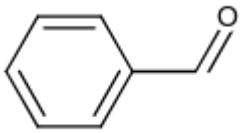
Question 175

Identify A and B in the following sequence of reaction

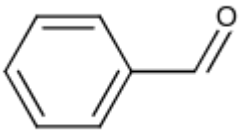




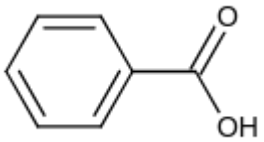
A.



B.



C.

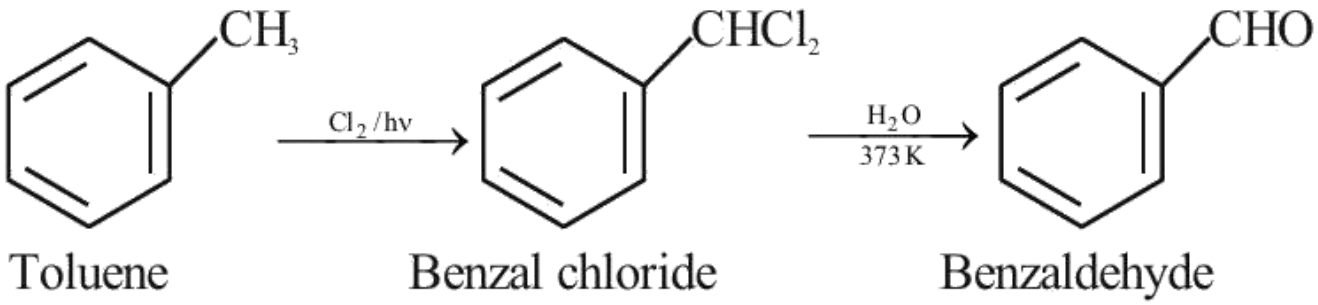


D.

Correct answer: B

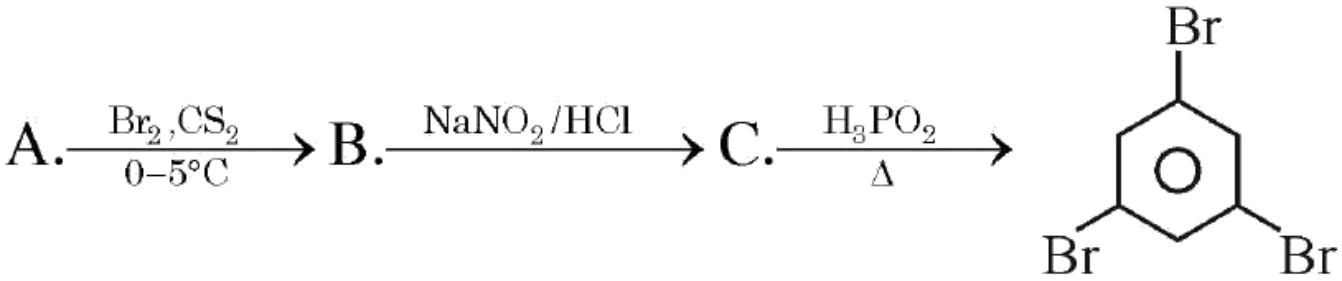
Source solution

Sol.



Question 176

Compound A from the following reaction sequence is:



A. Benzoic Acid

B. Phenol

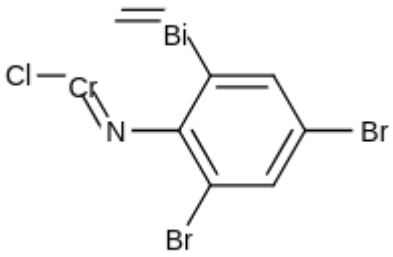
C. Salicylic Acid

D. Aniline

Correct answer: D

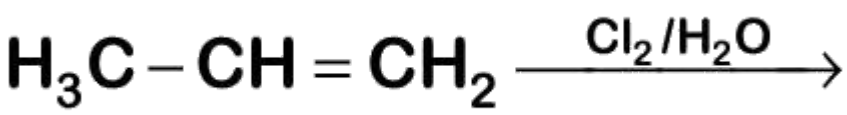
Source solution

Sol.

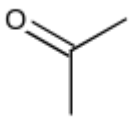


Question 177

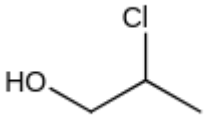
The major product of the following addition reaction is



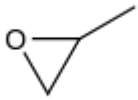
A.



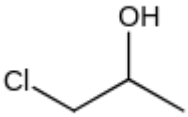
B.



C.



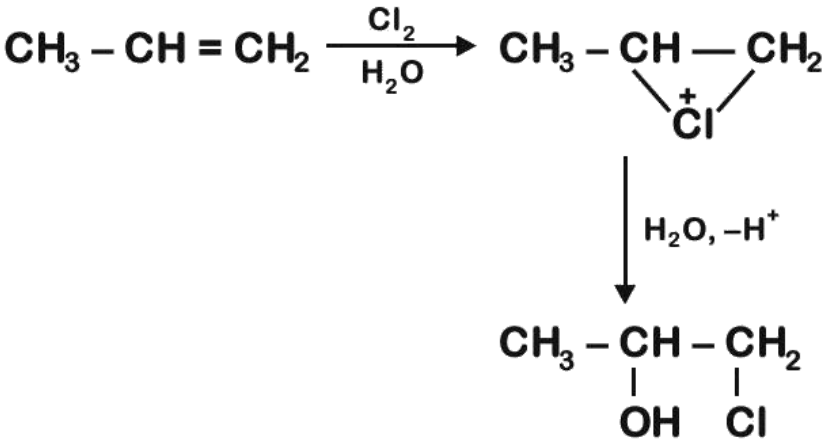
D.



Correct answer: D

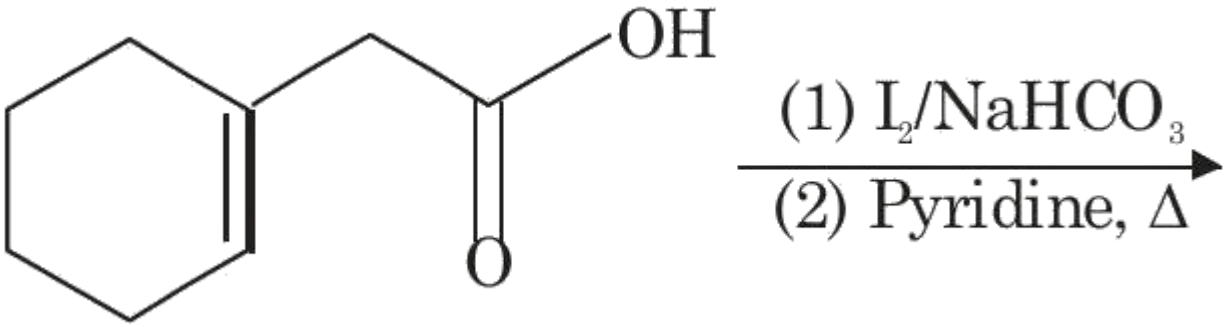
Source solution

Sol.

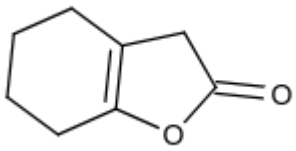


Question 178

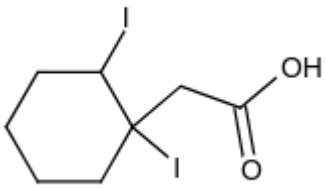
Find out the major product for the above reaction.



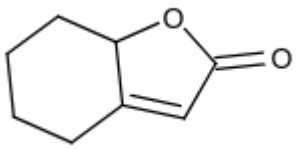
A.



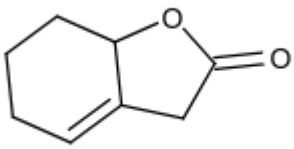
B.



C.



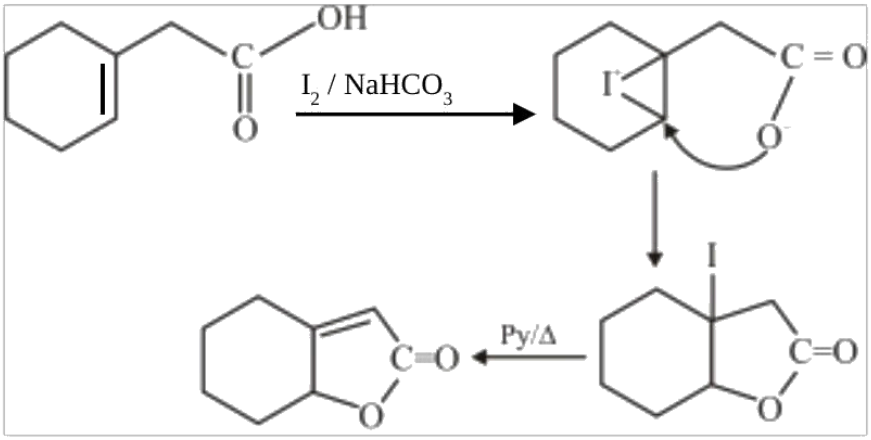
D.



Correct answer: C

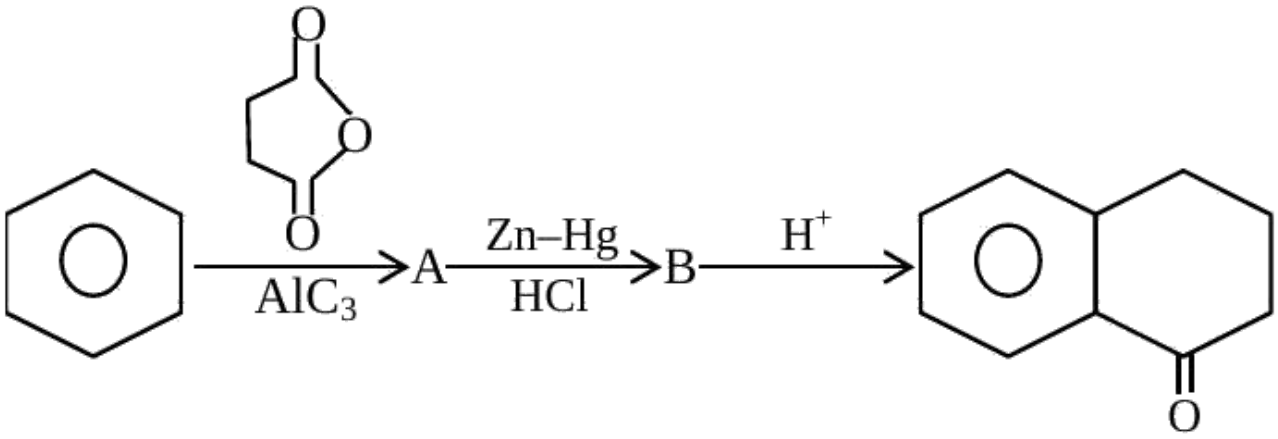
Source solution

Sol.

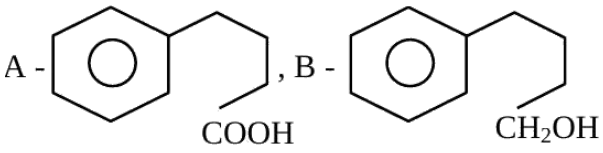

OH
C
O
I_2 / $NaHCO_3$
I
C = O
O
I
C=O
O
Py/Δ
C=O
O

Question 179

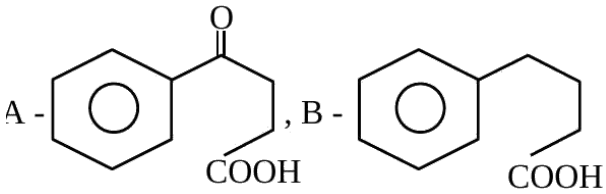
Identify A and B in the given chemical reaction sequence : -



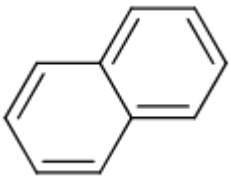
A.



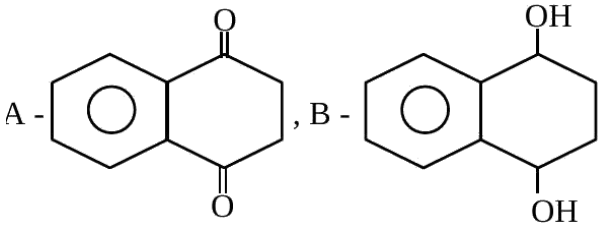
B.



C.



D.



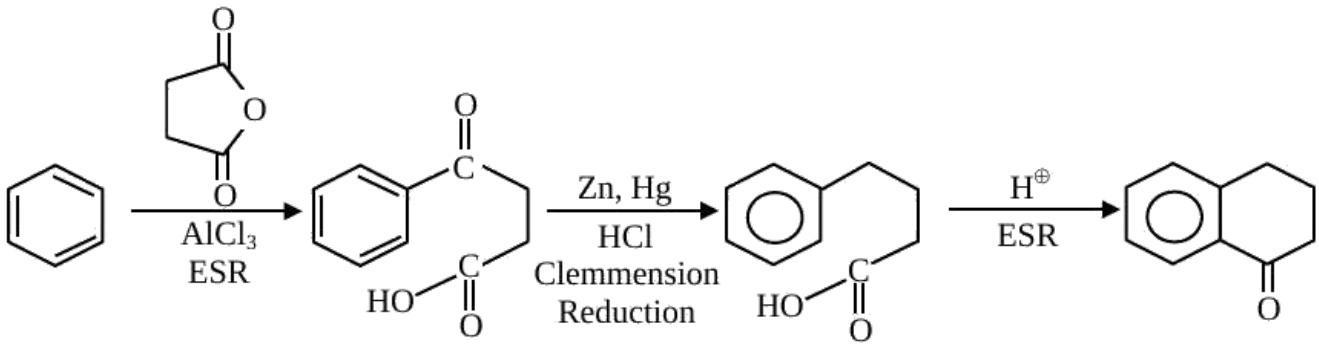
Correct answer: B

Source solution

Sol.

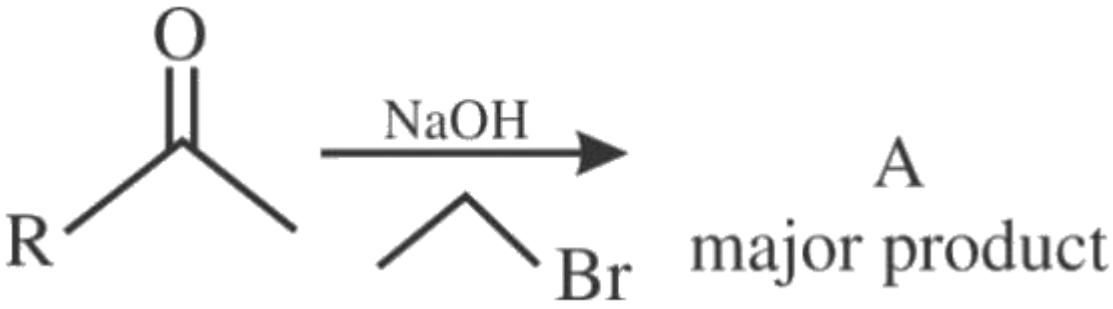
(A)

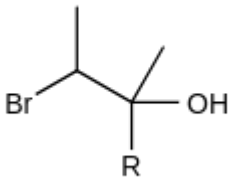
(B)


O
O
O
AlCl3
ESR
O
C
C
HO
O
Zn, Hg
HCl
Clemmension
Reduction
C
HO
O
H⊕
ESR
O

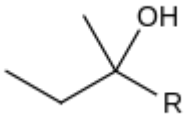
Question 180

The structure of A in the given reaction is:

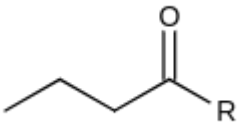




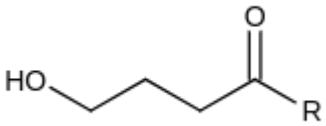
A.



B.



C.

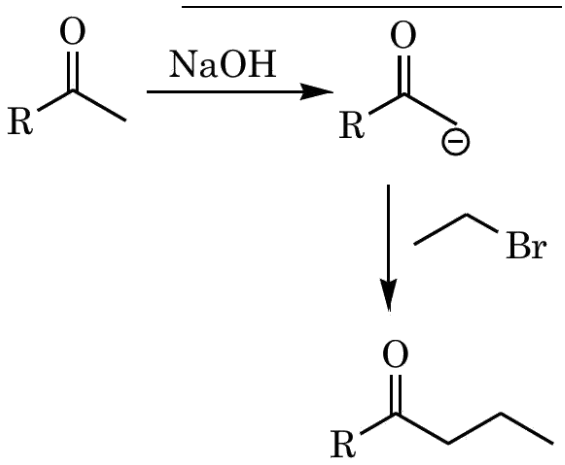


D.

Correct answer: C

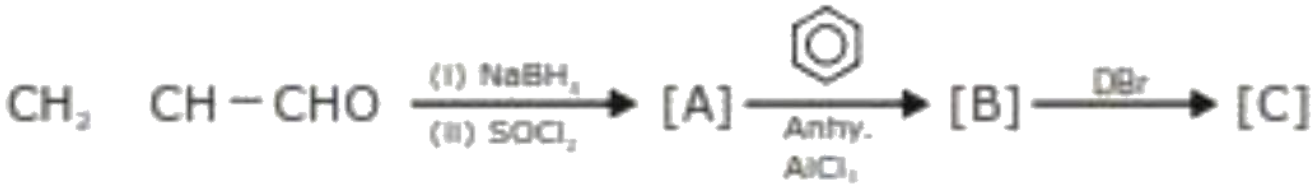
Source solution

Sol.

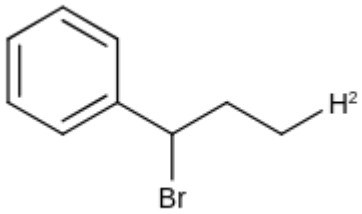


Question 181

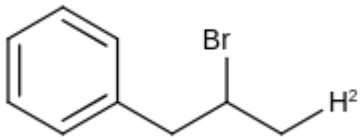
The major product [C] of the following reaction sequence will be :



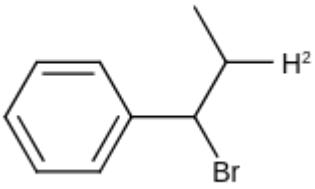
A.



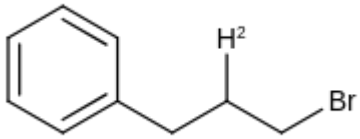
B.



C.



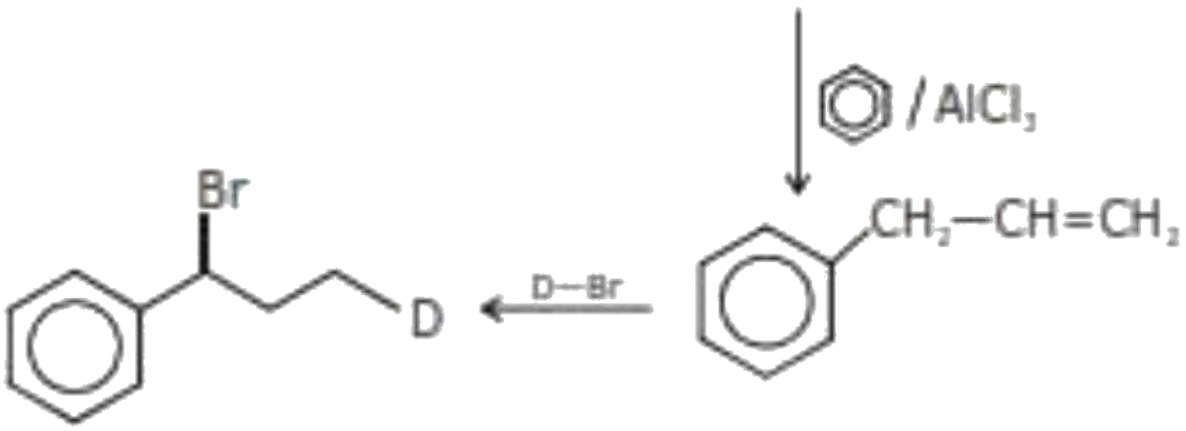
D.



Correct answer: A

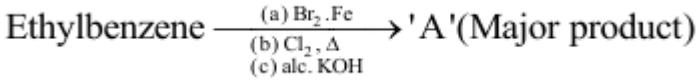
Source solution

Sol. 1}

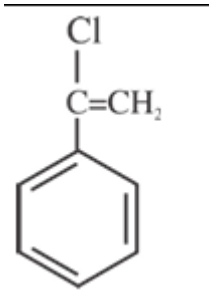


Question 182

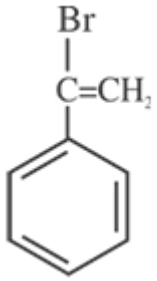
Product ' A ' of following sequence of reactions is



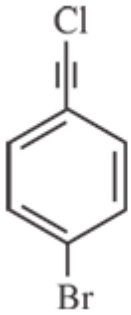
A.



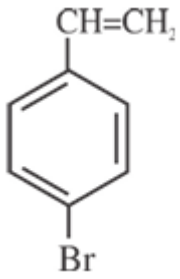
B.



C.



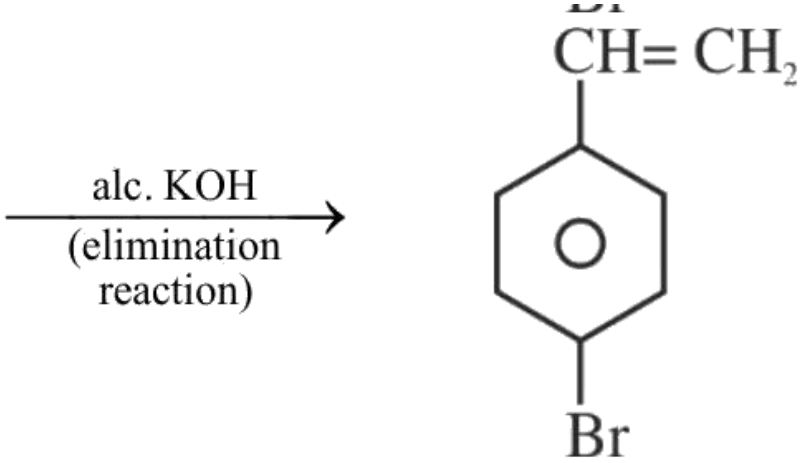
D.



Correct answer: D

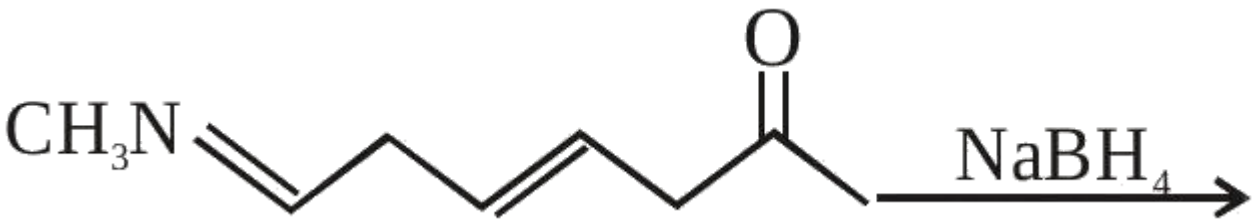
Source solution

Sol.

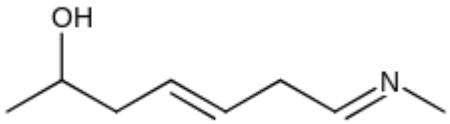


Question 183

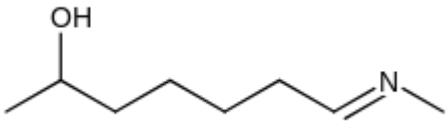
The major product of the following recation is:



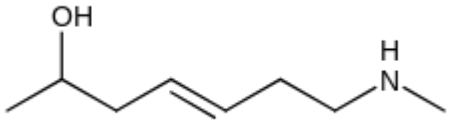
A.



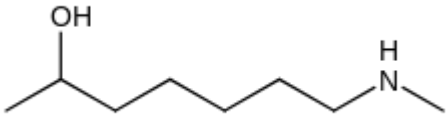
B.



C.



D.



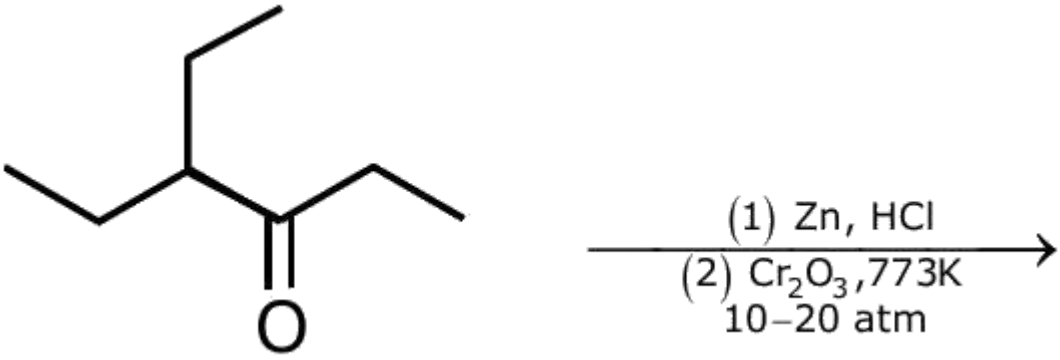
Correct answer: C

The source provides a brief answer only. A detailed worked solution is not available for this question.

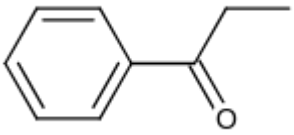
Source solution

Question 184

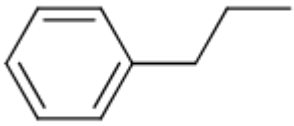
Considering the above reaction, the major product among the following is:



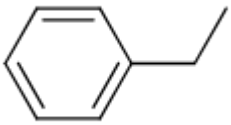
A.



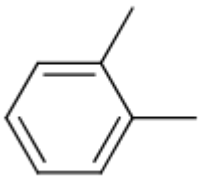
B.



C.



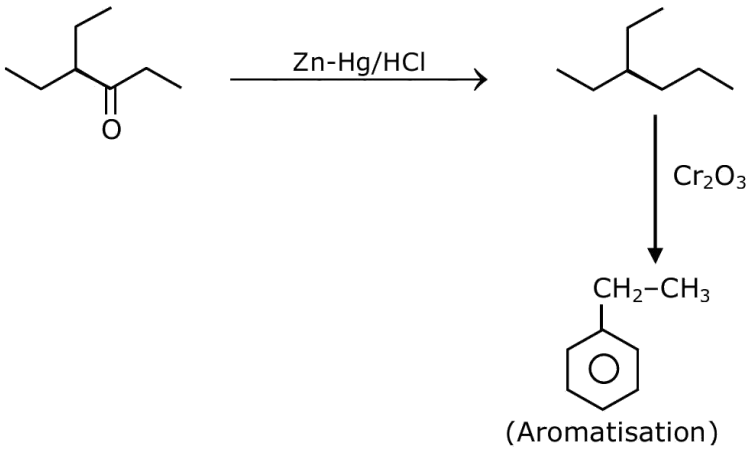
D.



Correct answer: C

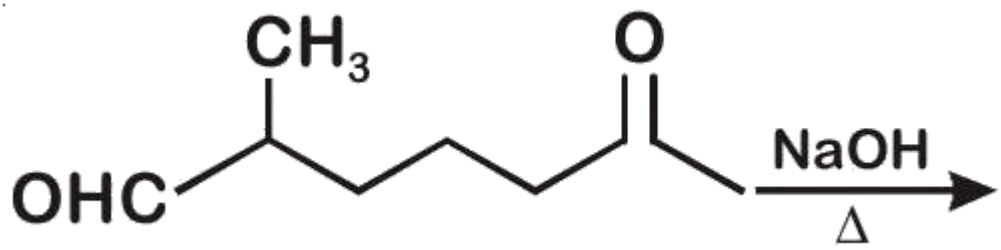
Source solution

Sol.

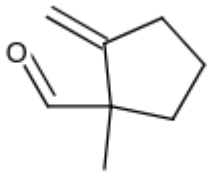

Zn-Hg/HCl
O
Cr_2O_3
$CH_2–CH_3$
(Aromatisation)

Question 185

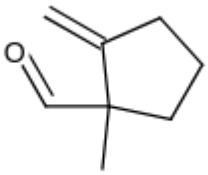
The major product obtained in the following reaction is



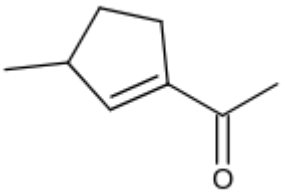
A.



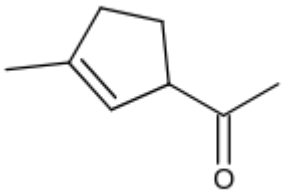
B.



C.



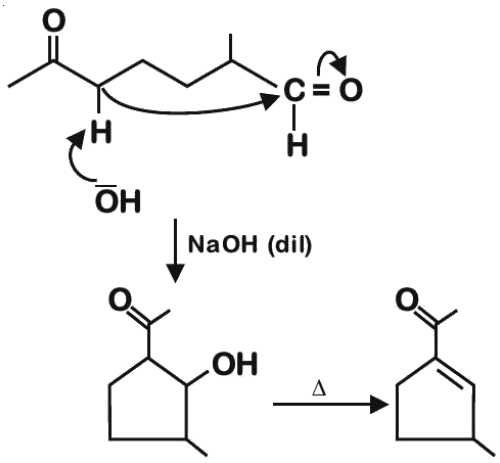
D.



Correct answer: C

Source solution

Sol.

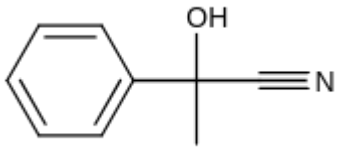


Question 186

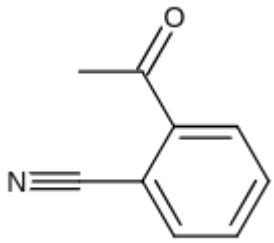
The structure of product C, formed by the following sequence of reactions is :

$$CH_3COOH + SOCl_2 \longrightarrow A \xrightarrow[AlCl_3]{Benzene} B \xrightarrow[-OH]{KCN} C$$

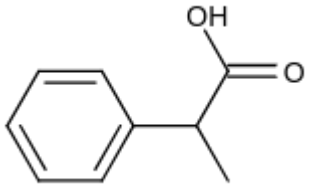
A.



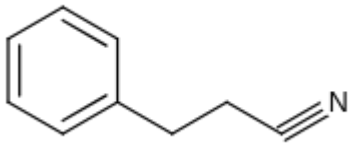
B.



C.



D.

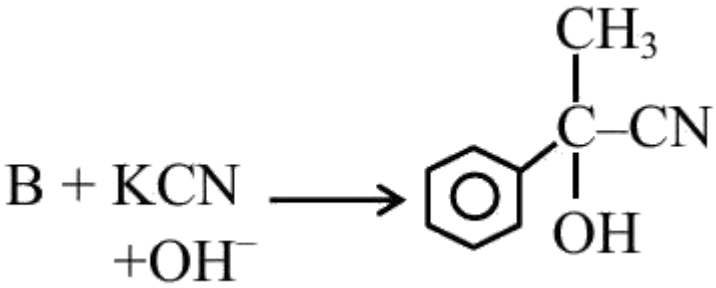


Correct answer: A

Source solution

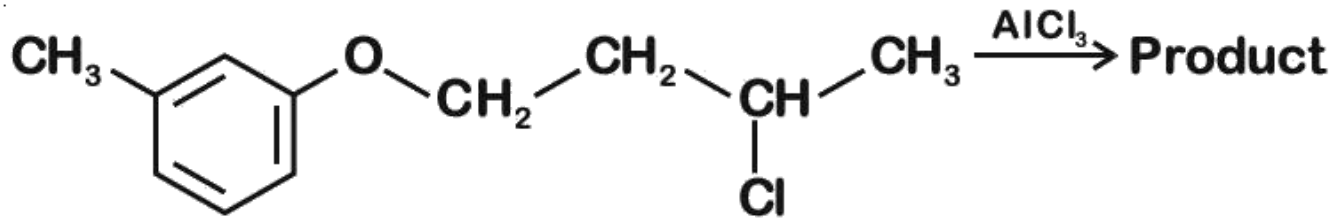
Sol.

SECTION-B}

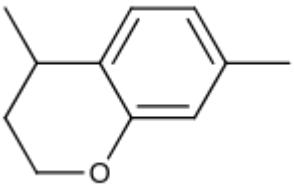


Question 187

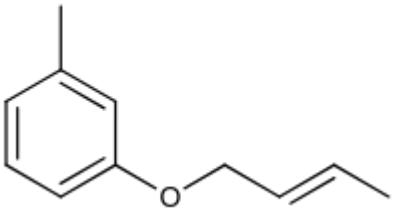
The major product obtained in the given reaction is :



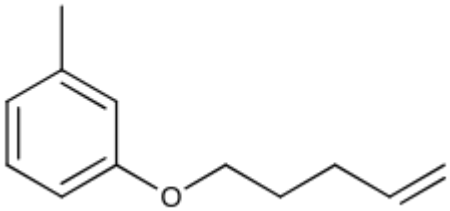
A.



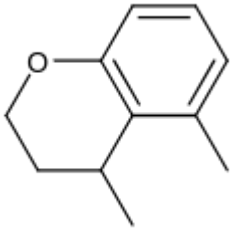
B.



C.



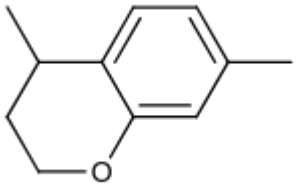
D.



Correct answer: A

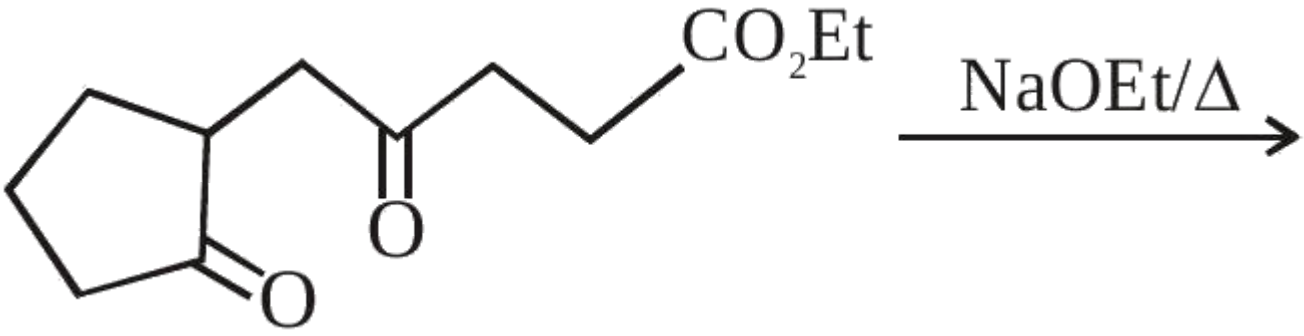
Source solution

Sol.

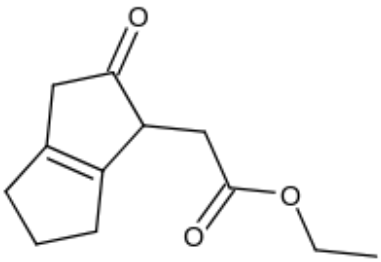


Question 188

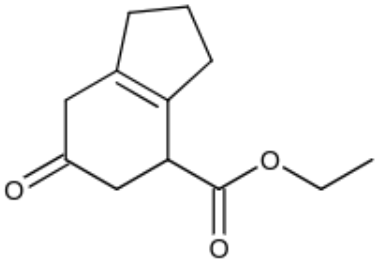
The major product obtained in the following reaction is :



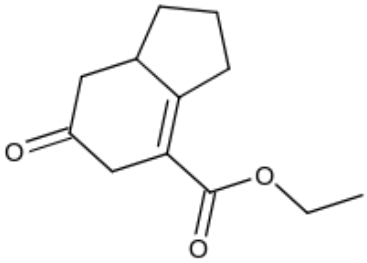
A.



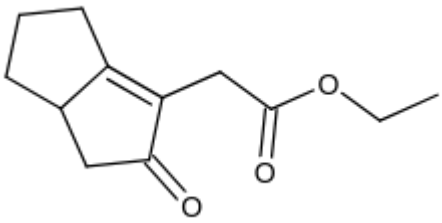
B.



C.



D.



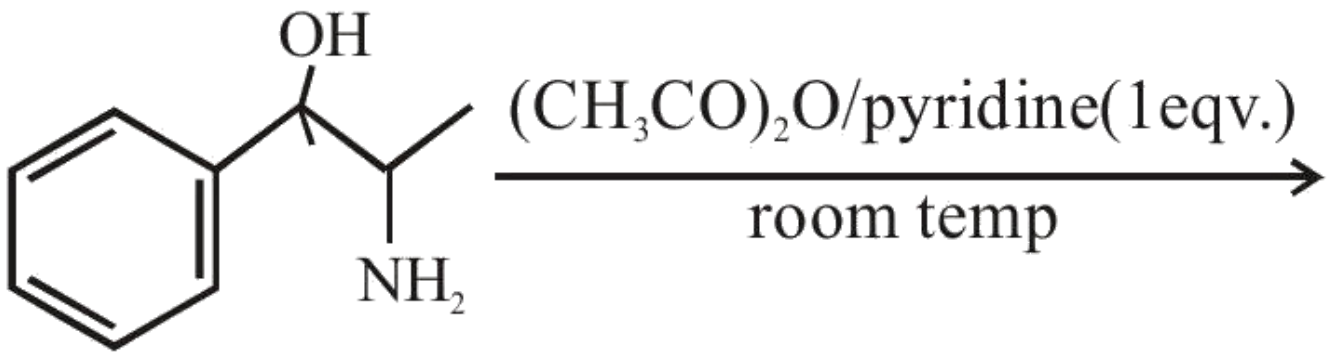
Correct answer: D

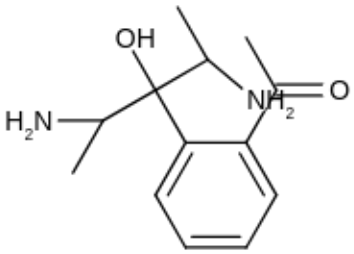
The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

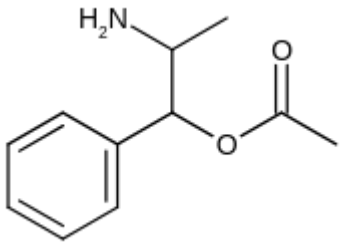
Question 189

The major product obtained in the following reaction is :

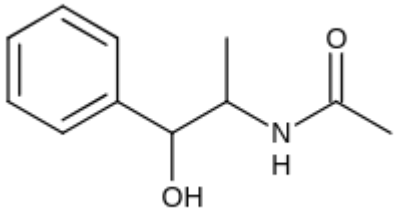




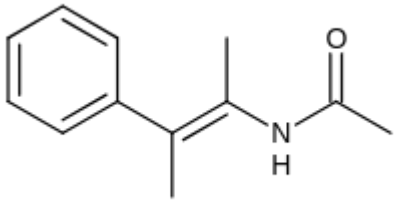
A.



B.



C.

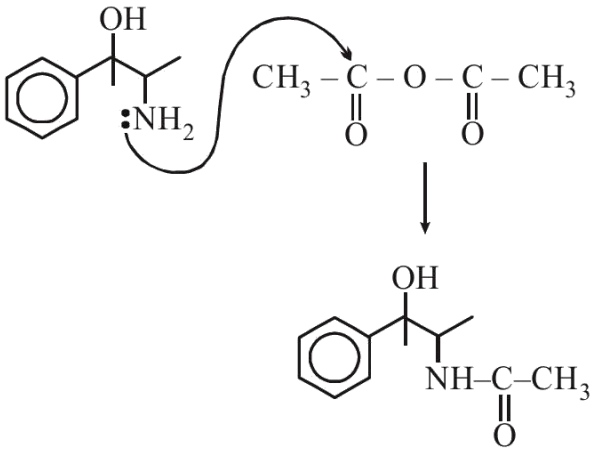


D.

Correct answer: C

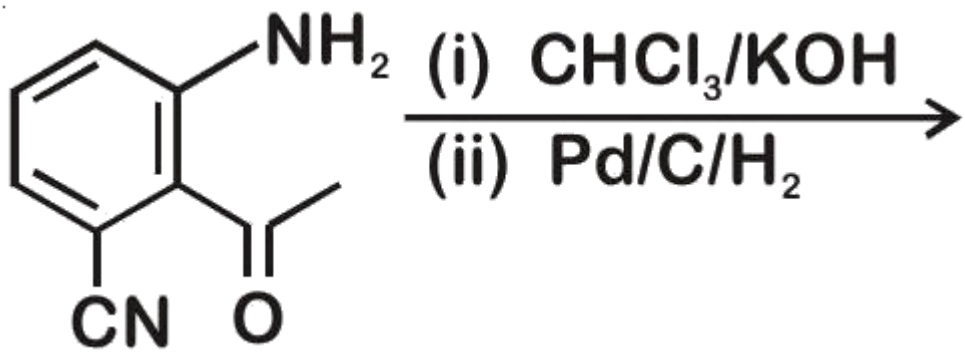
Source solution

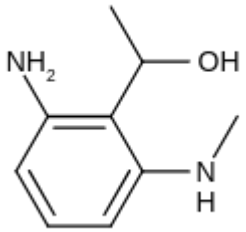
Sol.


OH
NH2
CH3 – C – O – C – CH3
O
O
OH
NH–C–CH3
O

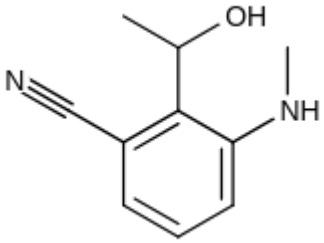
Question 190

The major product obtained in the following reaction is:

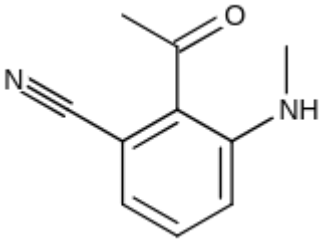




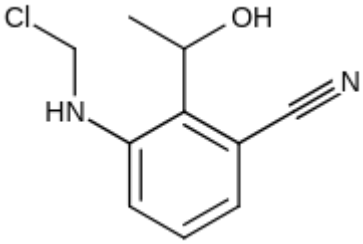
A.



B.



C.

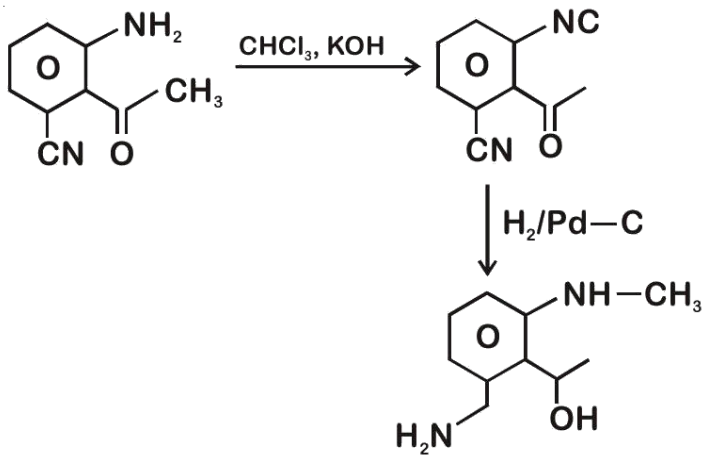


D.

Correct answer: A

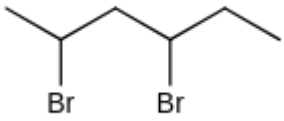
Source solution

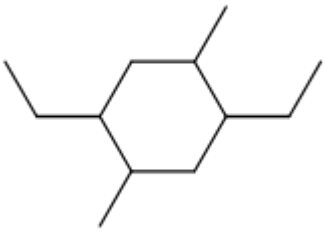
Sol.


NH2
O
CH3
CN
O
CHCl3, KOH
NC
O
CN
O
H2/Pd—C
NH—CH3
O
H2N
OH

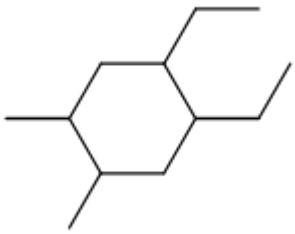
Question 191

The product formed in the first step of the reaction of

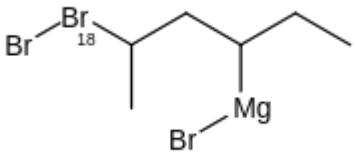




A.



B.



C.

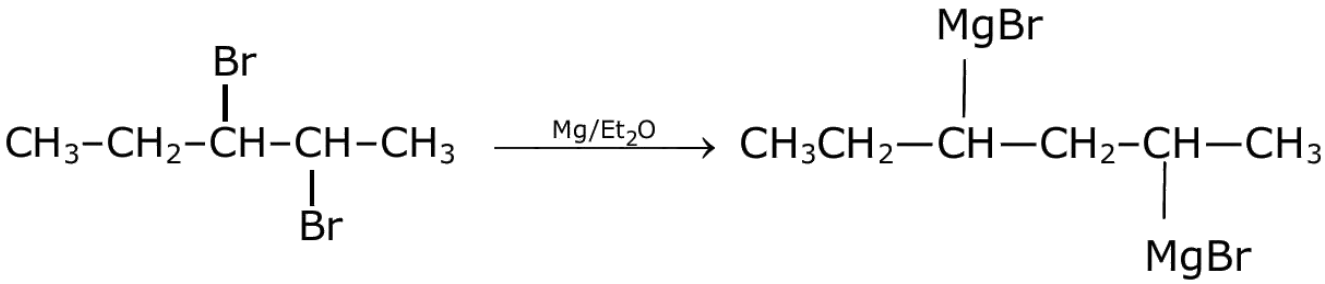


D.

Correct answer: C

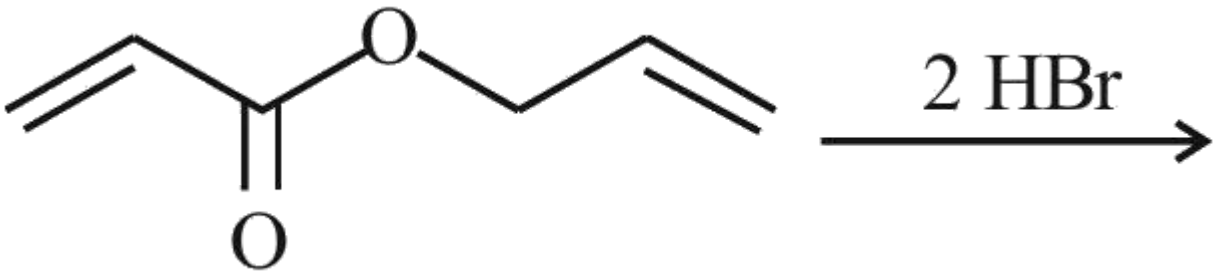
Source solution

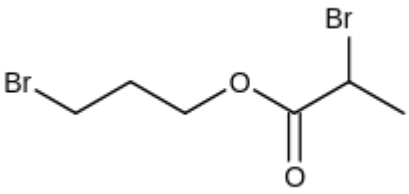
Sol.



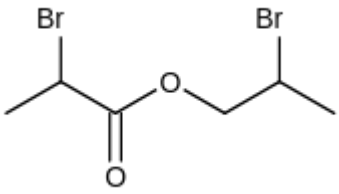
Question 192

Major product of the following reaction is

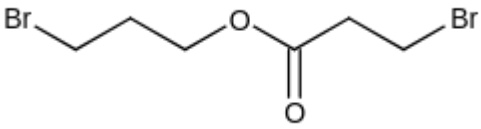




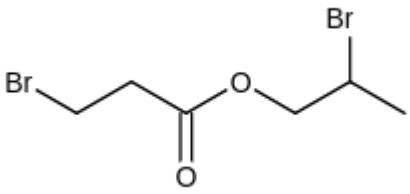
A.



B.



C.

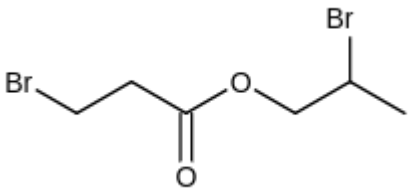


D.

Correct answer: D

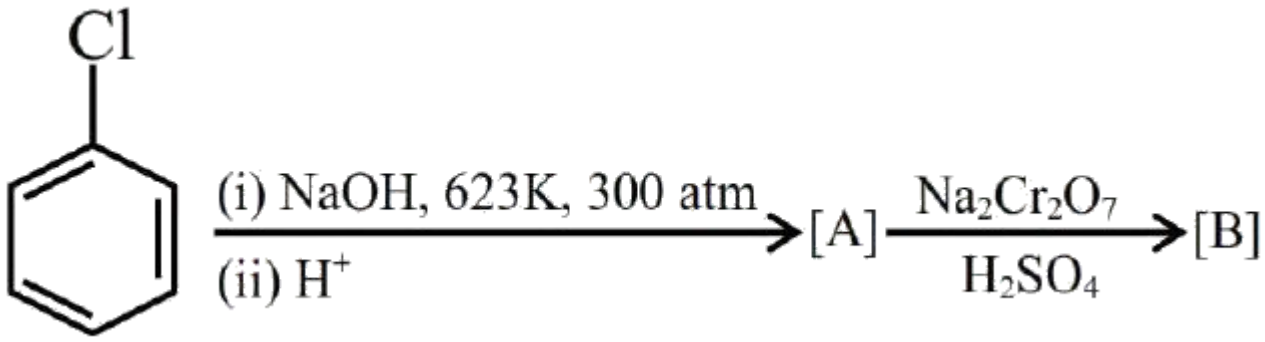
Source solution

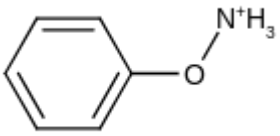
Sol.



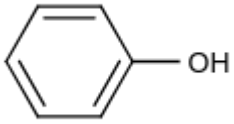
Question 193

Identify the products [A] and [B], respectively in the following reaction :





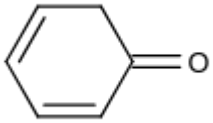
A.



B.



C.



D.

Correct answer: C

Source solution

Sol. A is phenol and B is para benzoquinone.

Solutions

Questions 194-199 / 6 selected / 2.0% practice weight / Consolidate

Question 194

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).

Correct answer: 85

Source solution

Initial conc. 1 m

$$\mathbf{K_4Fe(CN)_6 \rightleftharpoons 4\,K^+ + Fe(CN)_6{}^4}$$

Fill 4 (0.4

Final conc.$\mathbf{(1-0.4)m \quad 4\times 0.4 \quad 0.4\,m}$

$$\mathbf{= 0.6\,m \quad = 1.6\,m}$$

Effective molality $= \mathbf{0.6 + 1.6 + 0.4 = 2.6\ m}$

For same boiling point, the molality of another solution should also be 2.6 m .

Now, 18.1 weight percent solution means 18.1 gm solute is present in 100 gm solution and hence, $\mathbf{(100-18.1 =)81.9gm}$ water.

Now, $\mathbf{2.6 = \frac{18.1/M}{81.9/1000}}$

$\therefore$ Molar mass of solute, $\boldsymbol{M = 85}$

Question 195

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 $\times 10^{-3}$°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 $1.86\ \mathrm{K\ kg\ mol^{-1}}$ and $1\ \mathrm{g\ cm^{-3}}$ respectively.

Numerical answer: _____

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

Correct answer: 372

Source solution

The van t Hoff factor is $i = 1 + 0.20 = 1.2$. Molality is $(5/60)/0.5 = 1/6$ mol/kg. Thus $\Delta T_f = 1.2 \times 1.86/6 = 0.372$ degrees C, or 372×10^{-3} degrees C.

Question 196

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
$\mathbf{K_H}$	50	2	$\mathbf{2 \times 10^{-5}}$	0.5

(density of water $= \mathbf{10^3\ kg\ m^{-3}}$ 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

Correct answer: A

Source solution

Sol. 1}
$\mathbf{p = K_H X}$ mol fraction of gas in liquid.
On increasing tamp, ' $\mathbf{K'_H}$ increases
Hence solubility $\downarrow$
therefore, option 1

Question 197

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.

Correct answer: 0.18

Source solution

The balanced equation is

$SO_2 + 2NaOH \longrightarrow Na_2SO_3 + H_2O$

moles of $NaOH$ = molarity $\times$ volume (in litre)

$$= 0.1 \times 0.1$$
$$= 0.01 moles$$

Here NaOH is limiting Reagent

Question 198

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 $\mathbf{K_b}$ for $(\mathbf{H_2O}) = 0.52\ \mathbf{K\ kg\ mol^{-1}}$]

Numerical answer: _____

Enter the requested integer (0 decimal places).

Correct answer: 375

Source solution

375 K

$\mathbf{A_2\ B_3 \longrightarrow 2\ A^{+3} + 3\ B^{-2}}$

No. of ions $= \mathbf{2 + 3 = 5}$

$\mathbf{i = 1 + (n - 1) \propto}$

$\mathbf{= 1 + (5 - 1) \times 0.6}$

$\mathbf{= 1 + 4 \times 0.6 = 1 + 2.4 = 3.4}$

$\mathbf{\Delta T_b = K_b \times m \times i}$

$$\mathbf{= 0.52 \times 1 \times 3.4 = 1.768^{\circ}C}$$

$$\mathbf{\Delta T_b = (T_b)_{solution} - \left[(T_b)_{H_2O}\right]_{Solution}}$$
$$\mathbf{1.768 = (T_b)_{solution} - 100}$$
$$\mathbf{(T_b)_{solution} = 101.768^{\circ}C}$$
$$\mathbf{= 375\ K}$$

Question 199

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.

Correct answer: 3

Source solution

$AB \rightarrow A^+ + B^-$
$1-\alpha \quad \alpha \quad \alpha$
$\alpha = 3/4$
$\mathrm{N} = 2$
$\mathrm{i} = [1 + (2-1)\alpha]$
$2.5 = [1 + (2-1)3/4] \times 0.52 \times \mathrm{m}$
$\mathrm{m} = \frac{2.5}{0.52 \times 7/4} = \frac{10}{3.64} = 2.747$
$\mathrm{m} = 2.747 \simeq 3\ \mathrm{mol/kg}$

Electrochemistry

Questions 200-201 / 2 selected / 0.7% practice weight / Consolidate

Question 200

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 $\mathbf{Zn \rightarrow Zn^{2+} + 2e^-}$

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

Correct answer: C

Source solution

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

Question 201

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)

Correct answer: A

Source solution

Sol. Cell constant $= \left(\frac{\ell}{A}\right) \Rightarrow$ Units $= m^{-1}$
Molar conductivity $(\Lambda_m) \Rightarrow$ Units $= Sm^2\,mole^{-1}$
Conductivity $(K) \Rightarrow$ Units $= Sm^{-1}$
Degree of dissociation $(\alpha) \rightarrow$ Dimensionless
$\therefore$ (a) - (iii)
(b) - (i)
(c) - (iv)
(d) - (ii)

Chemical Kinetics

Questions 202-202 / 1 selected / 0.3% practice weight / Consolidate

Question 202

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).

Correct answer: 1

Source solution

$$7 \times 10^{-9} = K \times \left(8 \times 10^{-5}\right)^{x}\left(8 \times 10^{-5}\right)^{y}$$

$$2.1 \times 10^{-8} = K \times \left(24 \times 10^{-5}\right)^{x}\left(8 \times 10^{-5}\right)^{y} \quad (1)$$

$$\frac{1}{3}=\left(\frac{1}{3}\right)^{x} \Rightarrow x=1 \tag{2}$$

The p-Block Elements

Questions 203-207 / 5 selected / 1.7% practice weight / Consolidate

Question 203

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

Correct answer: D

Source solution

The original worked solution identifies A and B as correct. The reducing property increases from hydrogen sulphide to hydrogen telluride down the group, so C is false. Ozone contains six lone pairs, so D is false.

Question 204

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)

Correct answer: C

Source solution

$$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 4H_2O$$
$$KMnO_4 + HCl \rightarrow MnCl_2 + KCl + Cl_2 + H_2O$$
$$Al + NaOH + H_2O \rightarrow H_2 + Na\,[Al(OH)_4]$$
$$NaNO_3 \longrightarrow NaNO_2 + O_2$$

Question 205

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

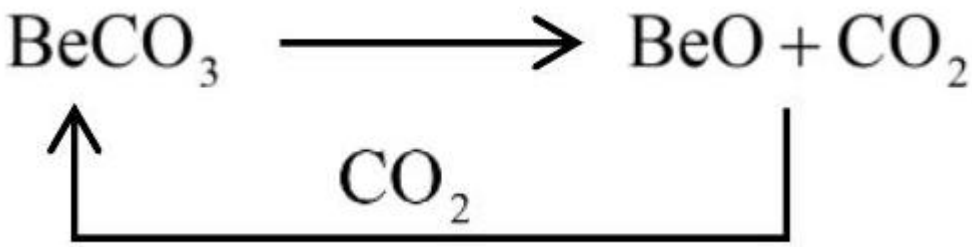
C. A, B and C only

D. A and B only

Correct answer: A

Source solution

BeO is Amphoteric



BeSO4 is solube in water

Due to small size Be shows anomalous behaviour.

Question 206

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

Correct answer: A

Source solution

Chlorine oxides, Cl_2O, ClO_2, Cl_2O_6 and Cl_2O_7 are heighly Reactive oxidising Agents and tend to explode.

Question 207

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

Correct answer: D

Source solution

Slaked Lime $\rightarrow Ca(OH)_2$
Dead burnt plaster $\rightarrow CaSO_4$
Caustic Soda $\rightarrow NaOH$
Washing Soda $\rightarrow Na_2CO_3.10H_2O$

The d- and f-Block Elements

Questions 208-210 / 3 selected / 1.0% practice weight / Consolidate

Question 208

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

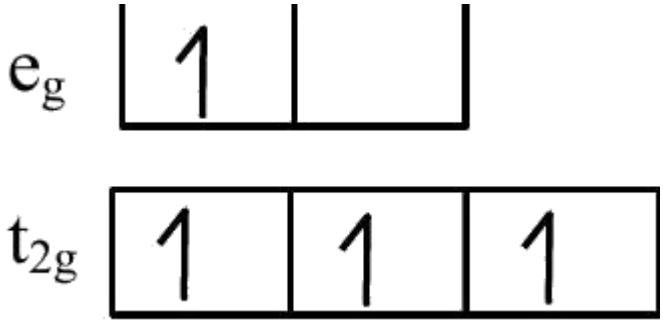
C. 5

D. 1

Correct answer: A

Source solution

Sol. $[V(H_2O)_6]^{3+} \rightarrow d^2sp^3$
$_{23}V : -[Ar]3d^3 4s^2$
$V^{+3} : -[Ar]3d^2, n = 2$ (even number of unpaired e^-)
$[Cr(H_2O)_6]^{2+} \rightarrow sp^3 d^2$
$_{24}Cr : -[Ar]3d^5 4s^1$
$Cr^{+2} : -[Ar]3d^4, n = 4$ (even number of unpaired e^-)
$[Fe(H_2O)_6]^{3+} \rightarrow sp^3 d^2$
$Fe^{3+} : -[Ar]3d^5 4s^0$
$n = 5$ (odd number of unpaired e^-)
$[Ni(H_2O)_6]^{3+} \rightarrow sp^3 d^2$
Ni :- $[Ar]3d^8 4s^2$
$Ni^{+3} : -[Ar]3d^7, n = 3$ (odd number of unpaired e^-)
$[Cu(H_2O)_6]^{2+} \rightarrow sp^3 d^2$
$Cu : -[Ar]3d^9 4s^0$
$n = 1$ (odd number of unpaired e^-)



Question 209

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

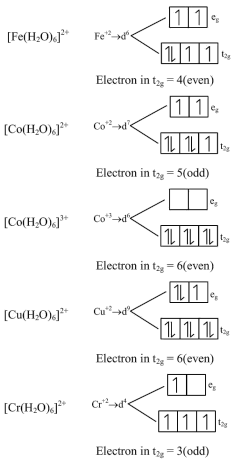
C. 2

D. 5

Correct answer: B

Source solution

Sol.



Question 210

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

Correct answer: A

Source solution

Sol. $_{63}Eu^{2+} - [Xe]4f^7 6\ s^0$

$_{64}Gd^{3+} - [Xe]4f^7 5\ d^0 6\ s^0$

$_{63}Eu^{3+} - [Xe]4f^6 6\ s^0$

$_{65}\ Tb^{3+} - [Xe]4f^8 6\ s^0$

$_{62}Sm^{2+} - [Xe]4f^6 6\ s^0$

$Eu^{2+} \& Gd^{3+}$

Coordination Compounds

Question 211

Identify the coordination complexes in which the central metal ion has $\mathbf{d^4}$ configuration.

(A) $[\mathbf{FeO_4}]^{2-}$

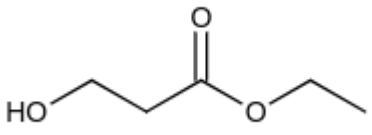
(B) $[\mathbf{Mn(CN)_6}]^{3-}$

(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

Correct answer: C

Source solution

Step 1: d-electron count in each complex

$$\textbf{(A)}\ [\mathrm{FeO_4}]^{2-}$$

$$\mathrm{Fe}^{6+} : d^2 \Rightarrow \text{not } d^4$$

(B) $[\mathrm{Mn(CN)_6}]^{3-}$

$$\mathrm{Mn^{3+}} : 25 - 3 = 22 \Rightarrow d^4$$

(C) $[\mathrm{Fe(CN)_6}]^{3-}$

$$\mathrm{Fe^{3+}} : d^5 \Rightarrow \text{not } d^4$$

(D) (assumed correct option) $\Rightarrow d^4$ configuration complex

(E) $[\mathrm{NiF_6}]^{2-}$

$$\mathrm{Ni^{4+}} : d^6 \Rightarrow \text{not } d^4$$

Hence, $\mathbf{d^4}$ complexes are:

$$\boxed{B \text{ and } D}$$

Question 212

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

Correct answer: A

Source solution

$$\mathbf{(A)}\ [FeO_4]^{2-}$$

$$Fe^{6+} : d^2 \Rightarrow \text{even}$$

$$\mathbf{(B)}\ [Fe(CN)_6]^{3-}$$

$$Fe^{3+} : d^5 \Rightarrow \text{odd}$$

$$\mathbf{(C)}\ [Fe(CN)_5NO]^{2-}$$

$$NO \text{ acts as } NO\hat{}+ \text{ (strong field ligand)}$$

$$\mathrm{Fe}^{2+} : d^6 \Rightarrow \text{even}$$

(D) $[\mathrm{CoCl_4}]^{2-}$

$$\mathrm{Co}^{2+} : d^7 \Rightarrow \text{odd}$$

(E) $[\mathrm{Co(H_2O)_3F_3}]$

$$\mathrm{Co}^{3+} : d^6 \Rightarrow \text{even}$$

Final Answer:

$$\boxed{(B), (D)}$$

Question 213

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

Correct answer: C

Source solution

Condition for low spin complexes:

$$\text{Strong field ligands } (CN\hat{}- , CO, NO\hat{}+ , NH_3 \text{ (for } Co\hat{}\{3+\})) \Rightarrow \text{low spin}$$

$$\textbf{(A)}\ [Fe(CN)_5NO]^{2-}$$

$$CN^- \text{ and } NO^+ \text{ are strong field ligands} \Rightarrow \text{low spin}$$

$$\textbf{(B)}\ [CoF_6]^{3-}$$

$$F^- \text{ is weak field ligand} \Rightarrow \text{high spin (not low spin)}$$

$$\textbf{(C)}\ [Fe(CN)_6]^{4-}$$

CN^- strong field $\Rightarrow$ low spin

(D) $[\mathrm{Co}(\mathrm{NH}_3)_6]^{3+}$

Co^{3+} has high effective nuclear charge, NH_3 acts as strong field $\Rightarrow$ low spin

(E) $[\mathrm{Cr}(\mathrm{H}_2\mathrm{O})_6]^{2+}$

$\mathrm{H}_2\mathrm{O}$ is weak field ligand $\Rightarrow$ high spin (not low spin)

$\boxed{C \text{ and } D}$

Question 214

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)

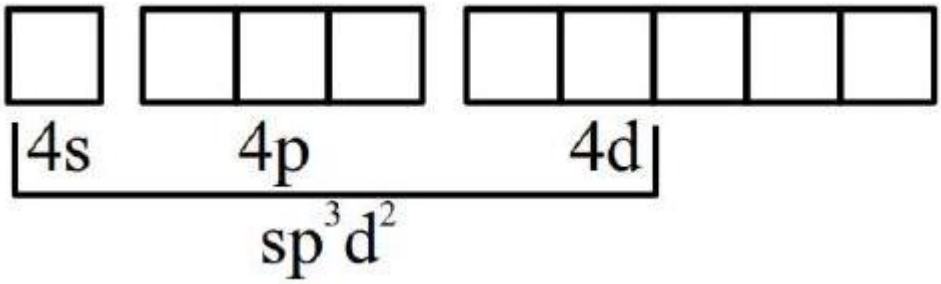
Correct answer: B

Source solution

(A) $[CoF_6]^{-3}$

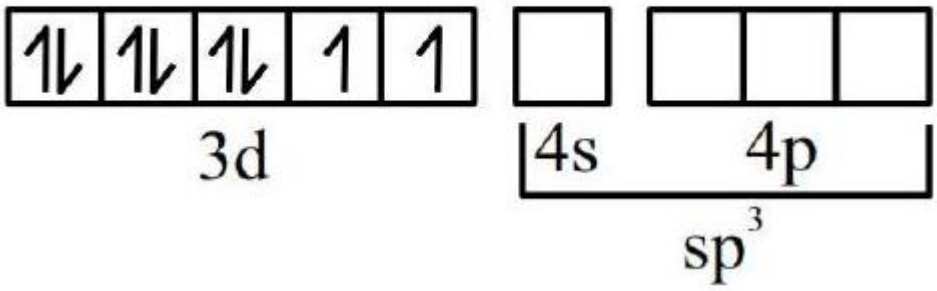
[

]



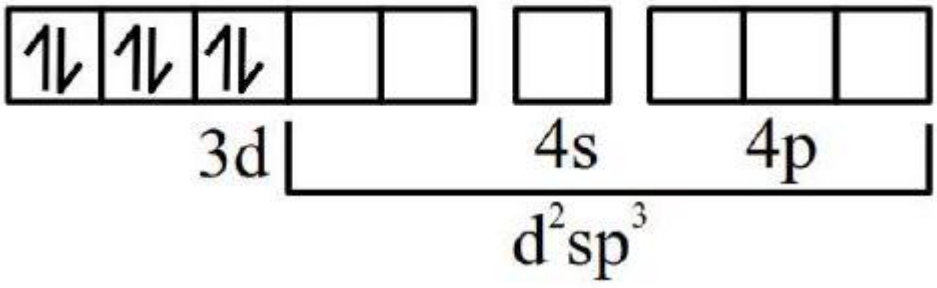
(B) $[NiCl_4]^{2-}$

$$Ni^{2+} \rightarrow 3d^8$$

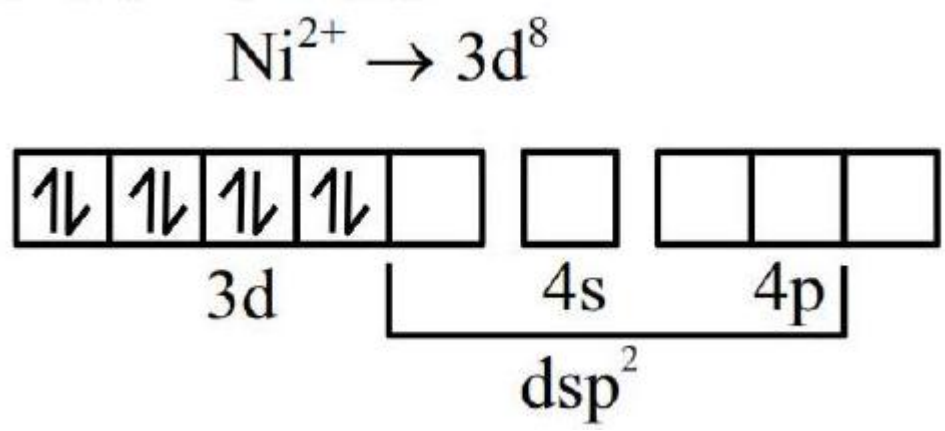


(C) $[Co(NH_3)_6]^{3+}$

$$Co^{3+} \rightarrow 3d^6$$



(D) $[Ni(CN)_4]^{2-}$



Question 215

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. $[Co(NH_3)_6]^{2+} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_4]^{2+} < [Co(en)_3]^{3+}$

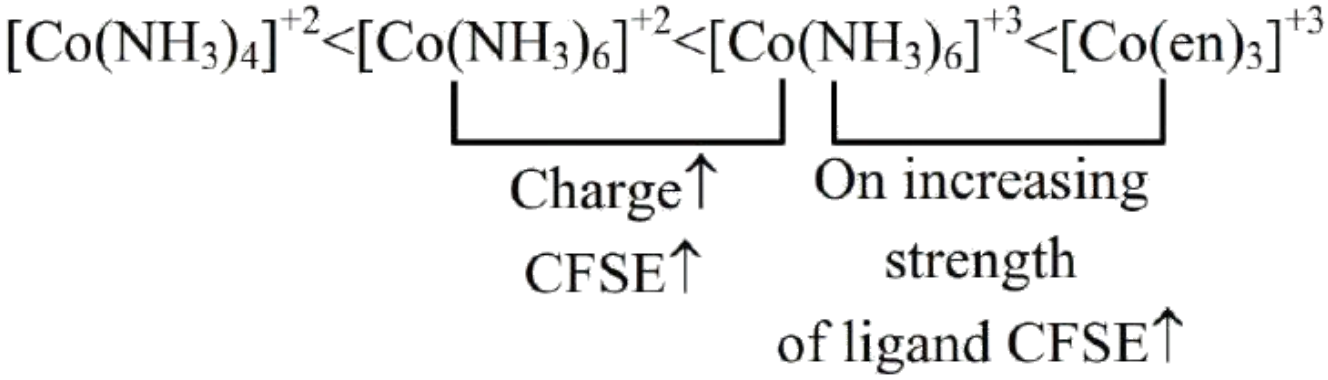
D. $[Co(en)_3]^{3+} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_6]^{2+} < [Co(NH_3)_4]^{2+}$

Correct answer: B

Source solution

Sol. Order of CFSE

SFL : $NH_3 <$ en



Question 216

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)

Correct answer: B

Source solution

$$(A)\ [CoF_6]^{3-}$$

$$Co^{3+} : d^6,\ F^- \text{ weak field} \Rightarrow \text{octahedral high spin} \Rightarrow sp^3d^2 \Rightarrow (III)$$

$$(B)\ [NiCl_4]^{2-}$$

$$Ni^{2+} : d^8,\ Cl^- \text{ weak field} \Rightarrow \text{tetrahedral} \Rightarrow sp^3 \Rightarrow (II)$$

$$(C)\ [Co(NH_3)_6]^{3+}$$

$$Co^{3+} : d^6,\ NH_3 \text{ strong field} \Rightarrow \text{inner orbital complex} \Rightarrow d^2sp^3 \Rightarrow (I)$$

$$(D)\ [Ni(CN)_4]^{2-}$$

$$Ni^{2+} : d^8,\ CN^- \text{ strong field} \Rightarrow \text{square planar} \Rightarrow dsp^2 \Rightarrow (IV)$$

Final Matching:

$$\boxed{A \to III,\ B \to II,\ C \to I,\ D \to IV}$$

Question 217

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

Correct answer: C

Source solution

Given complexes:

$$(I)\ [Mn(CN)_6]^{3-} \Rightarrow Mn^{3+} : d^4$$

$$(II)\ [Co(CN)_6]^{4-} \Rightarrow Co^{2+} : d^7$$

$$(III)\ [Fe(CN)_6]^{4-} \Rightarrow Fe^{2+} : d^6$$

$$(IV)\ [Fe(CN)_6]^{3-} \Rightarrow Fe^{3+} : d^5$$

Step 1: CNˆ- is strong field ligand $\Rightarrow$ all are low spin octahedral

Step 2: CFSE values (low spin octahedral)

$$d^4(Mn^{3+}) : t_{2g}^4 e_g^0 \Rightarrow \text{highest CFSE among given set}$$

$$d^5(Fe^{3+}) : t_{2g}^5$$

$$d^6(Fe^{2+}) : t_{2g}^6 \Rightarrow \text{maximum stability in this group}$$

$$d^7(Co^{2+}) : t_{2g}^6 e_g^1 \Rightarrow \text{lowest stability due to } e_g \text{ electron}$$

Step 3: Stability order (increasing CFSE)

$$\boxed{(I) < (II) < (IV) < (III)}$$

Question 218

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)

Correct answer: D

Source solution

Step 1: Determine oxidation state, geometry and magnetic nature

$$(A)\ [MnBr_4]^{2-}$$

$$Mn^{2+} : d^5 \quad Br^- \text{ is weak field ligand}$$

$$\Rightarrow \text{tetrahedral complex, } sp^3$$

$$\text{High spin } d^5 \Rightarrow \text{paramagnetic}$$

$$\Rightarrow (A) \rightarrow (IV)$$

$$(B)\ [FeF_6]^{3-}$$

$\mathrm{Fe}^{3+}: d^5 \quad F^-$ weak field ligand

$\Rightarrow$ octahedral, high spin $\Rightarrow sp^3d^2$

paramagnetic

$\Rightarrow (B) \rightarrow (II)$

$(C)\ [\mathrm{Co}(\mathrm{C_2O_4})_3]^{3-}$

$\mathrm{Co}^{3+}: d^6 \quad C_2O_4^{2-}$ is moderate/strong field ligand

$\Rightarrow$ low spin octahedral $\Rightarrow d^2sp^3$

diamagnetic

$\Rightarrow (C) \rightarrow (I)$

$(D)\ [\mathrm{Ni}(\mathrm{CO})_4]$

$\mathrm{Ni}^0: d^{10} \quad CO$ strong field ligand

$$\Rightarrow \text{tetrahedral, } sp^3$$

$$\text{diamagnetic}$$

$$\Rightarrow (D) \rightarrow (III)$$

Final Matching:

$$\boxed{(A)-(IV),\ (B)-(II),\ (C)-(I),\ (D)-(III)}$$

Question 219

Consider the following low-spin complexes
$\mathbf{K_3\,[Co(NO_2)_6]}, \mathbf{K_4\,[Fe(CN)_6]}, \mathbf{K_3\,[Fe(CN)_6]}$,
$\mathbf{Cu_2\,[Fe(CN)_6]}$ and $\mathbf{Zn_2\,[Fe(CN)_6]}$.
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.

Correct answer: 0

The source provides a brief answer only. A detailed worked solution is not available for this question.

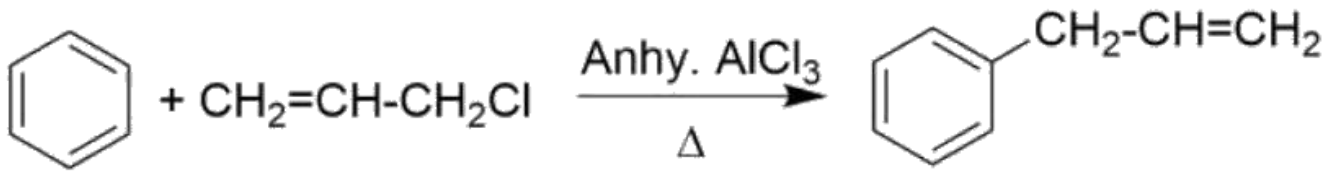
Source solution

Haloalkanes and Haloarenes

Questions 220-230 / 11 selected / 3.7% practice weight / Focus first

Question 220

Which of the following reactions are possible?



A. A, B, C

B. **B, D**

C. A, C, D

D. **A, C**

Correct answer: B

Source solution

Sol:}
In aryl halides, due to the partial double bond character generated by chlorine, the aryl cation is not formed.

Vinyl halides do not give Friedel-Crafts reaction, because the intermediate that is generated (vinyl cation) is not stable.

$H_2C=\overset{+}{C}H$

vinyl
cation

Question 221

Match List I with List II

List I Name of reaction		List II Reagent used	
A	Hell-VolhardZelinsky reaction	I.	$\mathbf{NaOH + I_2}$
B	Iodoform reaction	II.	(i) $\mathbf{CrO_2Cl_2, CS_2}$ (ii) $\mathbf{H_2O}$
C	Etard reaction	III.	(i) $\mathbf{Br_2/}$ red phosphorus (ii) $\mathbf{H_2O}$
D	Gatterman-Koch reaction	IV.	CO, HCl, anhyd. $\mathbf{A1C1_3}$

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

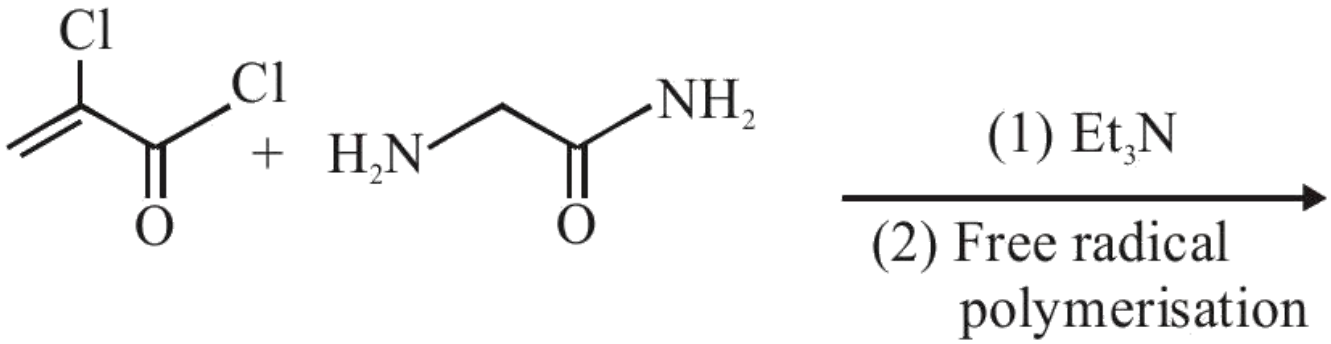
Correct answer: D

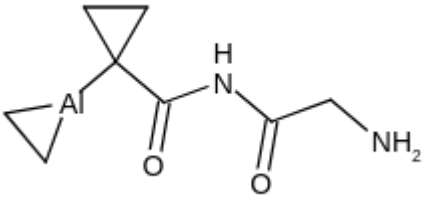
Source solution

Sol. $\mathbf{HVZ}$ reactions $= \mathbf{Br_2/}$ red P
Iodoform reaction $= \mathbf{NaOH + I_2}$
Etard reaction $=$ (i) $\mathbf{CrO_2Cl_2, CS_2}$ (ii) $\mathbf{H_2O}$
Gatterman-Koch Reaction = CO, HCl, Anhydrous, $\mathbf{AlCl_3}$

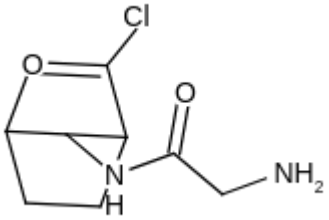
Question 222

Major product of the following reaction is :

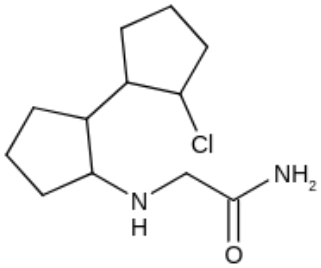




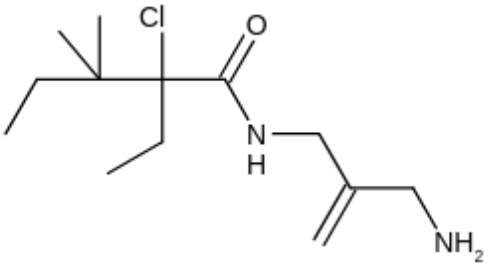
A.



B.



C.



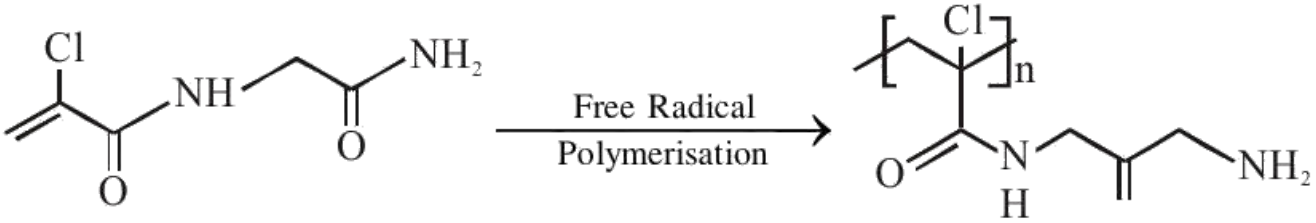
D.

Correct answer: D

Source solution

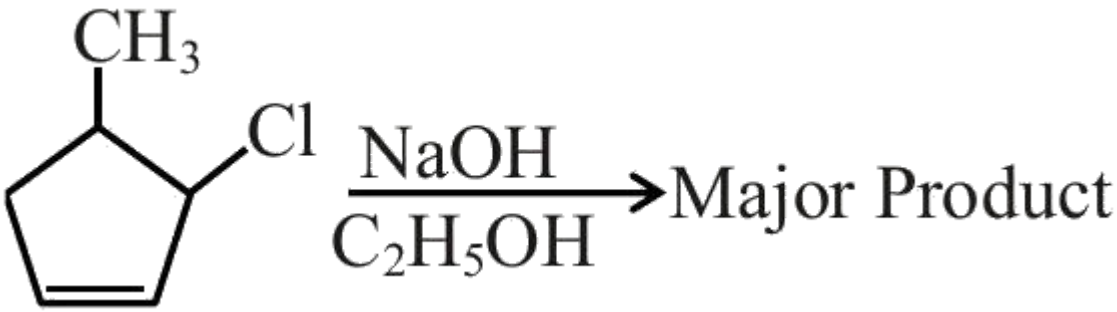
Sol.

$\mathbf{NH_2(a)}$ will wact as nucleophile as (b) is having delocalised lonepair.

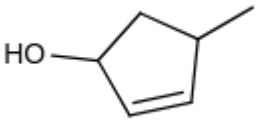


Question 223

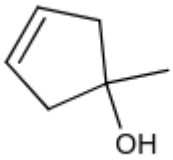
The major product of the following reaction is :



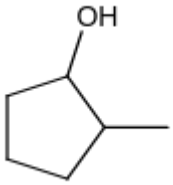
A.



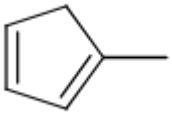
B.



C.



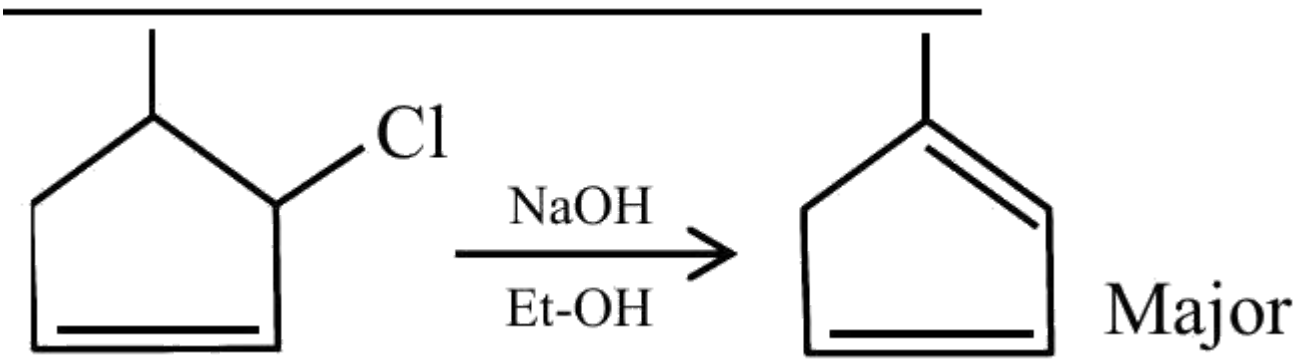
D.



Correct answer: C

Source solution

Sol. $\mathbf{NaOH + EtOH}$ is known as alcoholic NaOH , so it give $\mathbf{E^2}$ reaction with given alkyl halide.

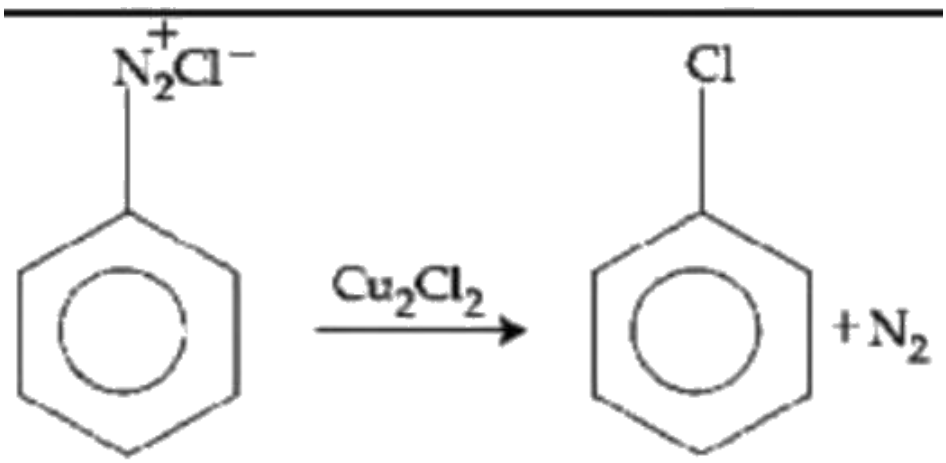


Question 224

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

Correct answer: A

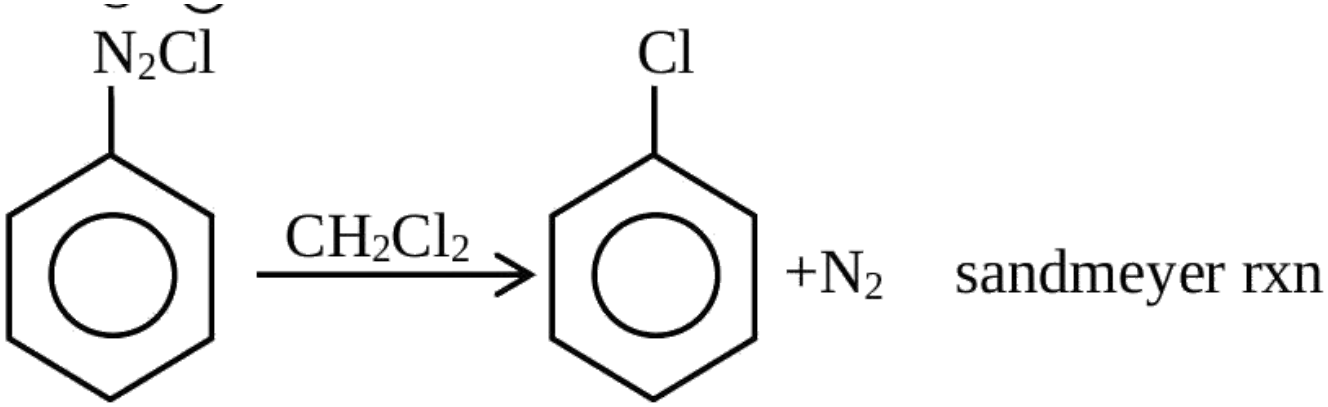
Source solution

Sol. 1
(A)

(B)

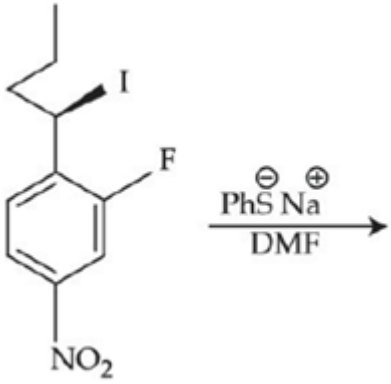
(C)

(D) $C_2H_5Cl + NaI \rightarrow C_2H_5I + NaCl$ Finkelstein rxn

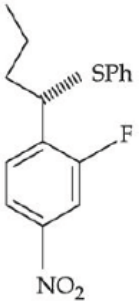


Question 225

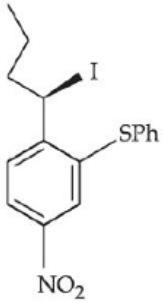
The major product of the following reaction is:



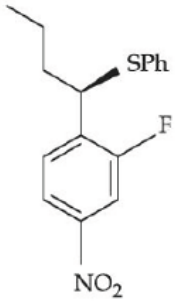
A.



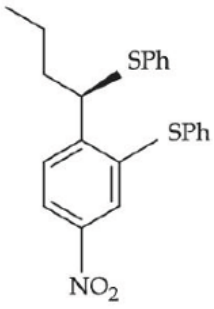
B.



C.



D.

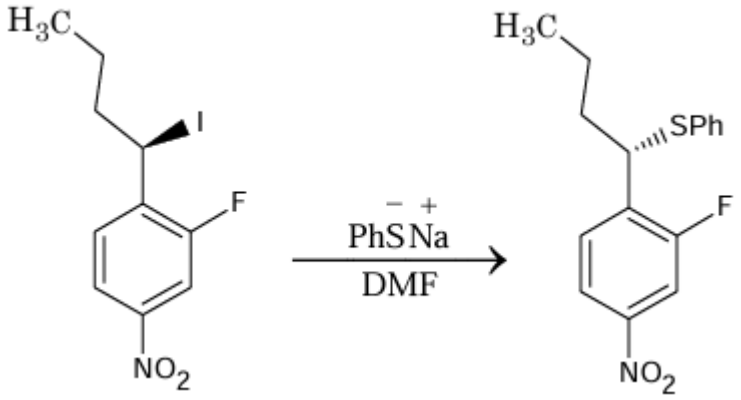


Correct answer: A

Source solution

Sol.

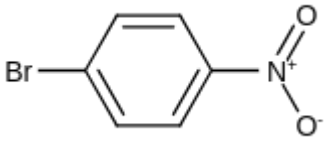
It is bimolecular nucleophilic substitution (SN^2) which occur at benzylic carbon by inversion in contiguration. This reaction cannot undergo substitution at benzene ring


H3C
I
F
NO2
− +
PhSNa
DMF
H3C
SPh
F
NO2

Question 226

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

Correct answer: B

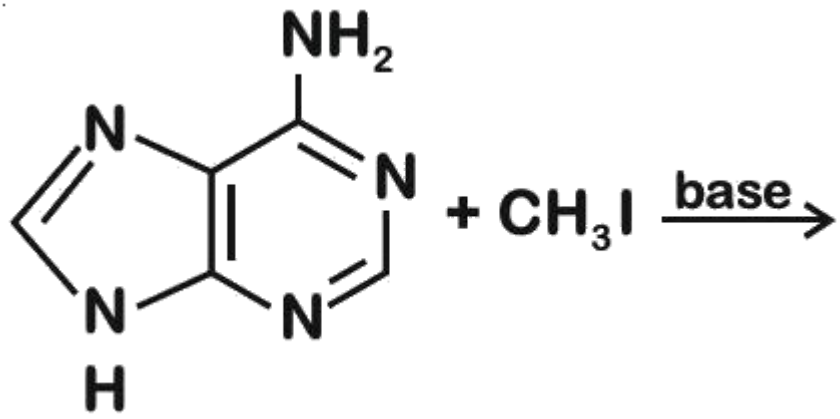
Source solution

Sol.}
All are correct
(A) S_N2 reaction decreases with increase in steric crowding.
(B) S_N1 reaction increases with stability of carbocation.
(C) EAS reaction decreases with decrease in electron density.
(D) Presence of electron withdrawing group at ortho and para-position to a halogen in haloarene increase nucleophilic aryl substitution.

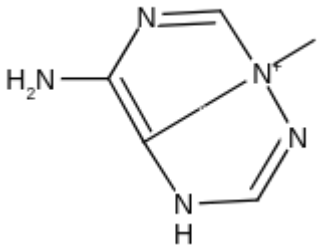
SECTION-B}

Question 227

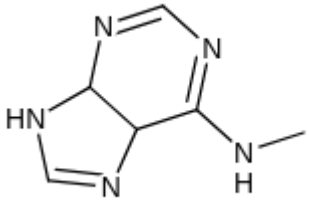
The major product in the following reaction is:



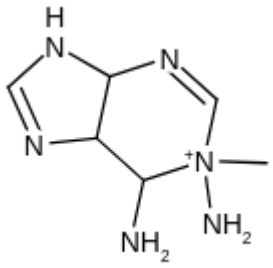
A.



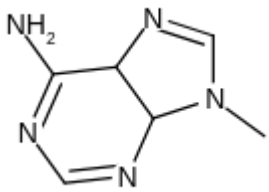
B.



C.



D.

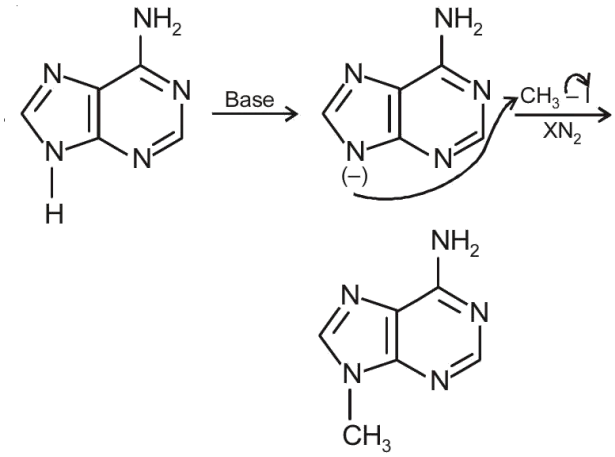


Correct answer: D

Source solution

Sol.

In the given compound, H -atom attached to secondary N -atom is more acidic. The base removes the more acidic H -atom and the conjugate base of the given compound attacks at CH_3 group to give the final product shown above.


NH2
N
N
N
N
H
Base
NH2
N
N
N
N
(–)
CH3 –I
XN2
NH2
N
N
N
N
CH3

Question 228

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

Correct answer: C

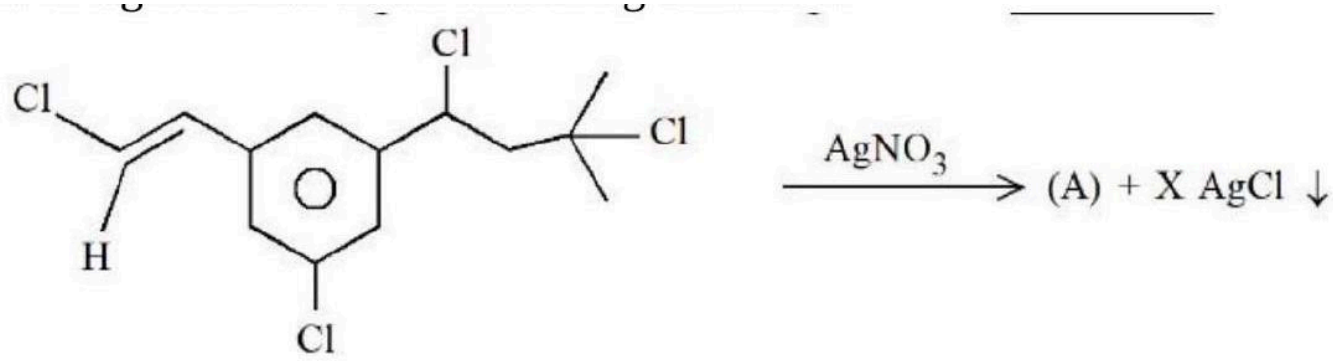
Source solution

Sol. (3)

LIST-I Name reaction		LIST-II Product obtainable	
A.	Swarts reaction	I.	$\text{Et-I} \xrightarrow[\text{DMF}]{\text{KF}} \text{Et-F}$
B.	Sandmeyer's reaction	II.	$\text{PhN}_2^{\oplus}\text{Cl}^- \xrightarrow{\text{CuCN/KCN}} \text{PhCN} + \text{N}_2$
C.	Wurtz Fittig reaction	III.	$\text{Ph} - \text{Cl} + \text{EtCl} \xrightarrow[\text{ether}]{\text{Na}}$ $\text{Ph} - \text{Et} + \text{Ph} - \text{Ph} + \text{Et} - \text{Et}$
D.	Finkelstein reaction	IV.	$\text{Et} - \text{Cl} \xrightarrow[\text{acetone}]{\text{NaI}} \text{Et} - \text{I} + \text{NaCl}$

Question 229

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).

Correct answer: 2

Source solution

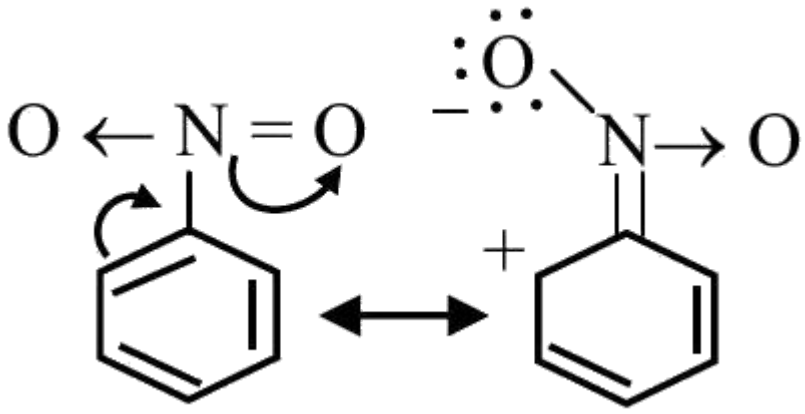
Silver nitrate replaces the ionisable benzylic and tertiary alkyl chlorides, giving 2 mol AgCl. The aryl and vinylic chlorides shown do not ionise in this test.

Question 230

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)

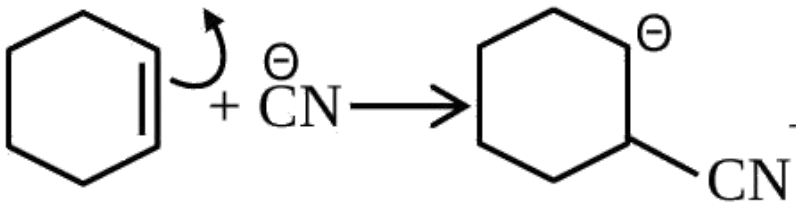
C. (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

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

Correct answer: A

Source solution

Sol.



– E Effect ($\bar{C}N$ electron deficient species)

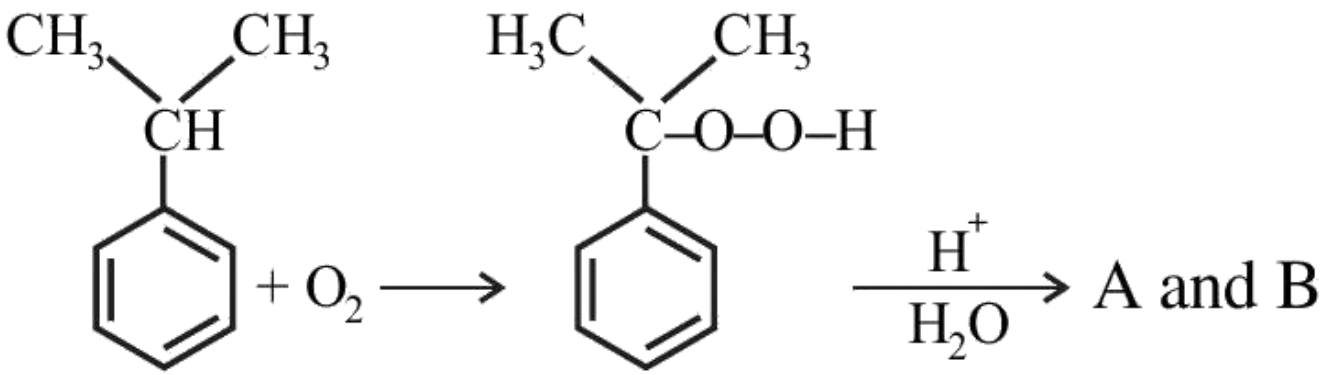
Alcohols, Phenols and Ethers

Questions 231-258 / 28 selected / 9.3% practice weight / Focus first

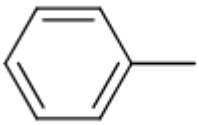
Question 231

In the following reaction:

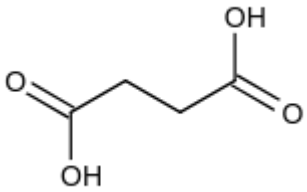
The compounds A and B respectively are :-



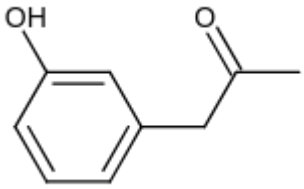
A.



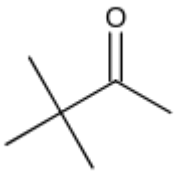
B.



C.



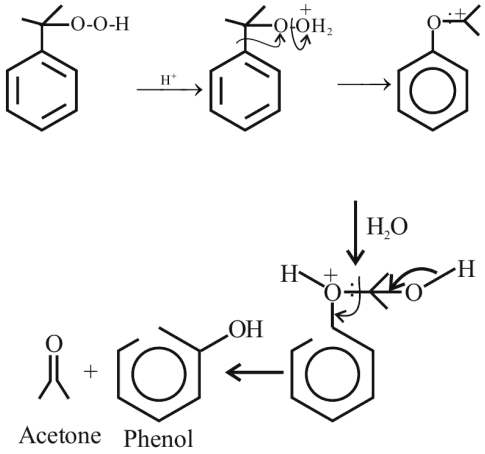
D.



Correct answer: C

Source solution

Sol. Given reaction is cumene-Peroxide method for the preparation of phenol. In this reaction

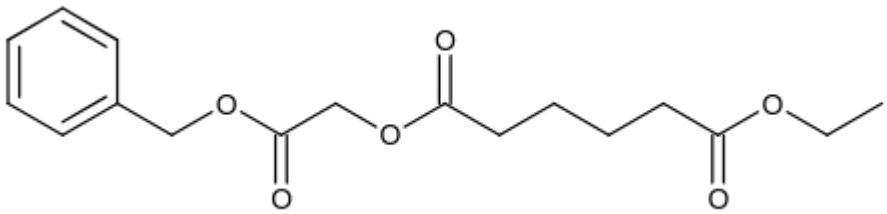

O-O-H
H+
OH2
H2O
H
O
H
OH
O
+
Acetone
Phenol

Question 232

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)

Correct answer: B

Source solution

Sol. $CH_3(CH_2)_5COOC_2H_5 \xrightarrow{\text{DIBAL-H, } H_2O} CH_3(CH_2)_5CHO$

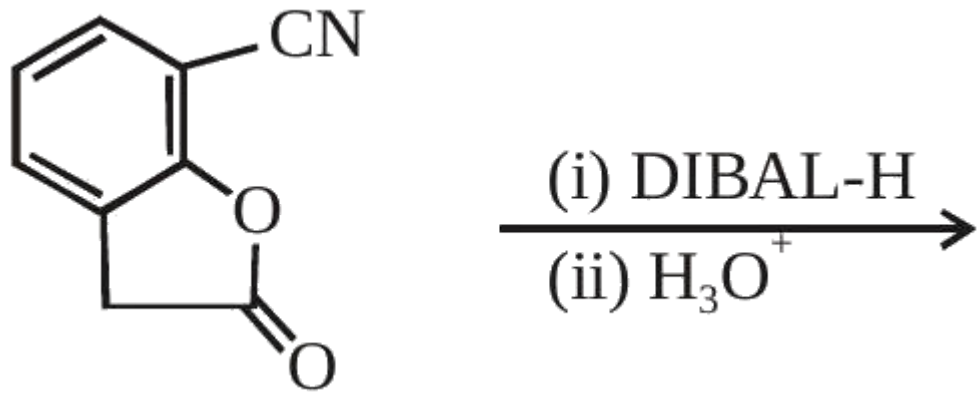
$C_6H_5COC_6H_5 \xrightarrow{Zn(Hg)\& \text{ conc. HCl}} C_6H_5CH_2C_6H_5$

$C_6H_5CHO \xrightarrow[H_2O]{CH_3MgBr} C_6H_5CH(OH)CH_3$

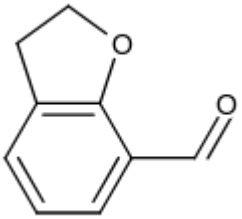
$CH_3COCH_2COOC_2H_5 \xrightarrow{NaBH_4, H^+} CH_3CH(OH)CH_2COOC_2H_5$

Question 233

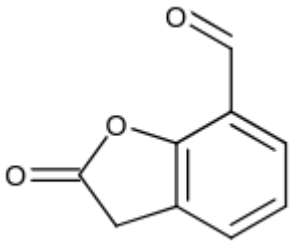
The major product of the following reaction is:



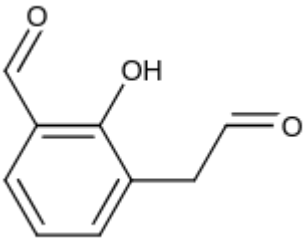
A.



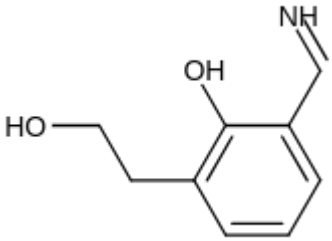
B.



C.



D.

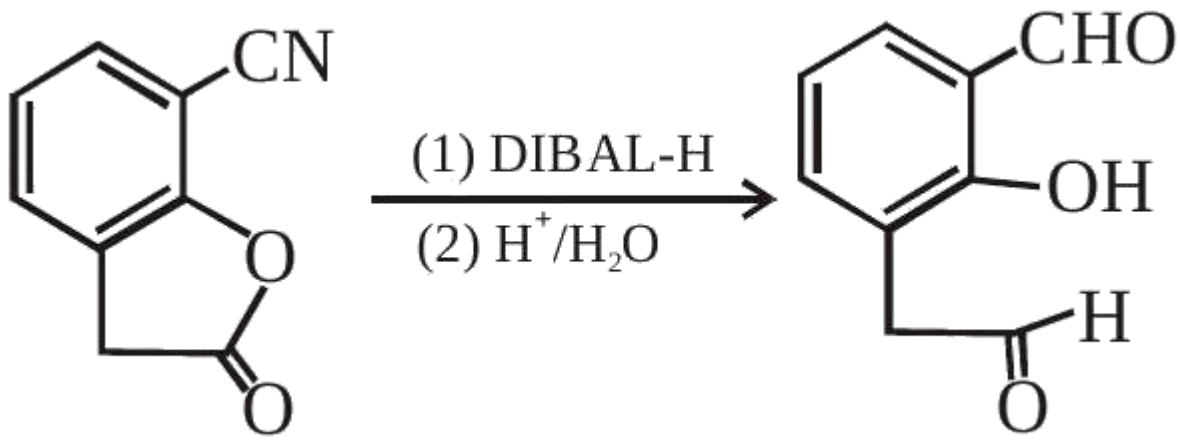


Correct answer: C

Source solution

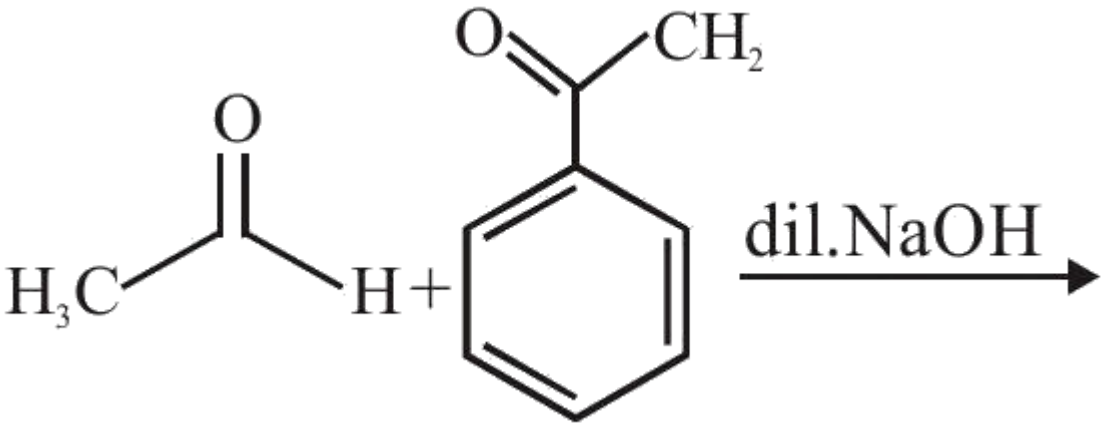
Sol.

DIBAL-H will reduce cyanides & esters to aldehydes.

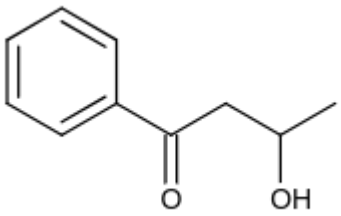

CN
O
O
(1) DIBAL-H
(2) H+/H2O
CHO
OH
H
O

Question 234

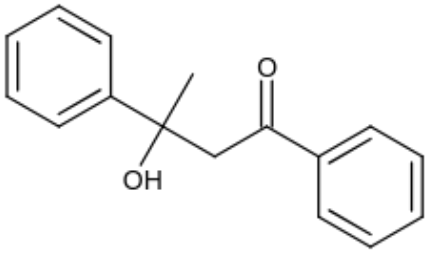
The major product formed in the following reaction is:



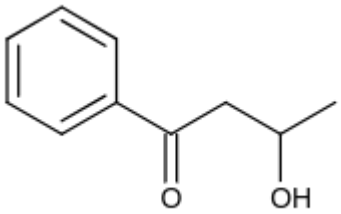
A.



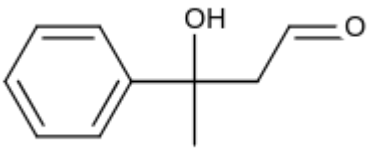
B.



C.



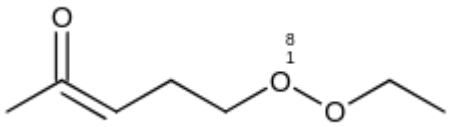
D.



Correct answer: A

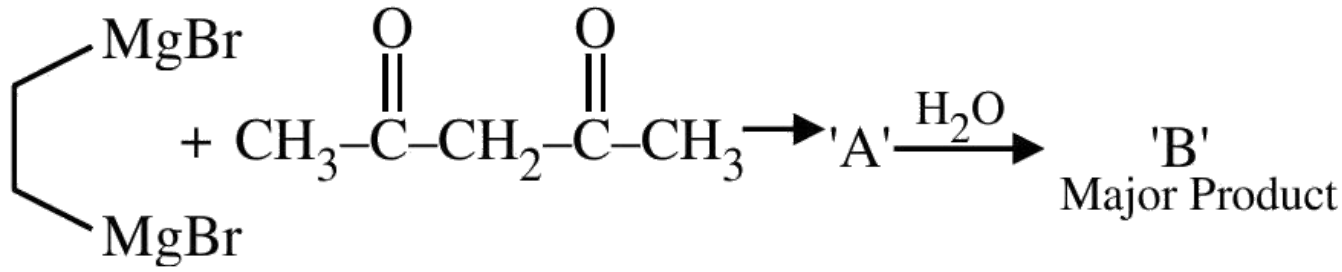
Source solution

Sol. Aldehyde reacts at a faster rate than keton during aldol and stericall less hindered anion will be a better nucleophile so sefl aldol at

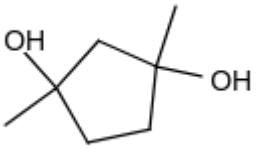

O
8
1
O
O

Question 235

Consider the above reaction sequence and identify the product B.



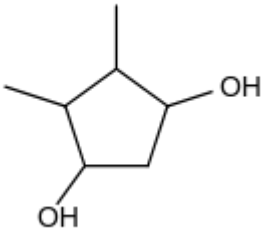
A.



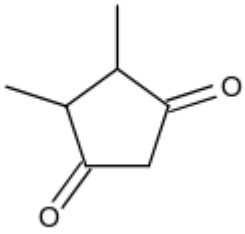
B.



C.



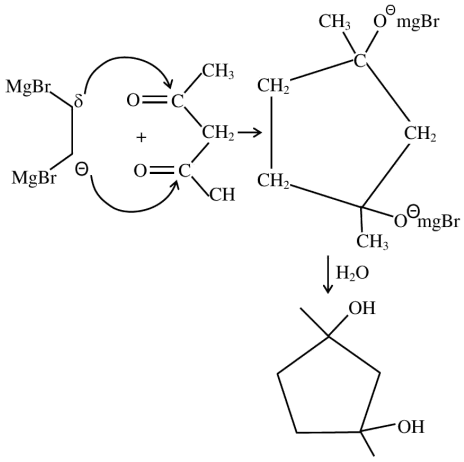
D.



Correct answer: A

Source solution

Sol. Although Acetyl Acetone predominantly gives Acid base reaction with G.R due to Active methylene group but according to given option ans should be based on nucleophilic addition reaction (NAR).


MgBr
δ
MgBr
Θ
O
C
CH3
CH2
+
O
C
CH
CH3
O Θ mgBr
C
CH2
CH2
CH2
O Θ mgBr
CH3
H2O
OH
OH

Question 236

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

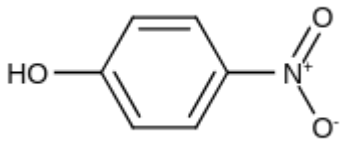
C. A-III, B-IV, C-I, D-II

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

Correct answer: B

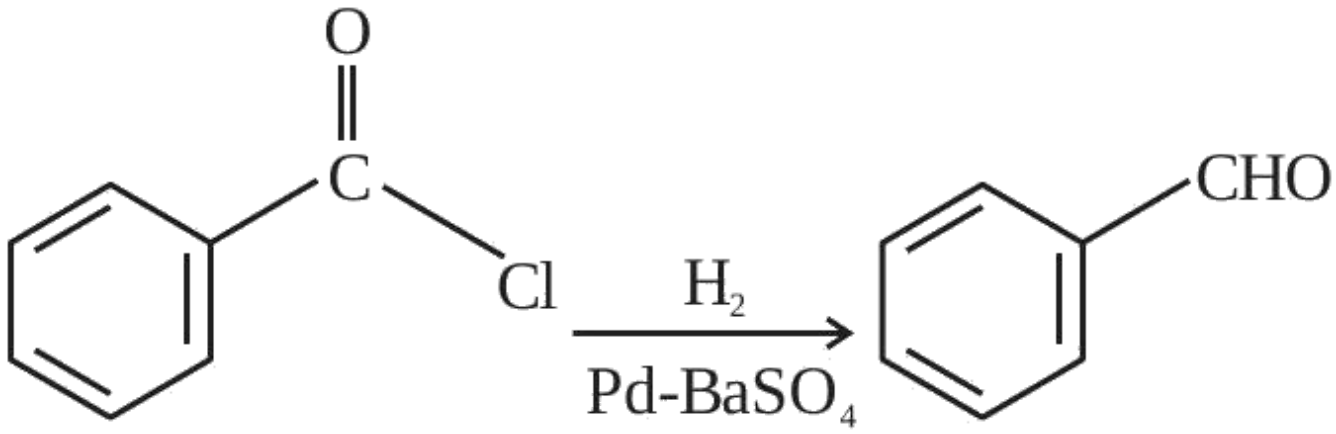
Source solution

Sol. 2}
(A) $C-C-C-NH_2 \& C-NH-C-C$: functional isomer (III)
(B)
(C)
&
(D)
: Position isomer (II)


HO
O
N+
O-

Question 237

This reduction reaction is known as:



A. Rosenmund reduction

B. Wolff-Kishner reduction

C. Stephen reduction

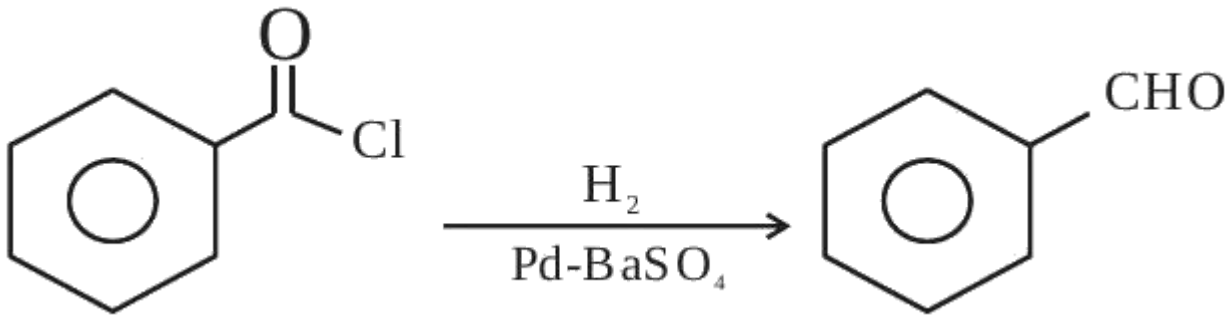
D. Etard reduction

Correct answer: A

Source solution

Sol.

It is known as rosenmund reduction that is the partial reduction of acid chloride to aldehyde



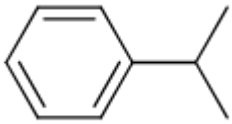
Question 238

The final product A, formed in the following reaction sequence is:

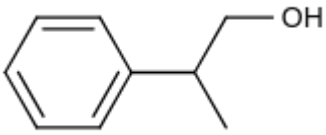
$$\mathrm{Ph{-}CH{=}CH_2} \xrightarrow[\text{(iii) HBr}]{\begin{array}{l}\text{(i) } BH_3\\ \text{(ii) } H_2O_2,\ \ominus OH\end{array}} A \xrightarrow{\text{(iv) Mg, ether, then } HCHO/H_3O^+}$$

A. $\mathrm{Ph-CH_2-CH_2-CH_3}$

B.



C.



D. $\mathrm{Ph-CH_2-CH_2-CH_2-OH}$

Correct answer: D

Source solution

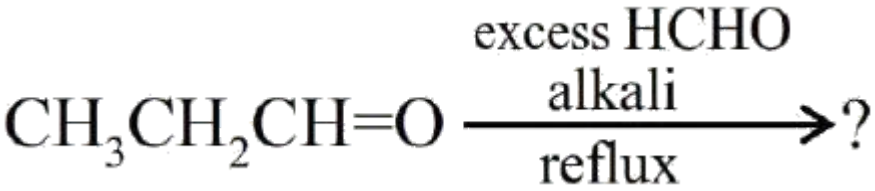
Sol. $\mathrm{PhCH=CH_2 \xrightarrow{B_2H_6/H_2O_2,OH^-} PhCH_2CH_2OH}$

$$\mathrm{PhCH_2CH_2OH + HBr \longrightarrow PhCH_2CH_2Br + H_2O\,(SN^{NGP})}$$

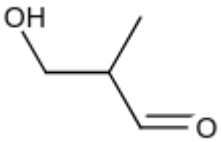
$$\mathrm{PhCH_2CH_2Br \xrightarrow{Mg/dry\ ether} PhCH_2CH_2MgBr \xrightarrow[\text{(II) } H_3O^+]{\text{(I) } H-\overset{\overset{O}{\|}}{C}-H} PhCH_2CH_2CH_2OH}$$

Question 239

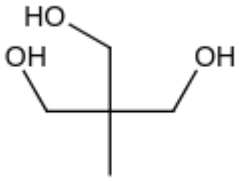
The major product of the following reaction is :



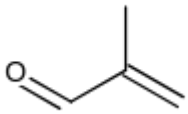
A. $CH_3 - CH_2 - CH_2 - OH$



B.



C.



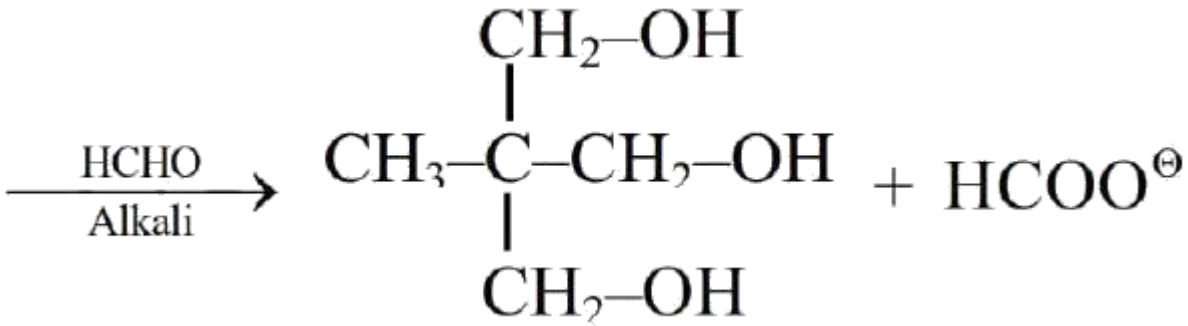
D.

Correct answer: C

Source solution

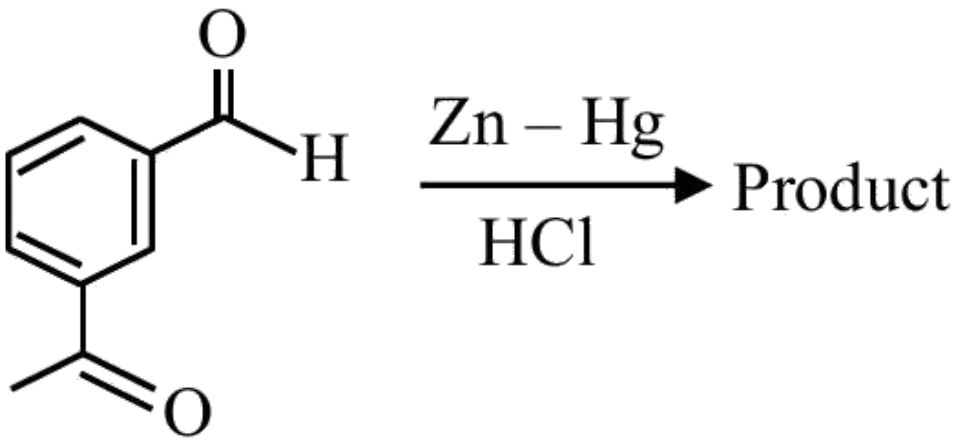
Sol. (3)

This is an example of Tollen's reaction i.e. multiple cross aldol followed by cross Cannizaro reaction

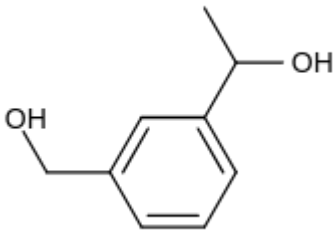


Question 240

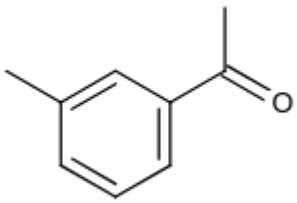
Identify the product in the following reaction :



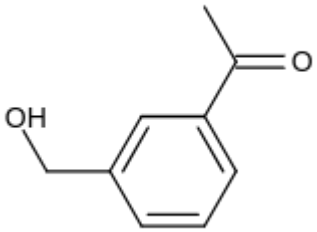
A.



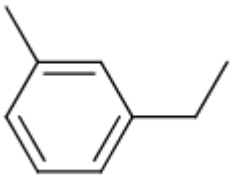
B.



C.



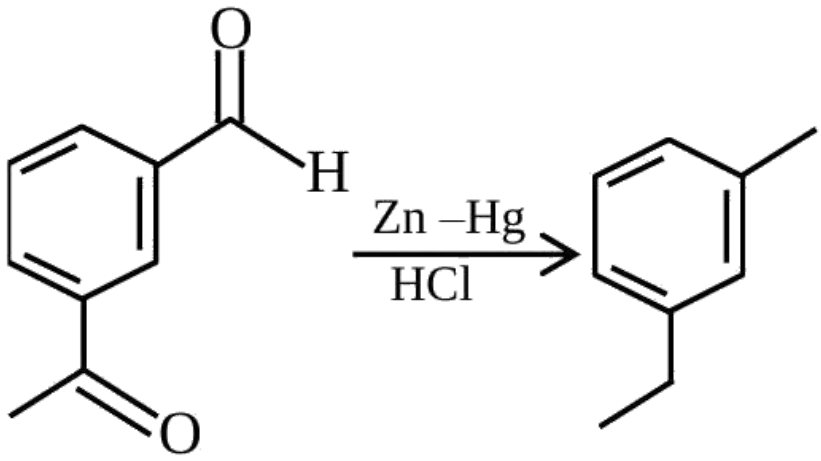
D.



Correct answer: D

Source solution

Sol.
(Clemmensen reduction)


O
H
Zn –Hg
HCl
O

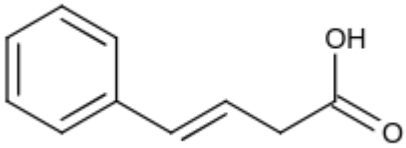
Question 241

The major product ' P ' formed in the following sequence of reactions is

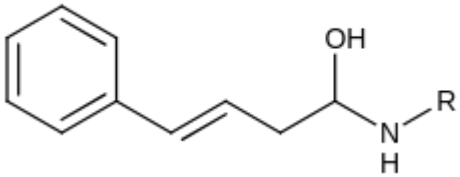
$\xrightarrow[\text{(ii) R–NH}_2]{\text{(i) SOCl}_2}$ 'P' (Major Product)

(iii) $LiAlH_4$

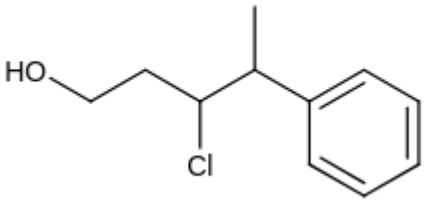
(iv) H_3O^+



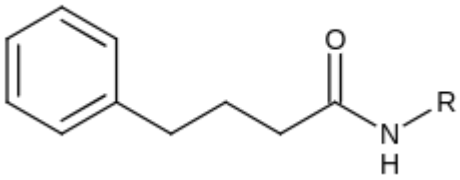
A. $H-N-R$



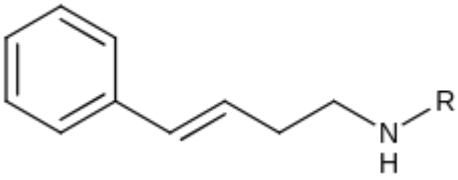
B.



C. H



D.

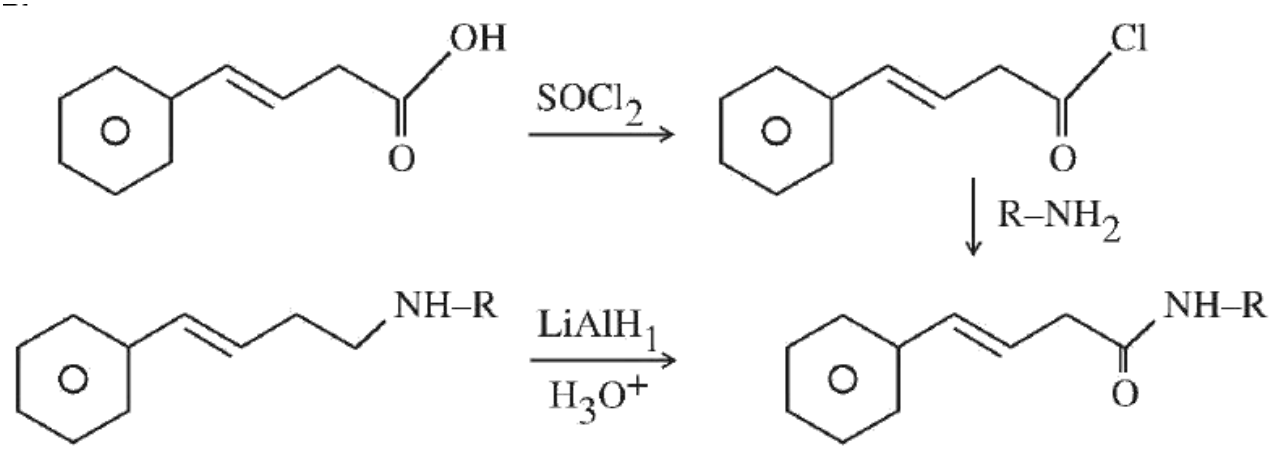


Correct answer: D

Source solution

Sol.

SECTION-B}



Question 242

The major product of the following reaction is

$$CH_3CH=CHCO_2CH_3 \xrightarrow{LiAlH_4}$$

A. $CH_3CH_2CH_2CH_2OH$

B. $CH_3CH_2CH_2CHO$

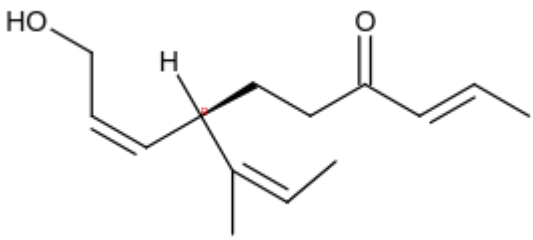
C. $CH_3CH_2CH_2CO_2CH_3$

D. $CH_3CH=CHCH_2OH$

Correct answer: D

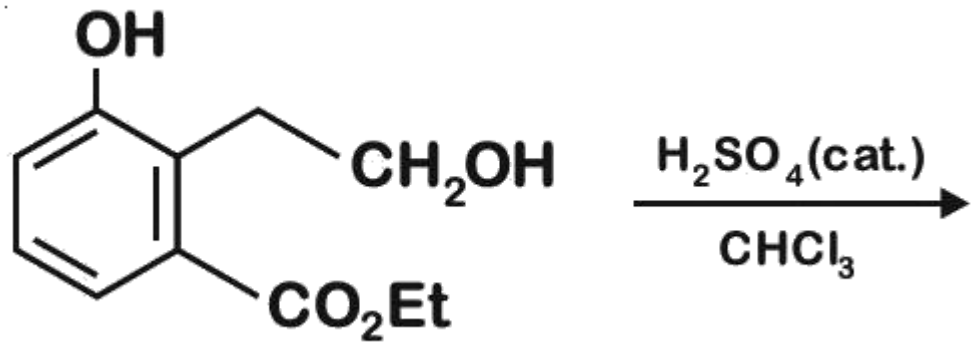
Source solution

Sol. $LiAlH_4$ reduces esters to alcohols but does not reduce $C=C$.

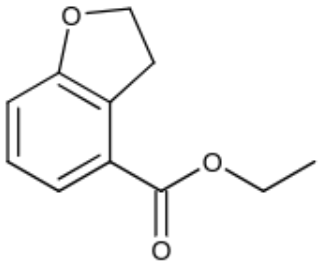


Question 243

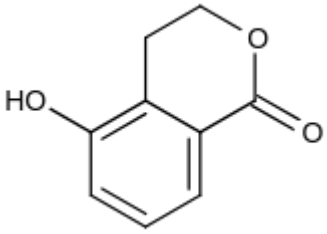
The major product of the following reaction is :



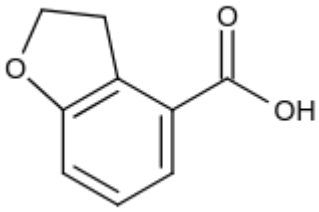
A.



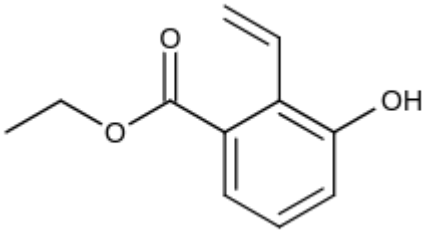
B.



C.



D.

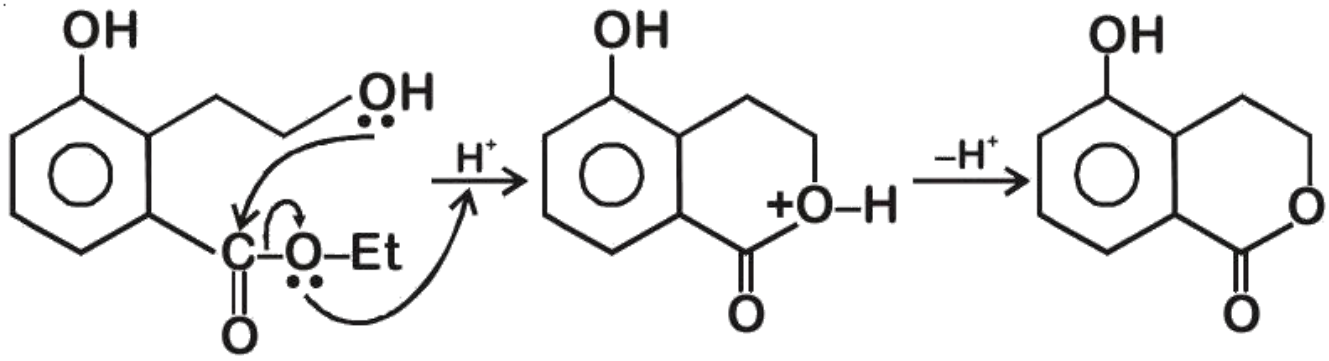


Correct answer: B

Source solution

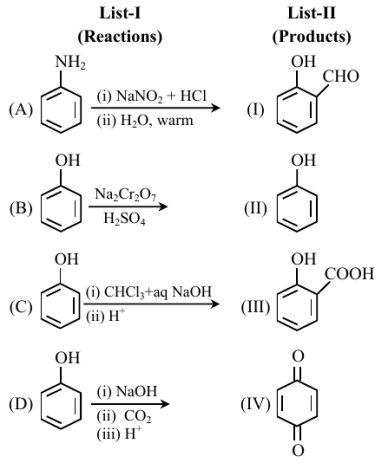
Sol.

Acid catalysed intramolecular esterification


OH
OH
C–O–Et
O
H+
OH
+O–H
O
–H+
OH
O
O

Question 244

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)

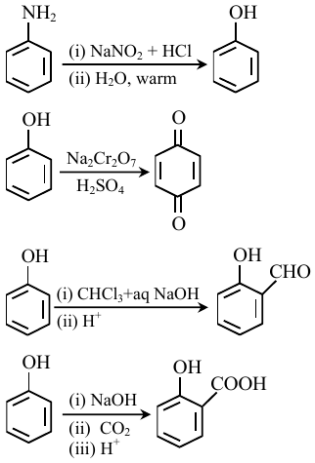
B. (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

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

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

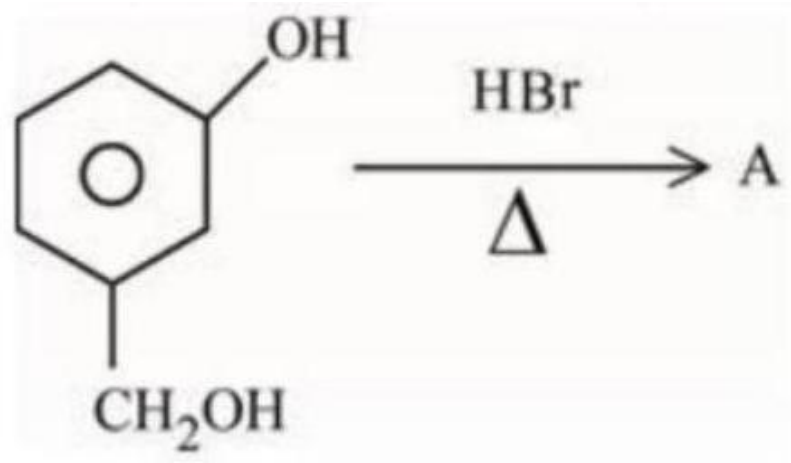
Correct answer: D

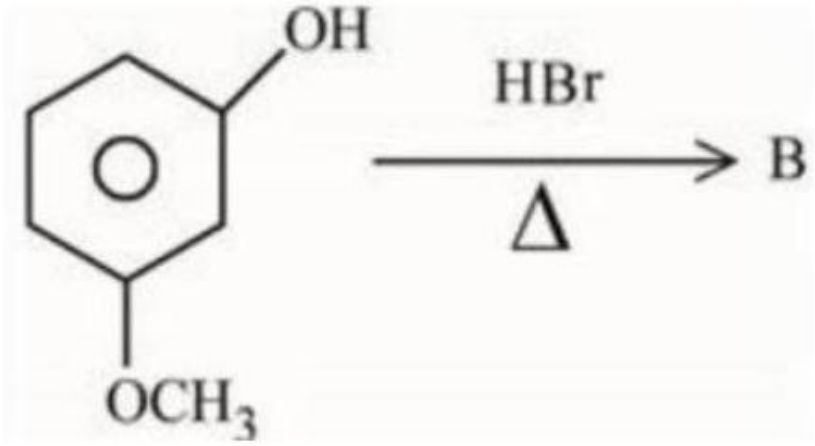
Source solution



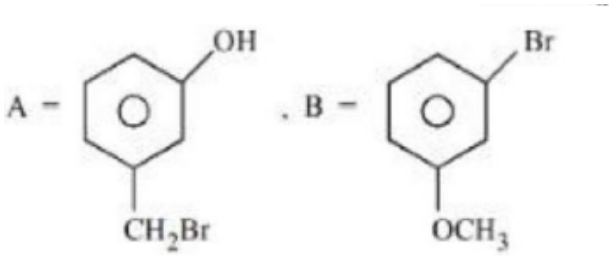
Question 245

' A ' and ' B ' formed in the following set of reactions are:

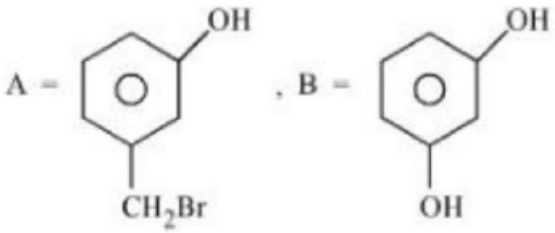




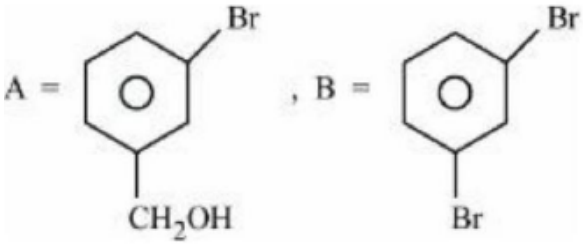
A.



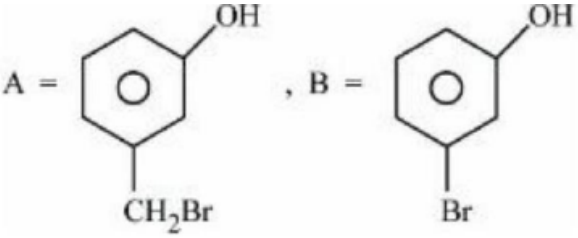
B.



C.



D.



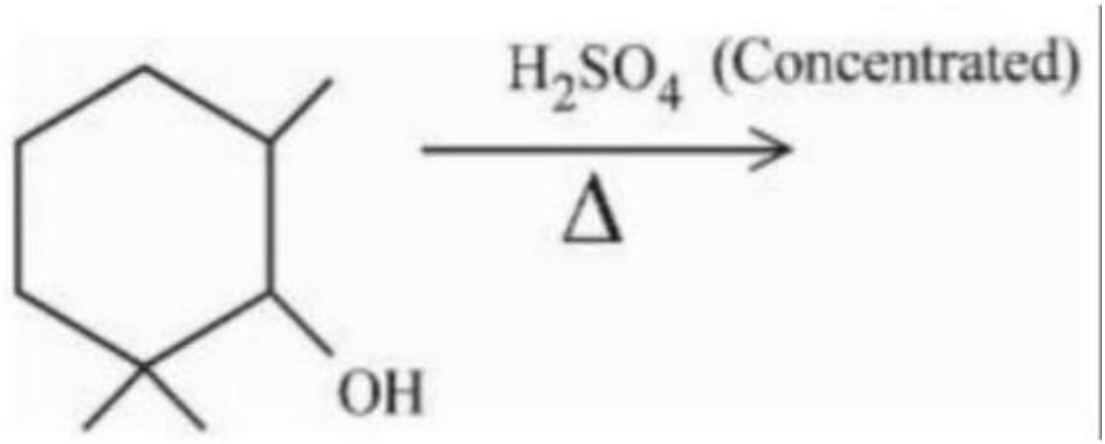
Correct answer: B

Source solution

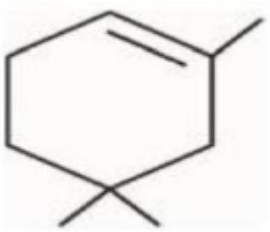
Hot HBr replaces the benzylic alcohol group by bromide in A. In B it cleaves the aryl methyl ether at its methyl group, giving the second phenolic OH group and methyl bromide. The phenolic C-O bonds remain intact; the pair is option 2.

Question 246

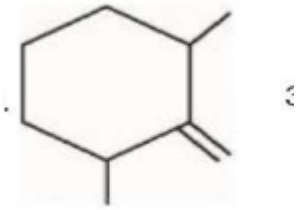
Find out the major product from the following reaction.



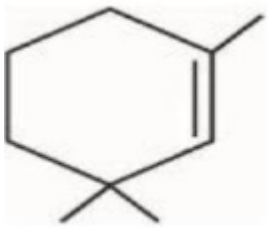
A.



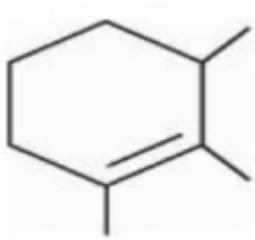
B.



C.

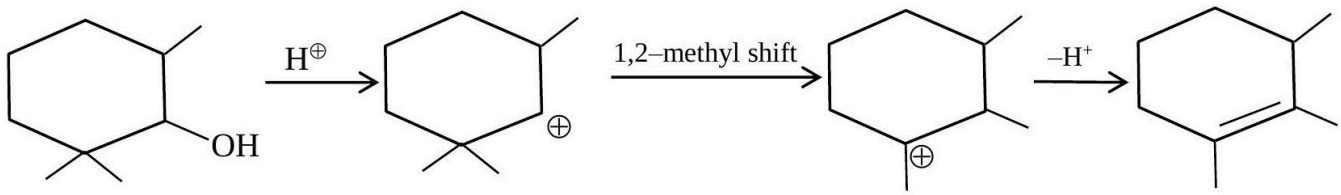


D.



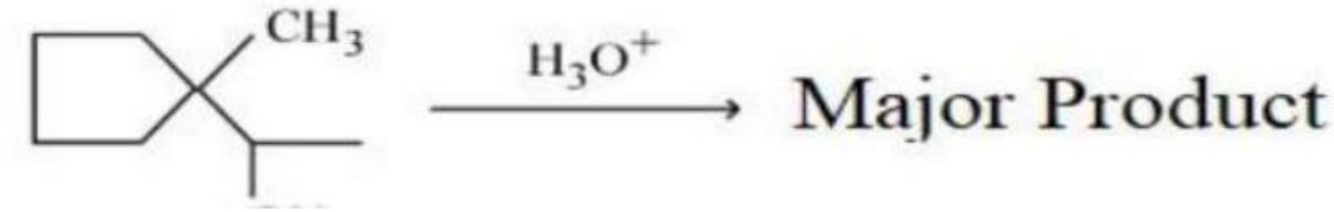
Correct answer: D

Source solution



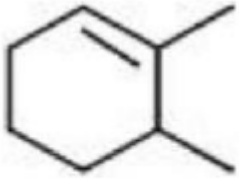
Question 247

Find out the major product for the following reaction.



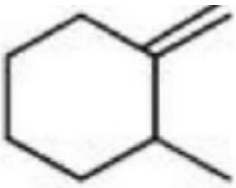


A.

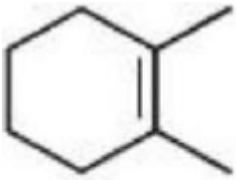


B.

3.



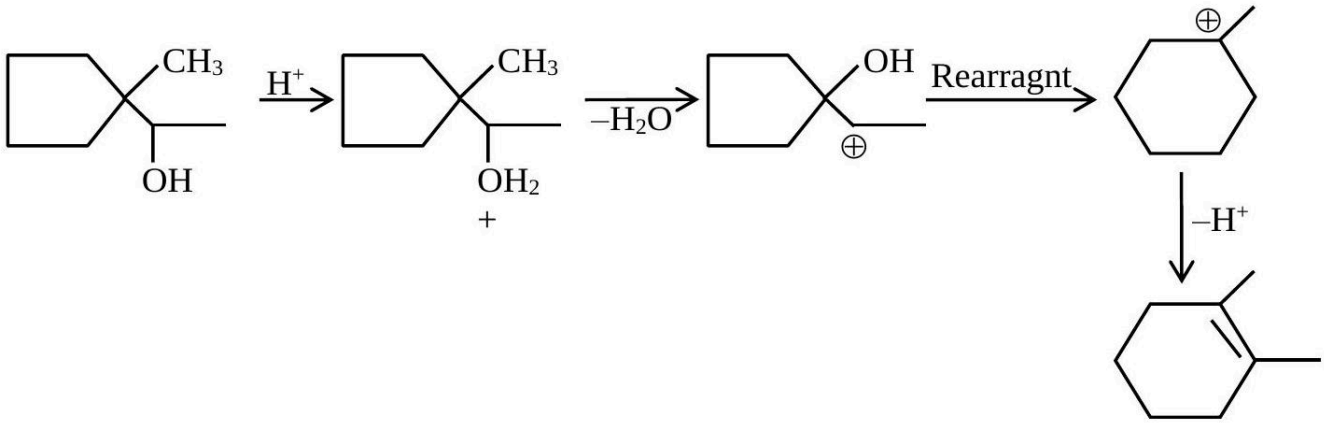
C.



D.

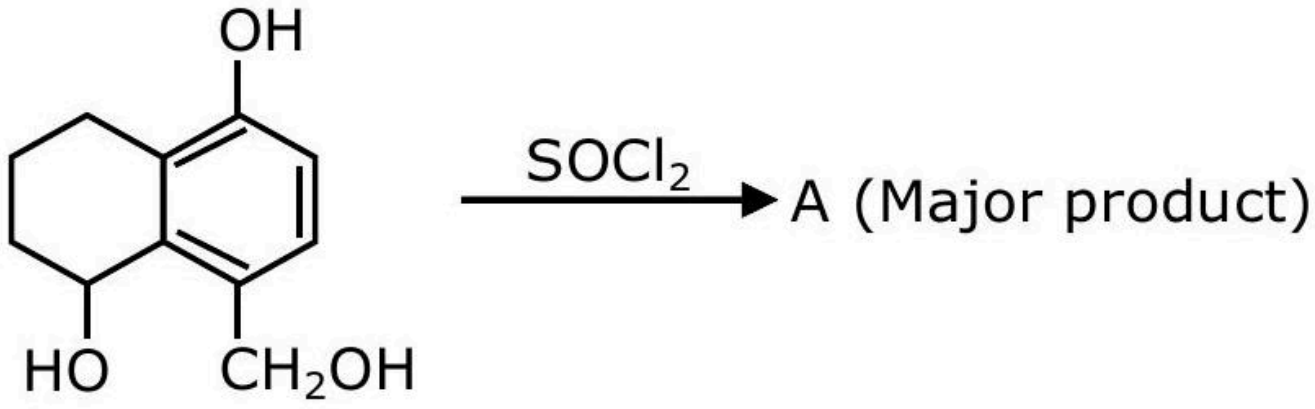
Correct answer: D

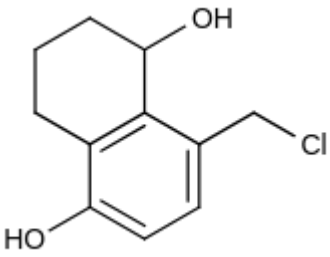
Source solution



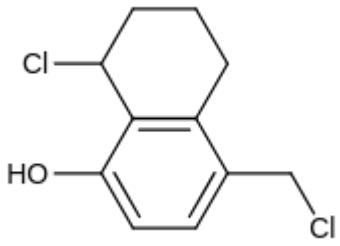
Question 248

Identify A in the given reaction

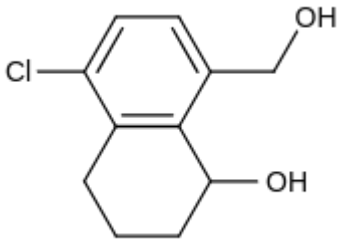




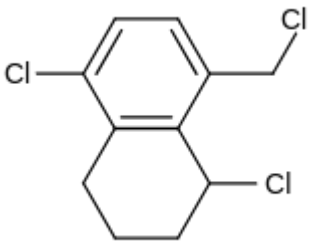
A.



B.



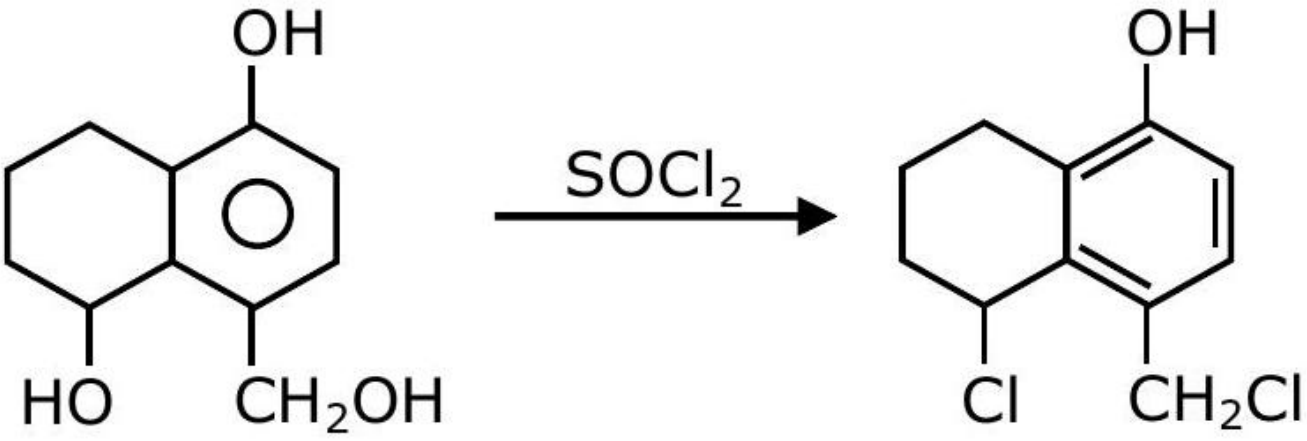
C.



D.

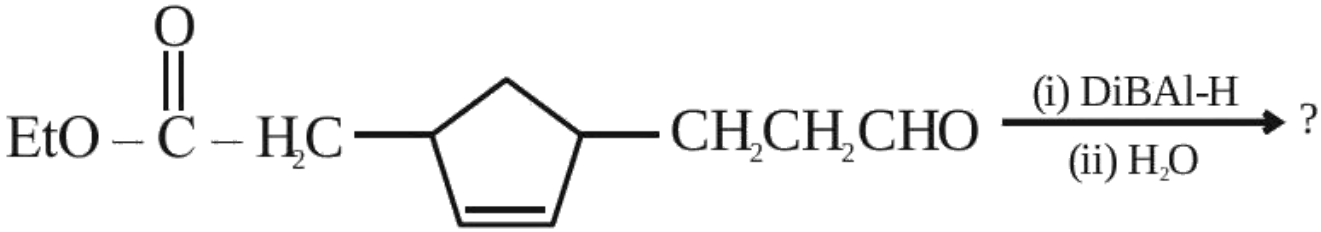
Correct answer: B

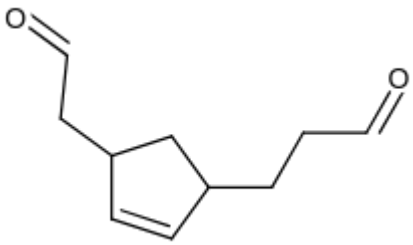
Source solution


OH
HO
CH2OH
SOCl2
OH
Cl
CH2Cl

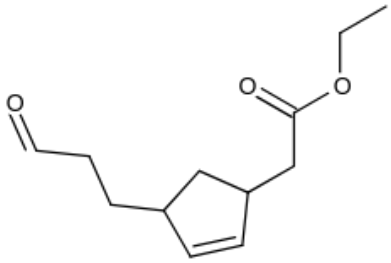
Question 249

Consider the above reaction and predict the major product.

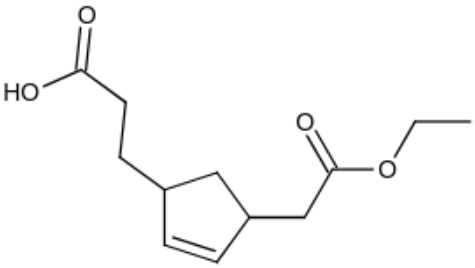




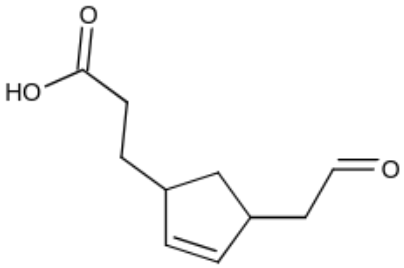
A.



B.



C.



D.

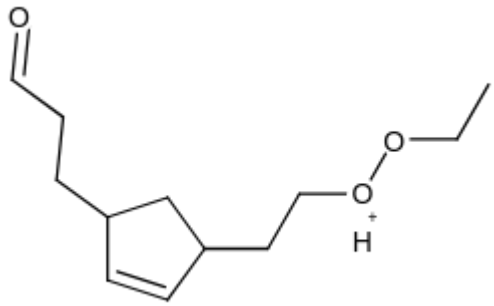
Correct answer: A

Source solution

Sol.

(i) $\mathbf{DiBAL-H}$

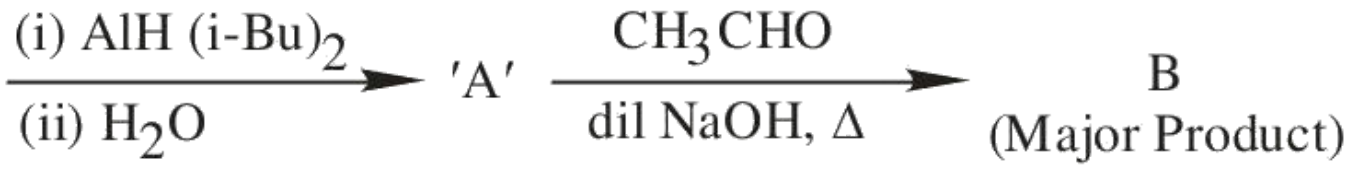
(ii) $\mathbf{H_2O}$


O
O
O
H
+

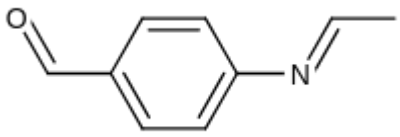
Question 250

Consider the following reaction sequence :

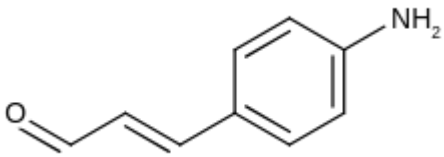
The product ' B ' is :



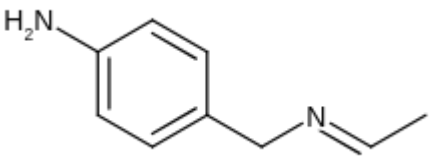
A.



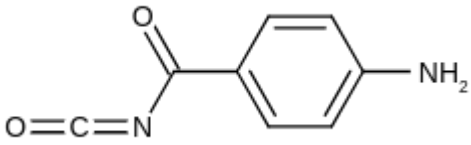
B.



C.



D.

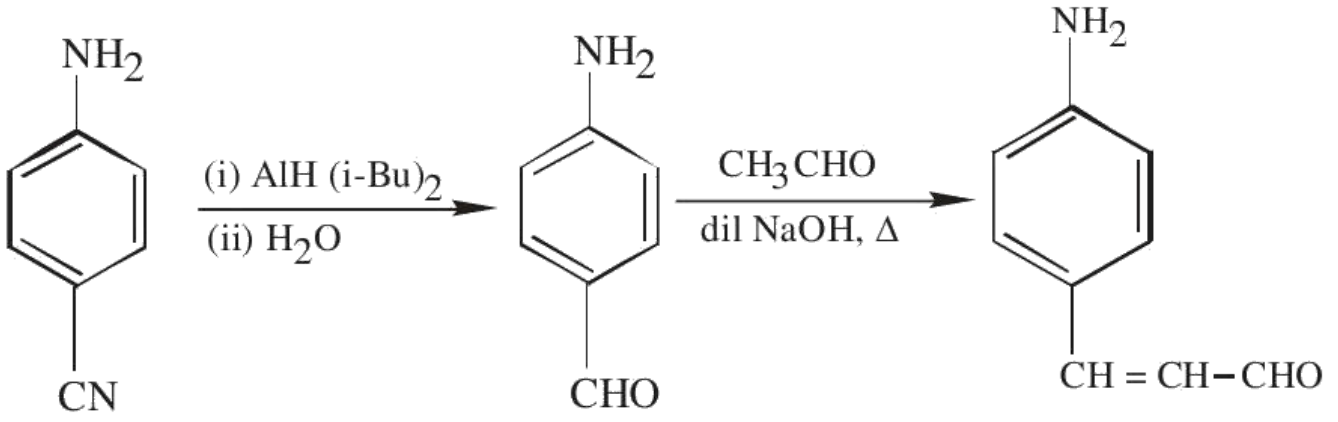


Correct answer: B

Source solution

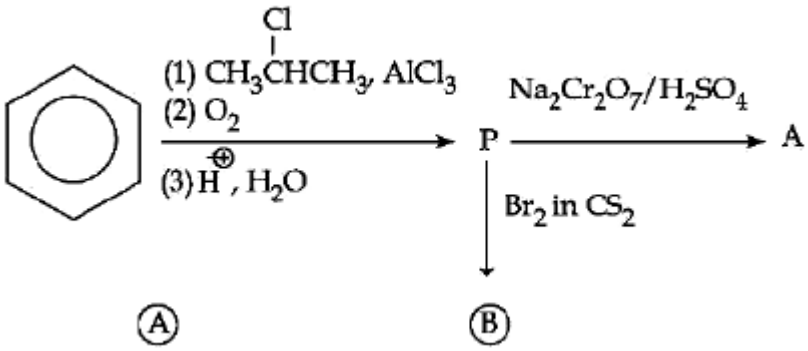
Sol.

Cross aldol condensation

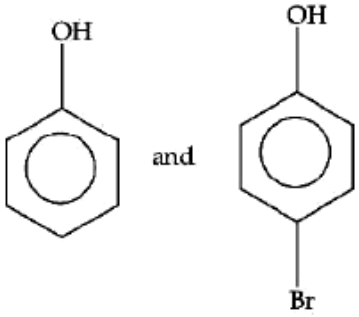


Question 251

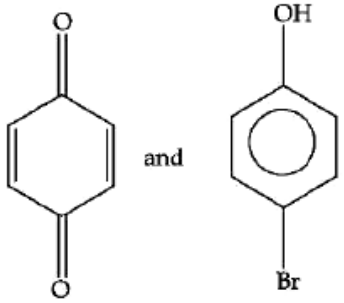
Identify the major products A and B in the following sequence:



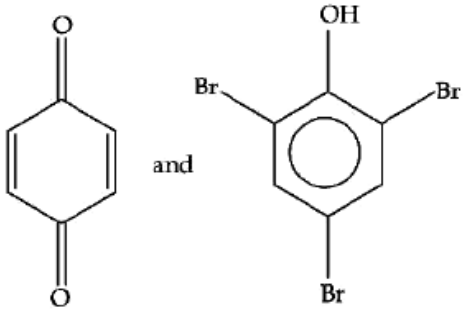
A.



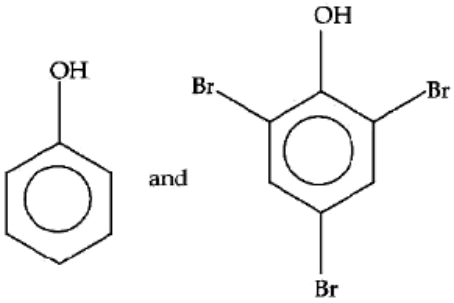
B.



C.



D.



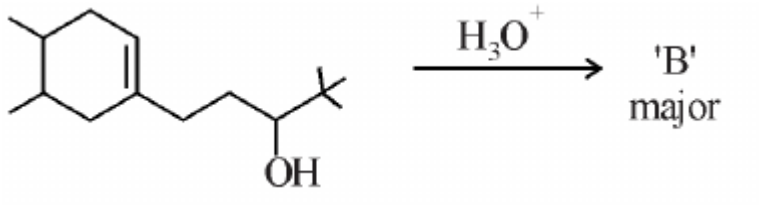
Correct answer: B

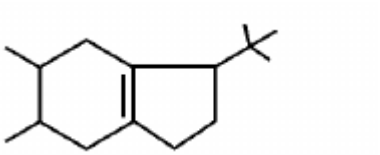
Source solution

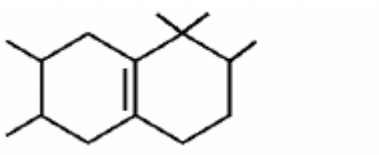
The cumene sequence produces phenol P. Oxidation by acidified dichromate gives p-benzoquinone A; bromination in CS2 gives predominantly p-bromophenol B. The pair is option 2.

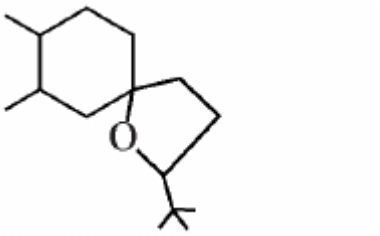
Question 252

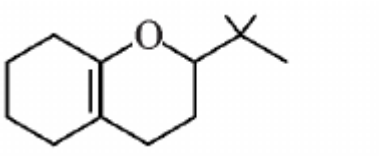
Identify the major product B in the following acid-catalysed reaction:



A. 

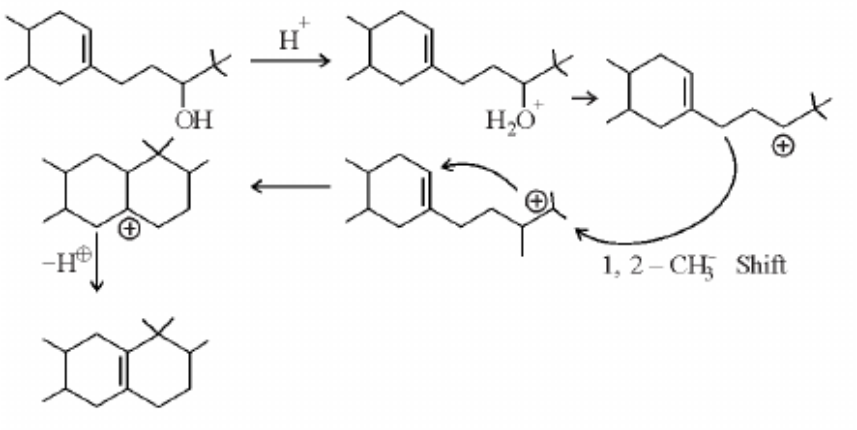
B. 

C. 

D. 

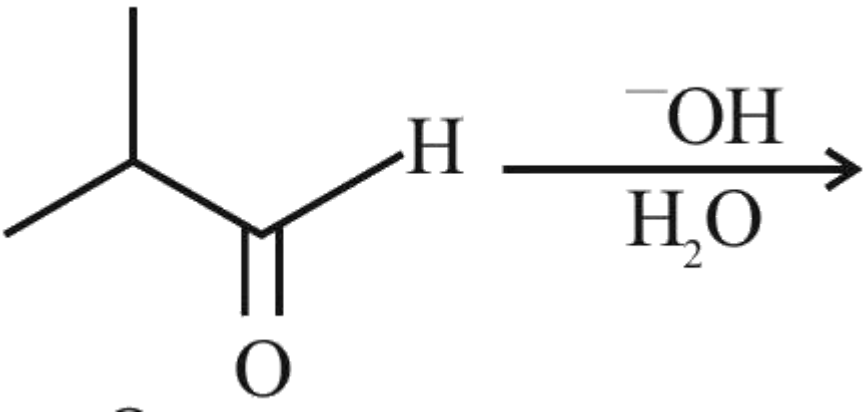
Correct answer: B

Source solution

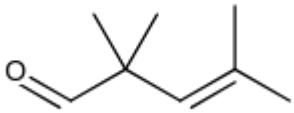


Question 253

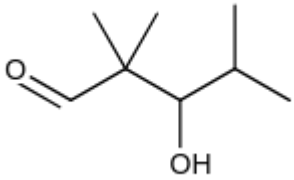
What is the major product of the following reaction?



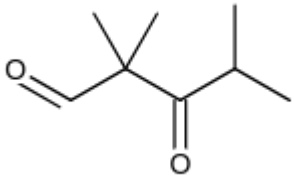
A.



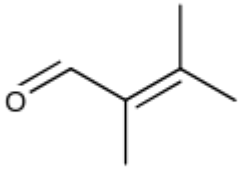
B.



C.



D.

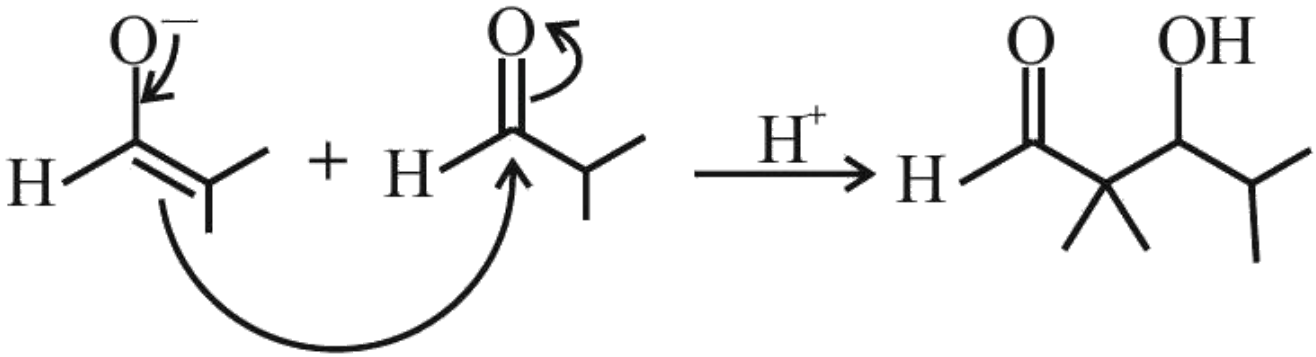


Correct answer: B

Source solution

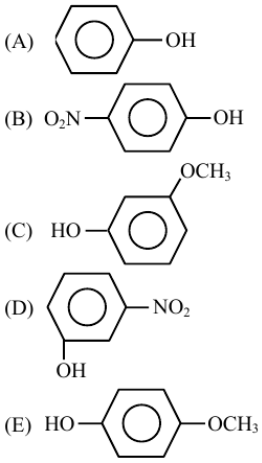
Sol.

Aldol formation takes place.



Question 254

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.

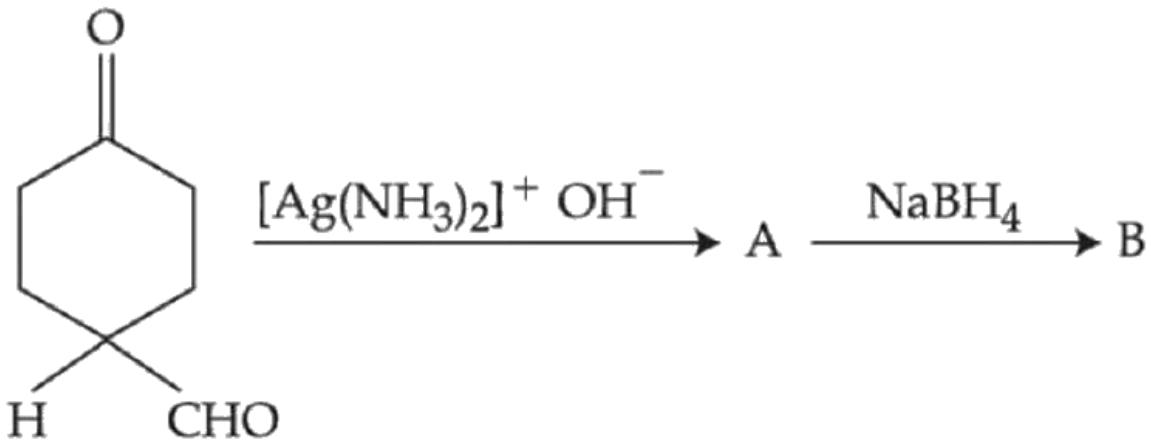
Correct answer: D

Source solution

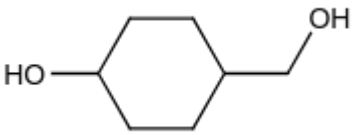
The ALLEN worked solution gives the increasing pKa order $(B) < (D) < (C) < (A) < (E)$. The original four options omitted that order; it is now supplied as corrected option 4.

Question 255

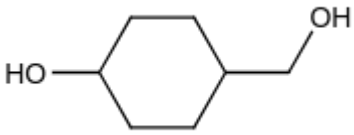
The products formed in the following reaction, A and B are



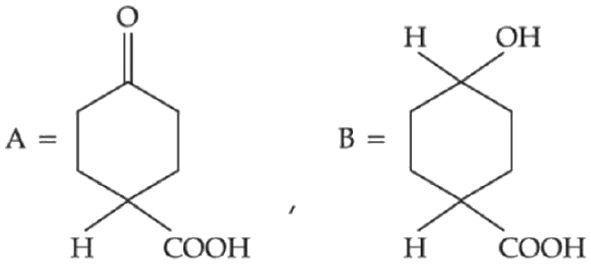
A. B =



B.

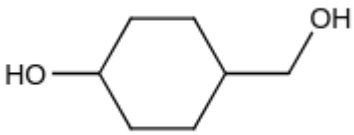


C.



D. $A =$

$B =$

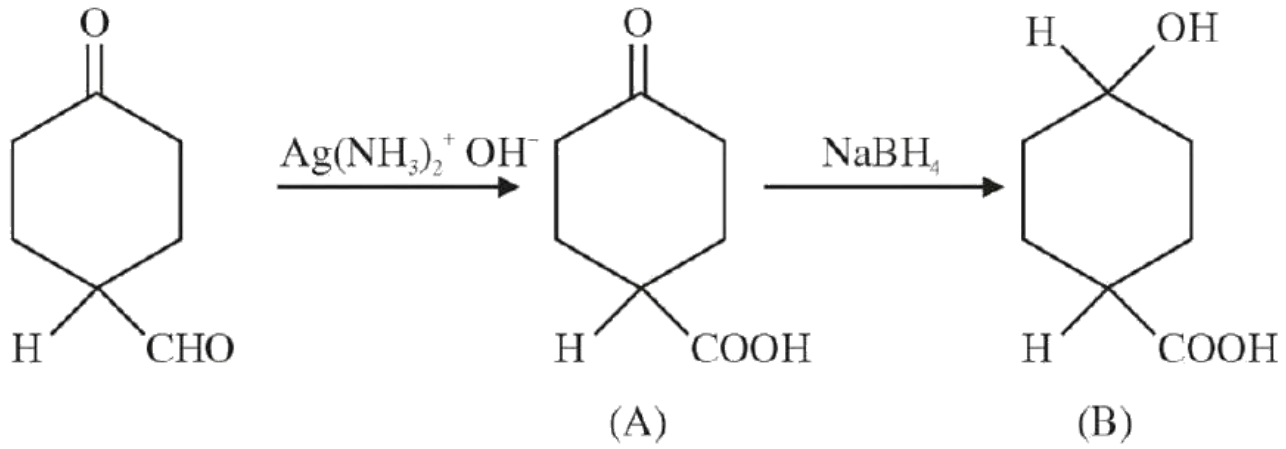


Correct answer: C

Source solution

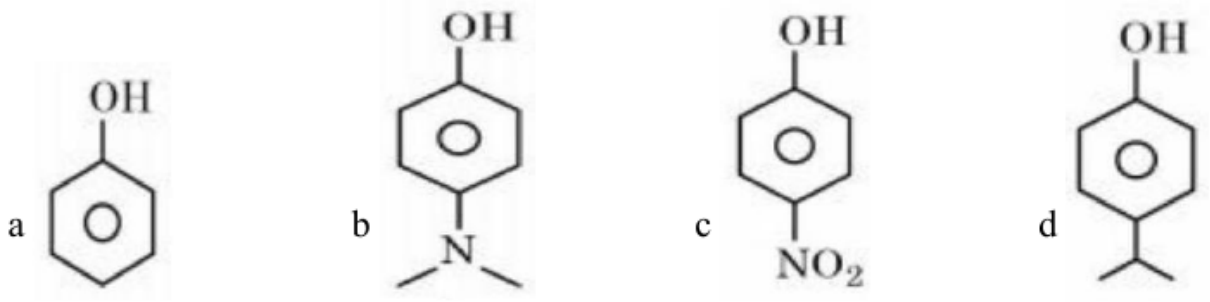
Sol.

$NaBH_4$ does not reduce carboxylic acid.



Question 256

Choose the correct order of pKa values for compounds a, b, c and d below:



A. $c > a > d > b$

B. b > a > d > c

C. $b > d > a > c$

D. $a > b > c > d$

Correct answer: C

Source solution

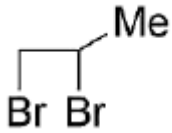
The nitro group stabilises phenoxide by its electron-withdrawing effects, lowering pKa. Dimethylamino and isopropyl groups donate electron density and raise pKa, with the amino resonance donation stronger. The order is b > d > a > c, option 3.

Question 257

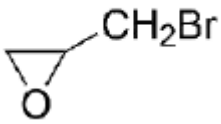
Predict the product of the following reaction with excess HBr:



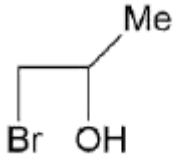
A.



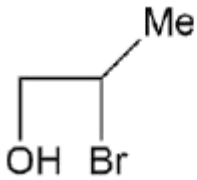
B.



C.



D.



Correct answer: A

Source solution

Protonation and bromide opening of the epoxide first give a bromohydrin. Excess HBr replaces the remaining OH group, yielding 1,2-dibromopropane, option 1.

Question 258

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

---

Correct answer: C

Source solution

Sol.

$$CH_3 - CH_2 - CHO$$

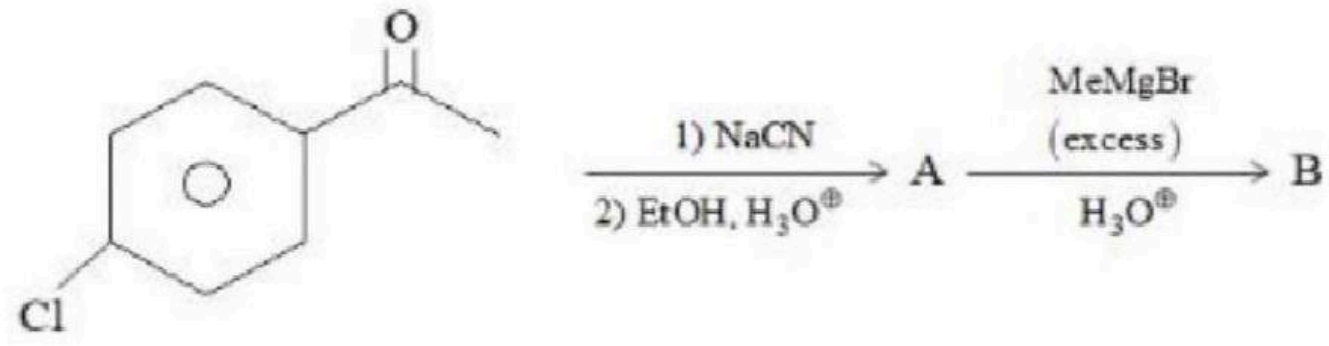
Generally, aldehydes are more reactive than ketones in nucleophilic addition reactions.
$\therefore$ Rate of reaction with alcohol to form acetal and ketal is



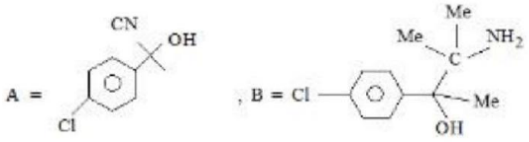
Aldehydes, Ketones and Carboxylic Acids

Question 259

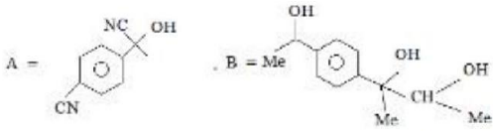
Find out the major products from the following reaction sequence.



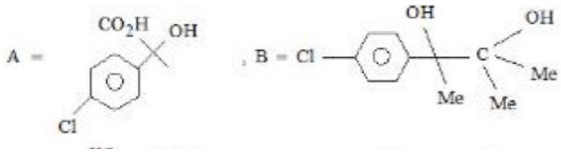
A.



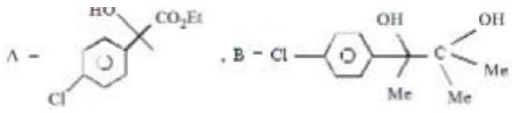
B.



C.

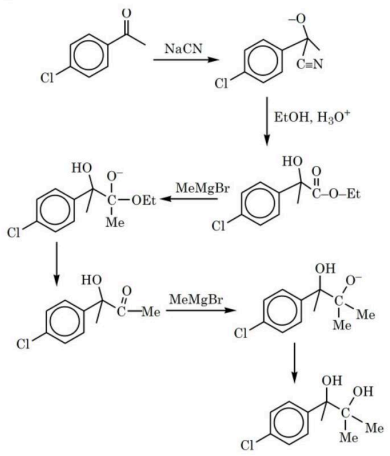


D.



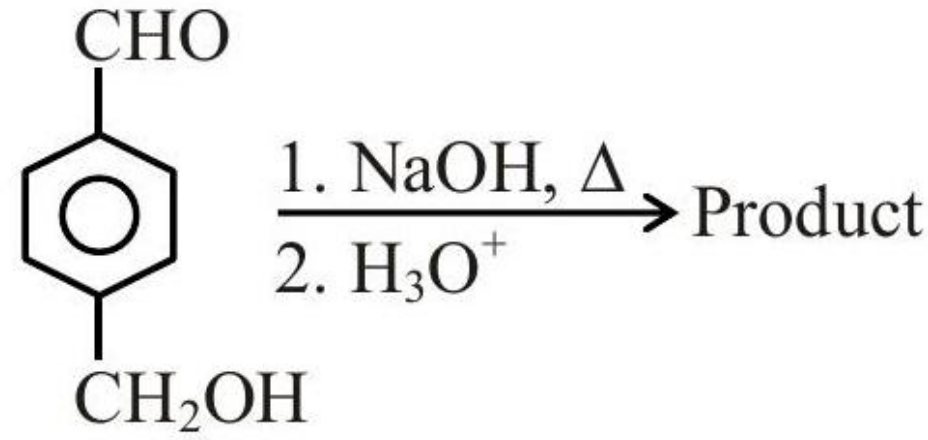
Correct answer: D

Source solution



Question 260

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

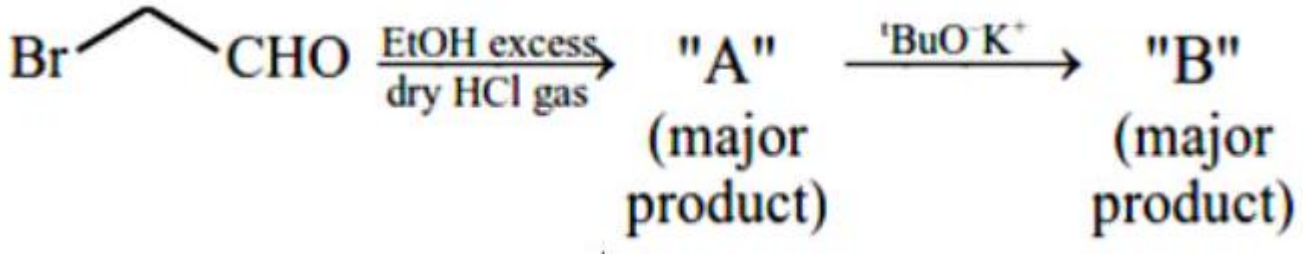
D. Diol

Correct answer: C

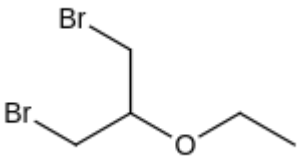
Source solution

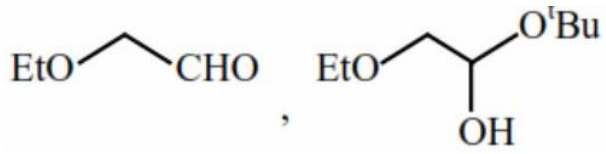
Cannizzaro disproportionation forms a diol and a hydroxy monocarboxylic acid. A dicarboxylic acid is not formed; option 3.

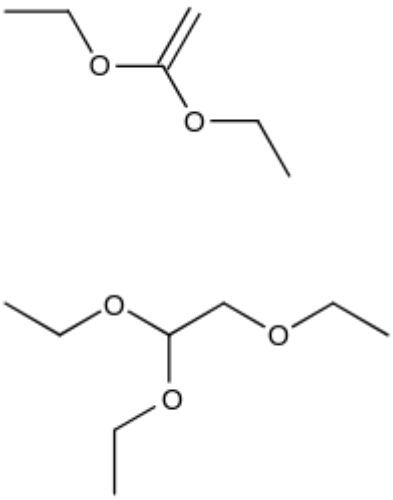
Question 261

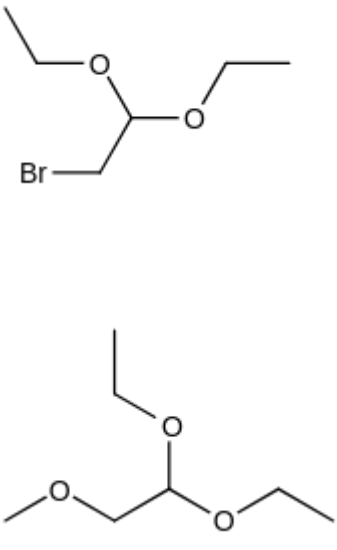


[where $\mathbf{Et} \Rightarrow -C_2H_5$ $^t\mathbf{Bu} \Rightarrow (CH_3)_3C-$] Consider the above reaction sequence, Product "A"and Product "B" formed respectively are :

A. 

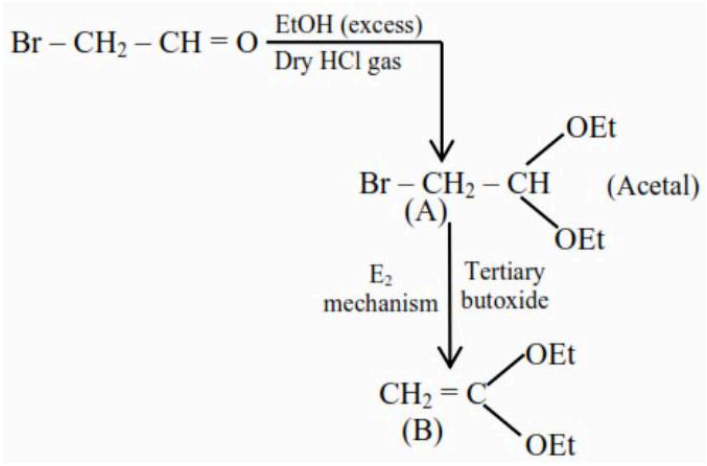
B. 

C. 

D. 

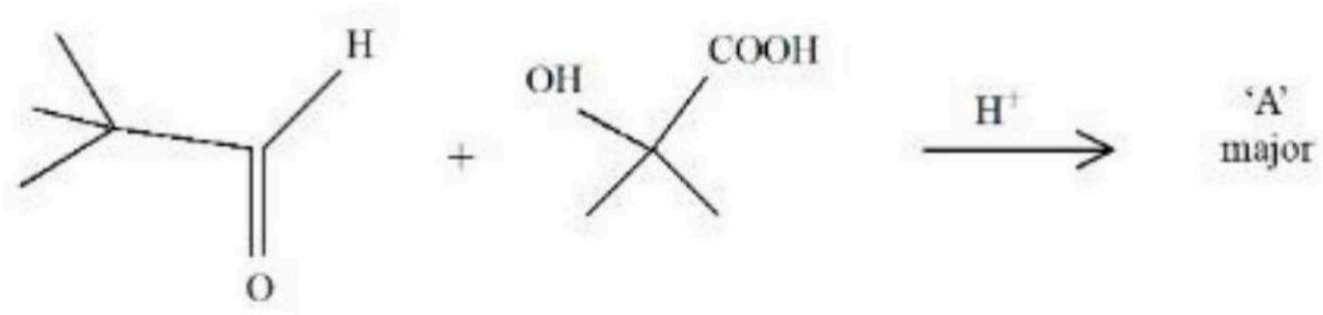
Correct answer: A

Source solution

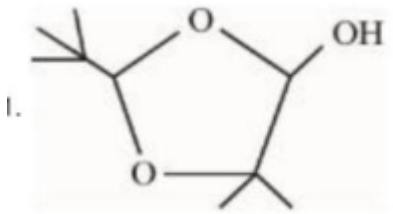

Br – CH2 – CH = O
EtOH (excess)
Dry HCl gas
OEt
Br – CH2 – CH
(A)
(Acetal)
OEt
E2
mechanism
Tertiary
butoxide
OEt
CH2 = C
(B)
OEt

Question 262

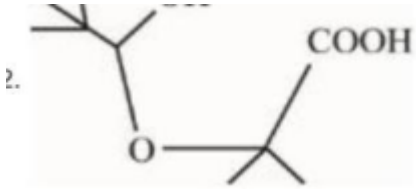
' A ' in the given reaction is



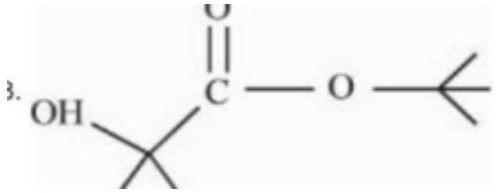
A.



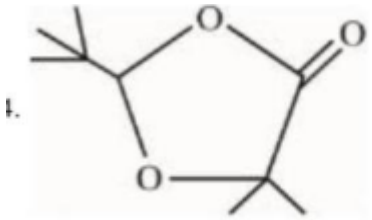
B.



C.

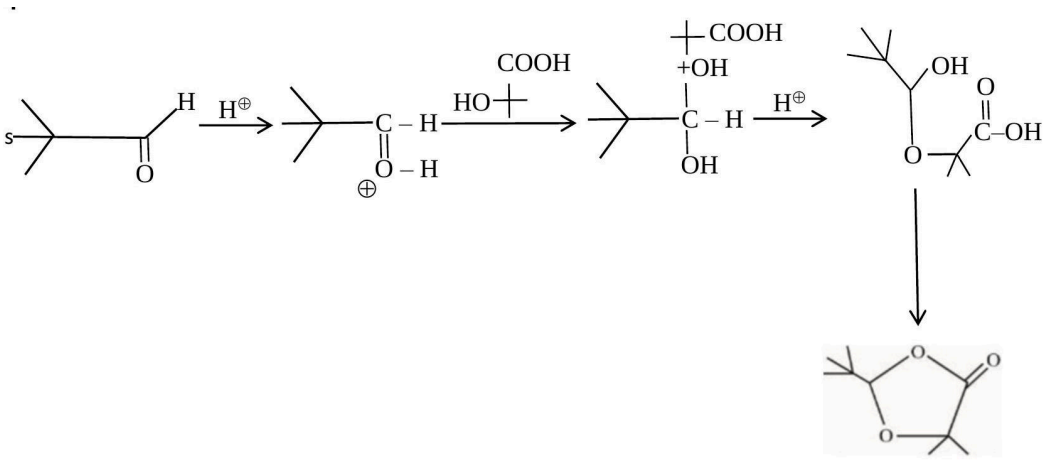


D.



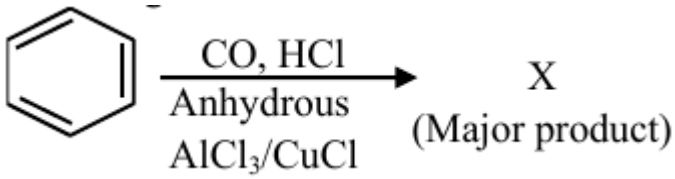
Correct answer: D

Source solution

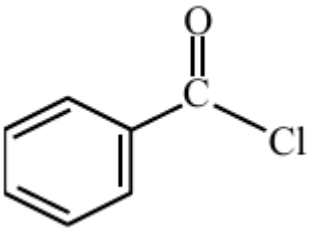


Question 263

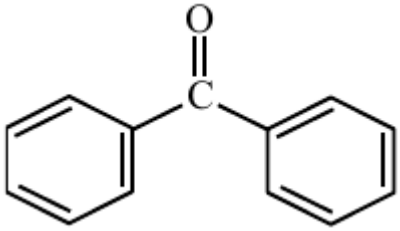
Identify the major product X in the following reaction:



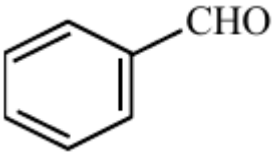
A.



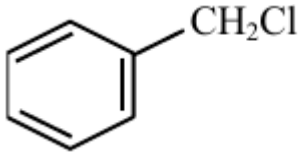
B.



C.



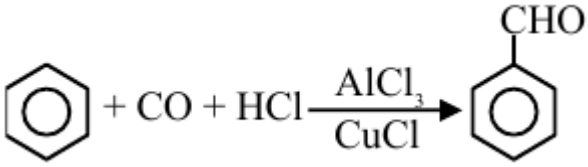
D.



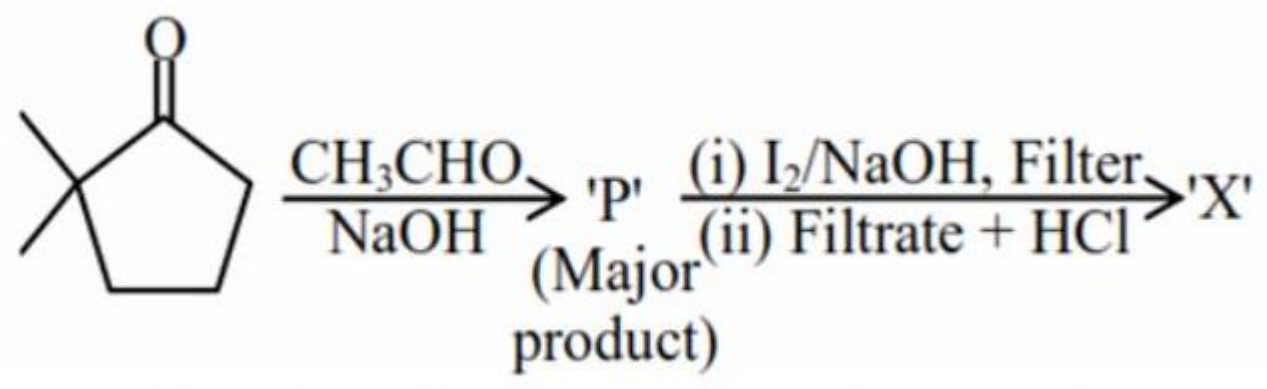
Correct answer: C

Source solution

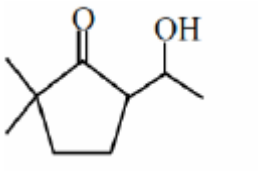
This is the Gattermann-Koch reaction:

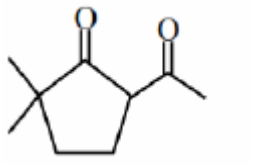


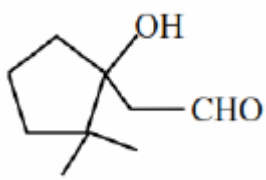
Question 264

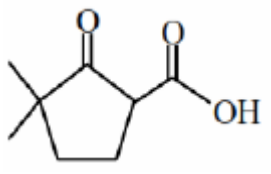


Consider the given reaction, the product ' X ' is:

A. 

B. 

C. 

D. 

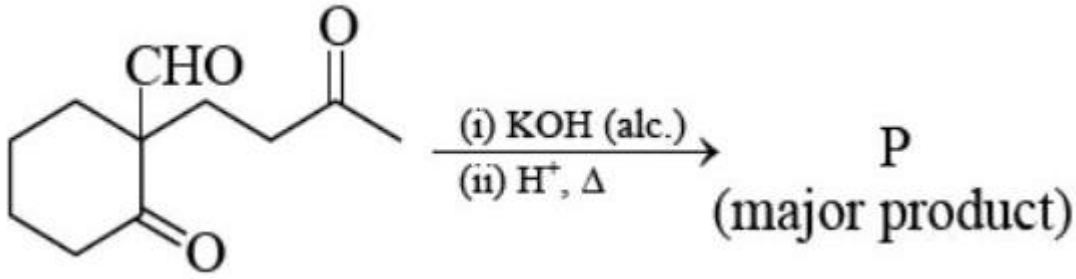
Correct answer: D

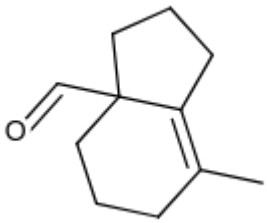
Source solution

The source worked reaction gives aldol addition followed by the haloform reaction and acidification, yielding the carboxylic acid in option 4.

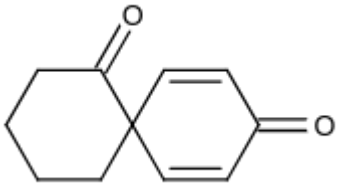
Question 265

The major product (P) in the following reaction is

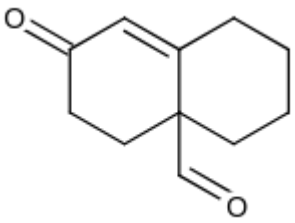




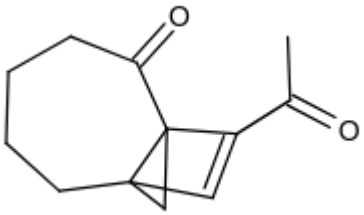
A.



B.



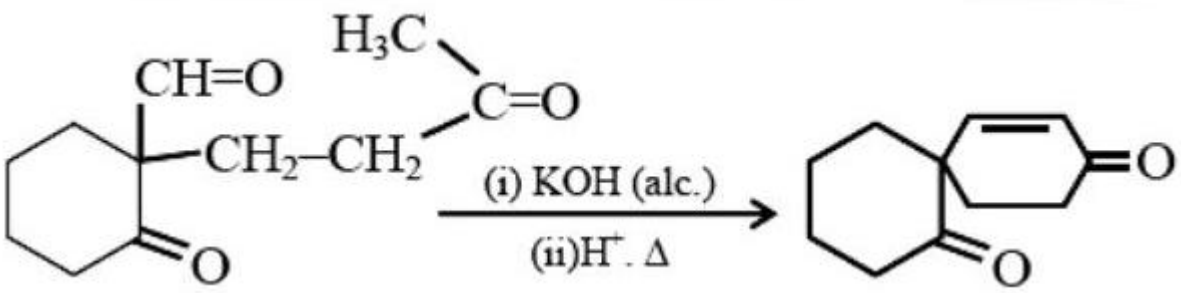
C.



D.

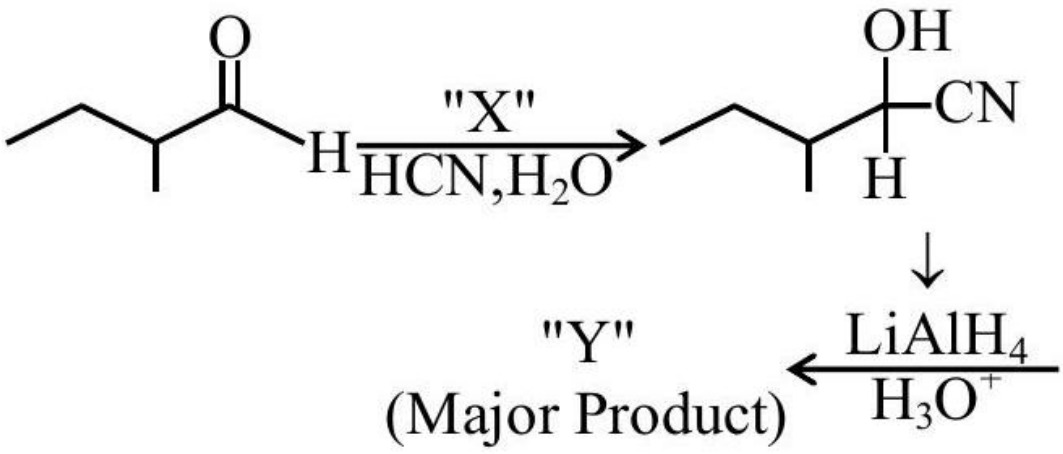
Correct answer: B

Source solution



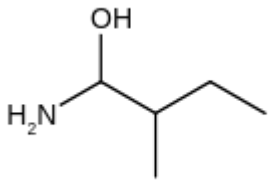
Intramolecular Aldol condenstion (Major Product)

Question 266

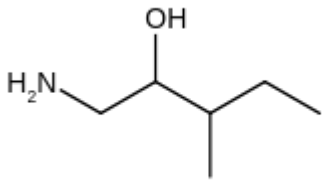


Consider the given reaction, Identify ' $\mathbf{X}$ ' and ' $\mathbf{Y}$ ' :

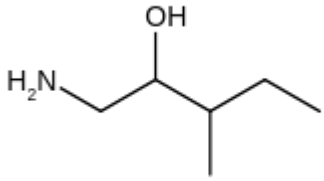
A. $\mathbf{X}-\mathbf{NaOHY}$



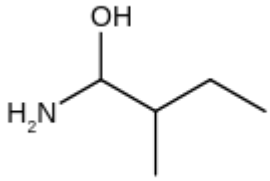
B. $\mathbf{X}-\mathbf{HNO_3}$



C. $X = NaOH; Y =$

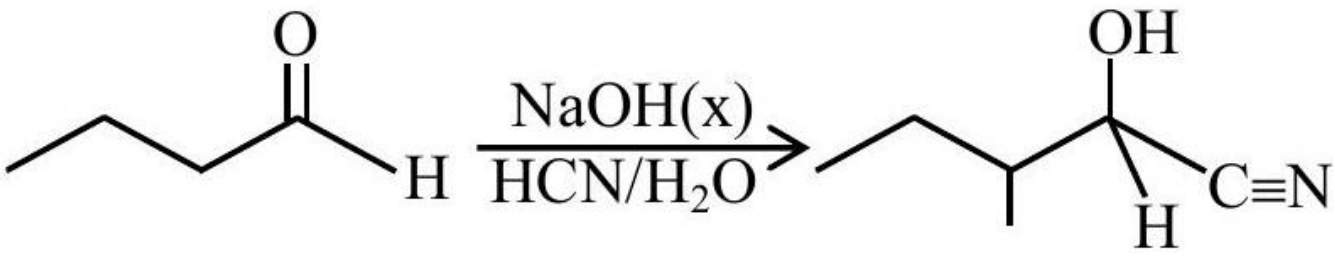


D. $\mathbf{X}-\mathbf{HNO_3}$



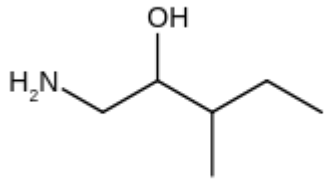
Correct answer: C

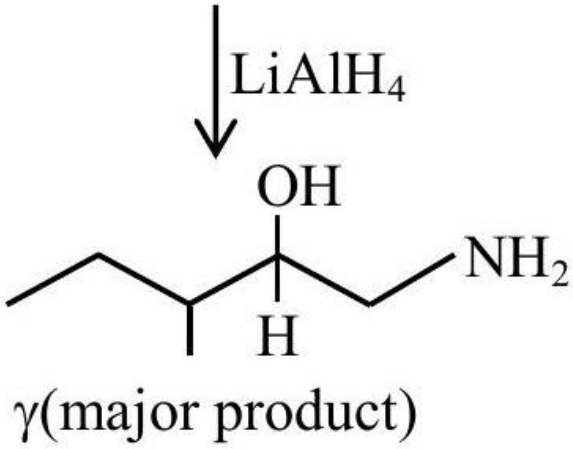
Source solution



$\mathbf{X} \Rightarrow \mathbf{NaOH}$

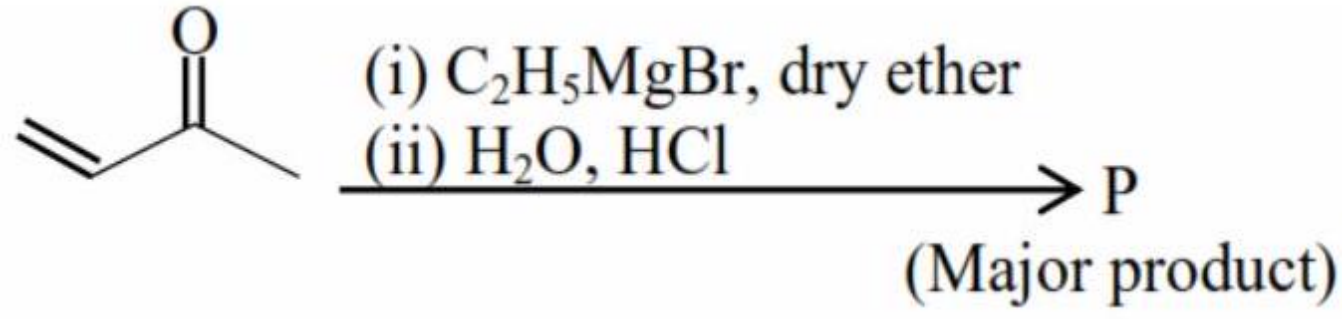
$Y \Rightarrow$



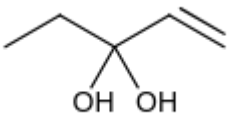


γ(major product)

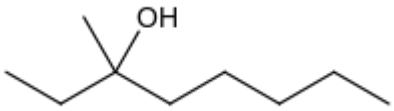
Question 267



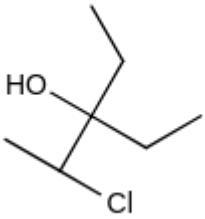
Consider the above reaction, the major product 'P' is:



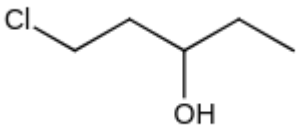
A.



B.



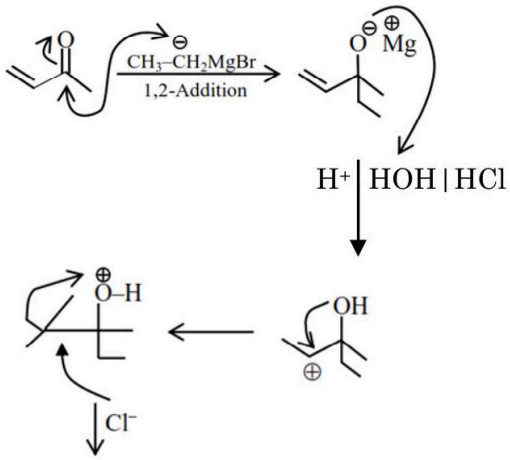
C.

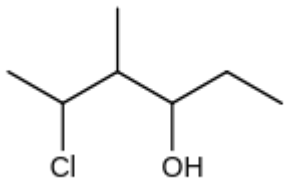


D.

Correct answer: C

Source solution



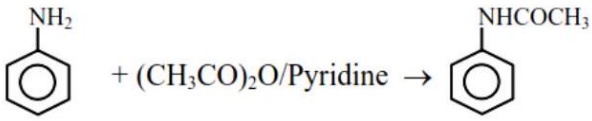

Cl
OH

Amines

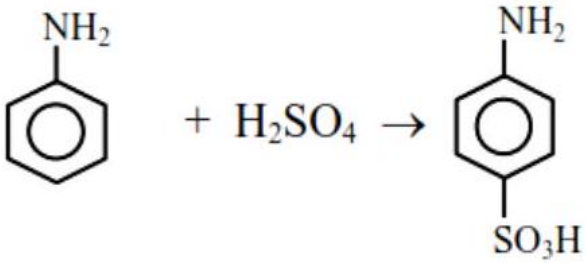
Question 268

Which one of the following reactions does not occur?

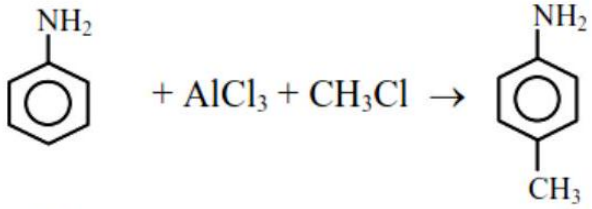
A.



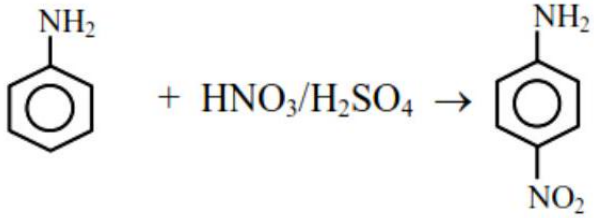
B.



C.

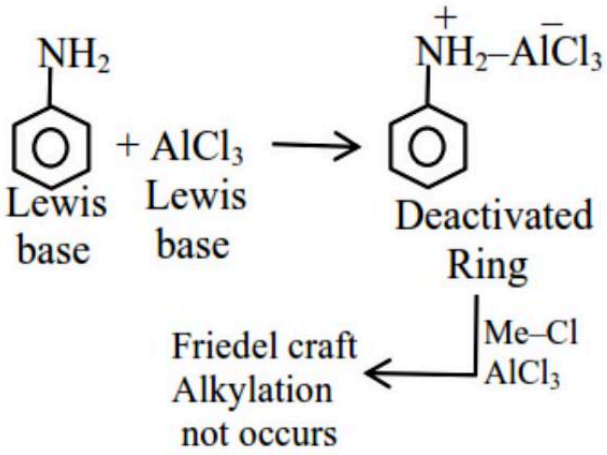


D.



Correct answer: C

Source solution



Aniline is lewis base give acid base reaction with $AlCl_3$ and form Anilinium ion Anilinium ion has strongest deactivated ring so further Friedel craft Alkylation not occurs.

Question 269

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)

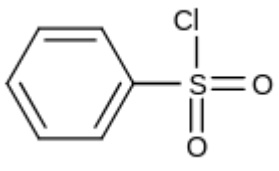
D. (3) A-III, B -IV, C-I, D-II

Correct answer: C

Source solution

Sol. (1)

Benzen sulphonyl chloride



Question 270

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

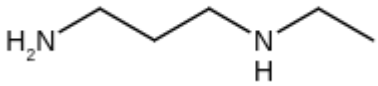
C. A-I, B-IV, C-II, D-III

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

Correct answer: A

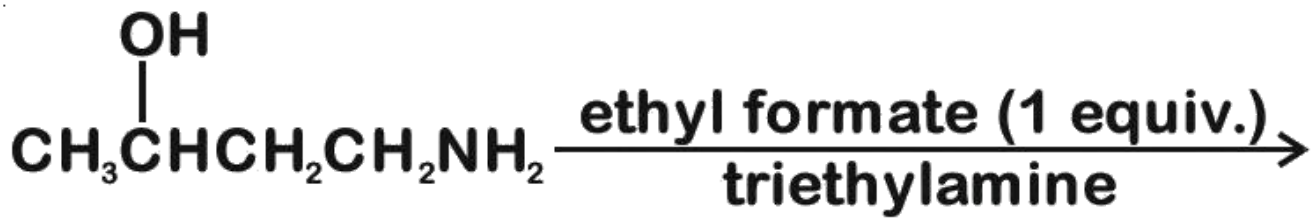
Source solution

Sol. 1}
Basicity order
pKb : 3.00, pKb : **3.25** pKb : **3.29** pKb : 9.38



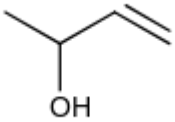
Question 271

The major product of the following reaction is:

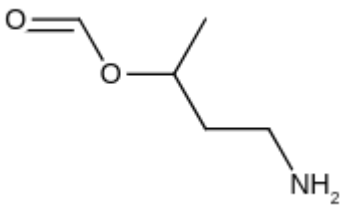


A. $CH_3CH = CH - CH_2NH_2$

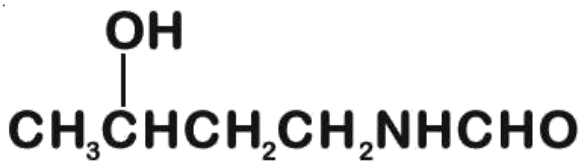
B.



C.



D.

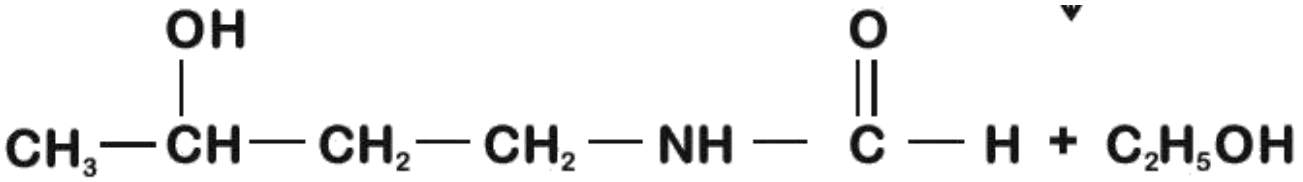


Correct answer: D

Source solution

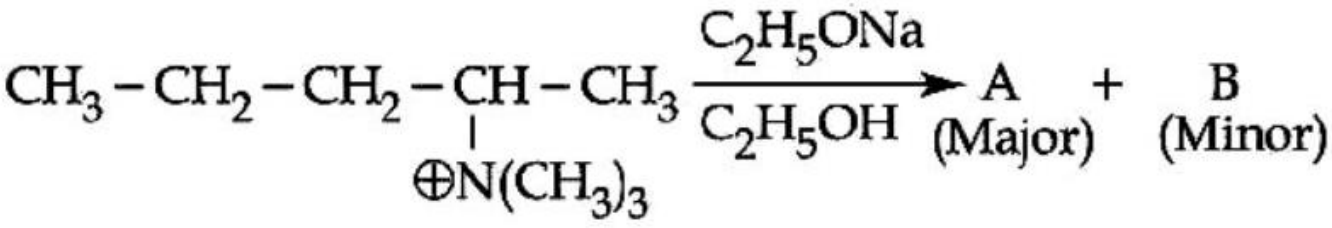
Sol.

The acylation of NH_2 group takes place and not of OH group due to lower electronegativity of N -atom.



Question 272

Identify the correct statement for the below given transformation.



A. $\mathbf{A} - CH_3CH_2CH = CH - CH_3$,
$\mathbf{B} - CH_3CH_2CH_2CH = CH_2$,
Saytzeff products

B. $\mathbf{A} - CH_3CH_2CH = CH - CH_3$,
$\mathbf{B} - CH_3CH_2CH_2CH = CH_2$,
Hafmann products

C. $\mathbf{A} - CH_3CH_2CH_2CH = CH_2$,
$\mathbf{B} - CH_3CH_2CH = CHCH_3$,
Hofmann products

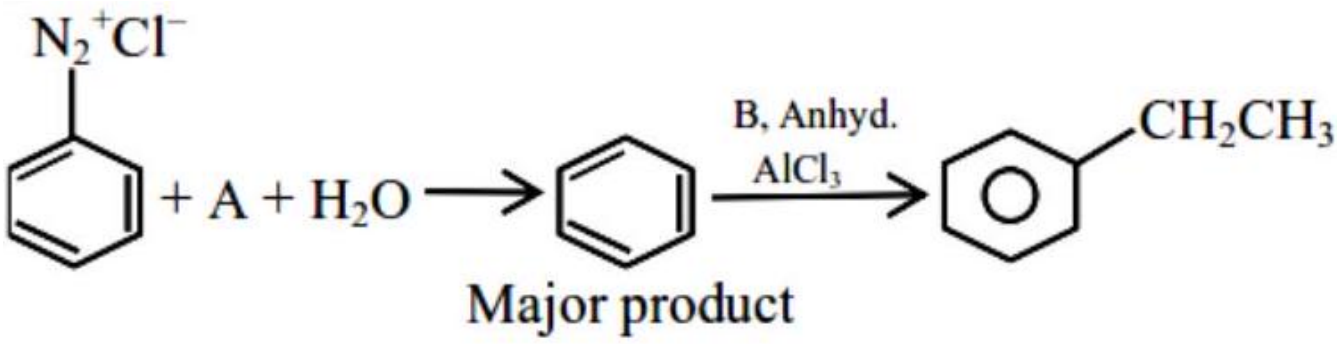
D. $\mathbf{A} - CH_3CH_2CH_2CH = CH_2$,
$\mathbf{B} - CH_3CH_2CH = CHCH_3$,
Saytzeff products

Correct answer: C

Source solution

The quaternary ammonium group undergoes Hofmann elimination. The less substituted pent-1-ene is major A and pent-2-ene is minor B. Option 3 has both structures and the Hofmann label.

Question 273



In the chemical reactions given above A and B respectively are :

A. H_3PO_2 and CH_3CH_2Cl

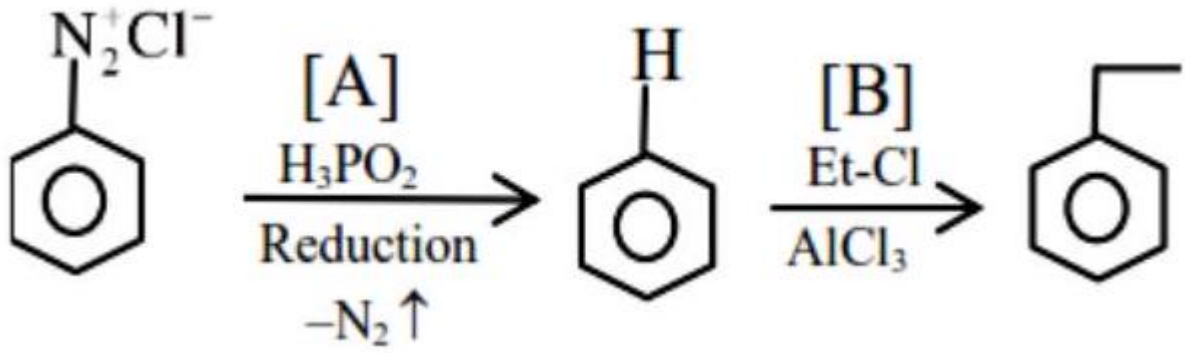
B. CH_3CH_2OH and H_3PO_2

C. H_3PO_2 and $CH_3CH_2PO_2$

D. CH_3CH_2Cl and H_3PO_2

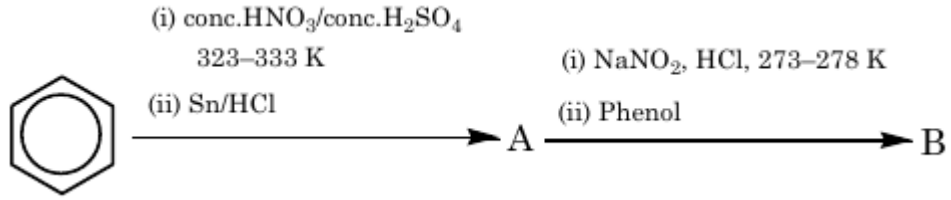
Correct answer: A

Source solution

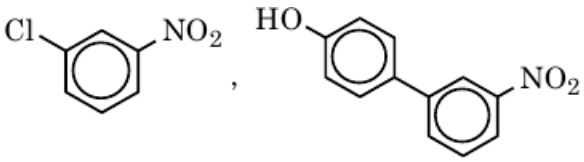


Question 274

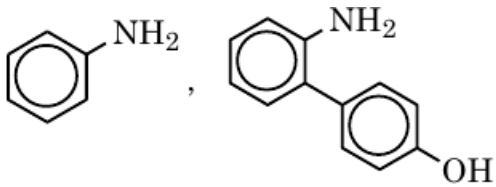
The products A and B formed in the following reaction scheme are respectively:



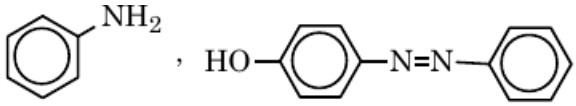
A.



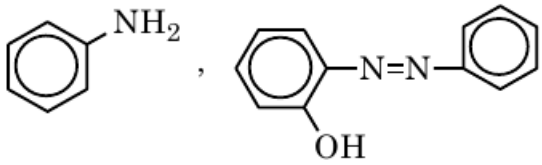
B.



C.

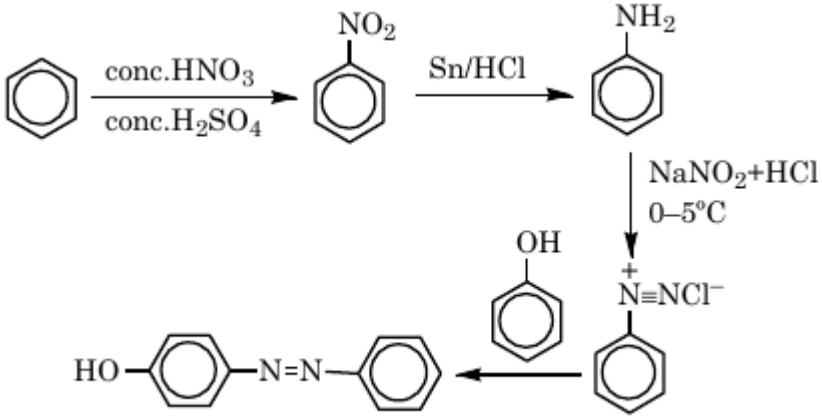


D.



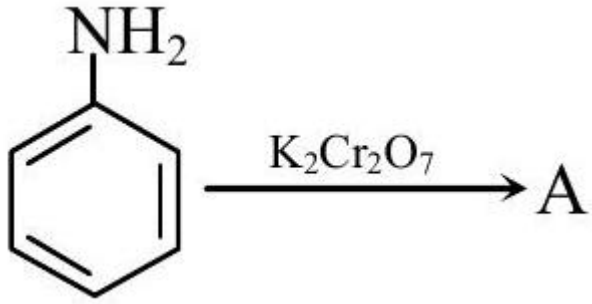
Correct answer: C

Source solution



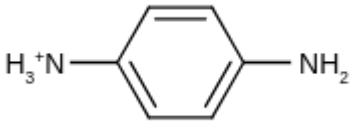
Question 275

Identify A in the following reaction.

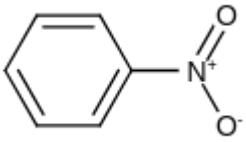




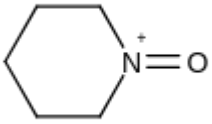
A.



B.



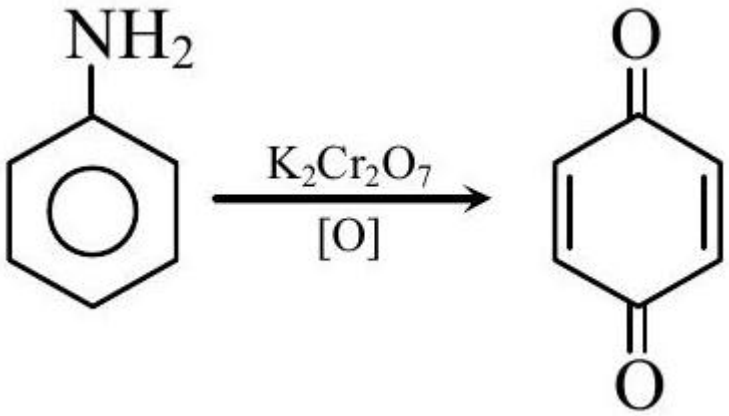
C.



D.

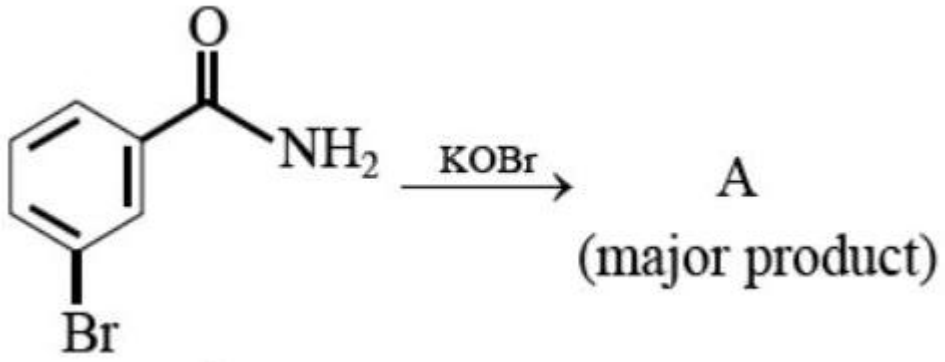
Correct answer: A

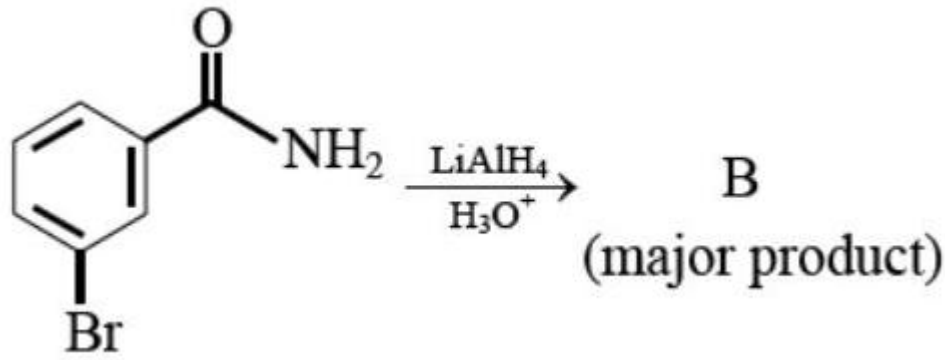
Source solution



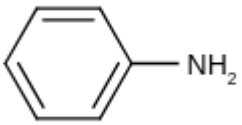
[A]

Question 276

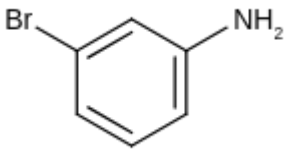




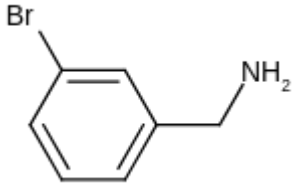
In the above reactions, product A and product B respectively are :

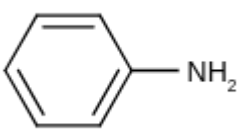


A. ,

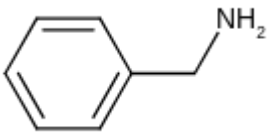


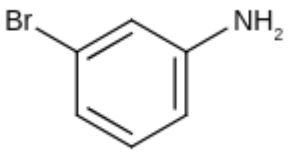
B. ,



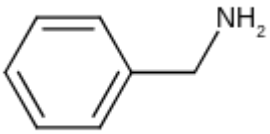


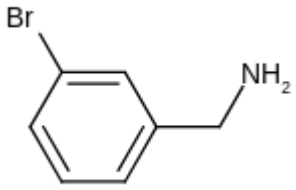
C. ,





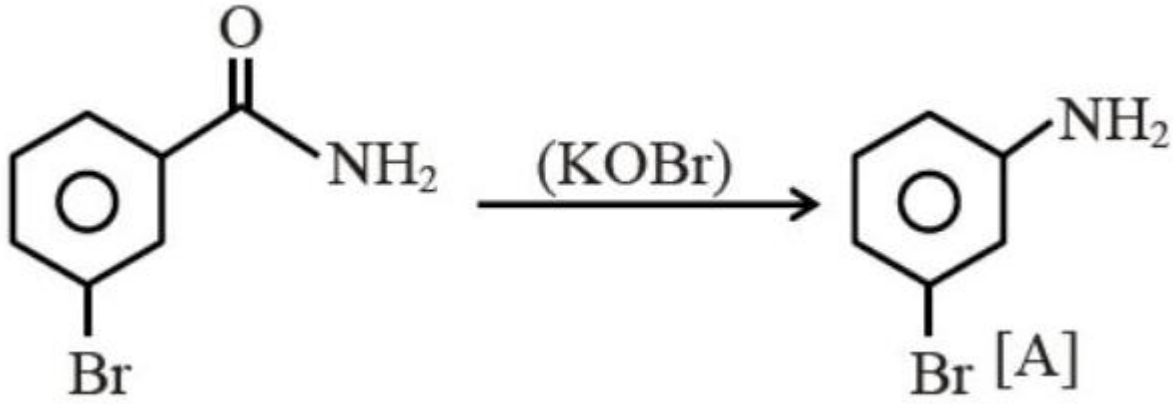
D. ,

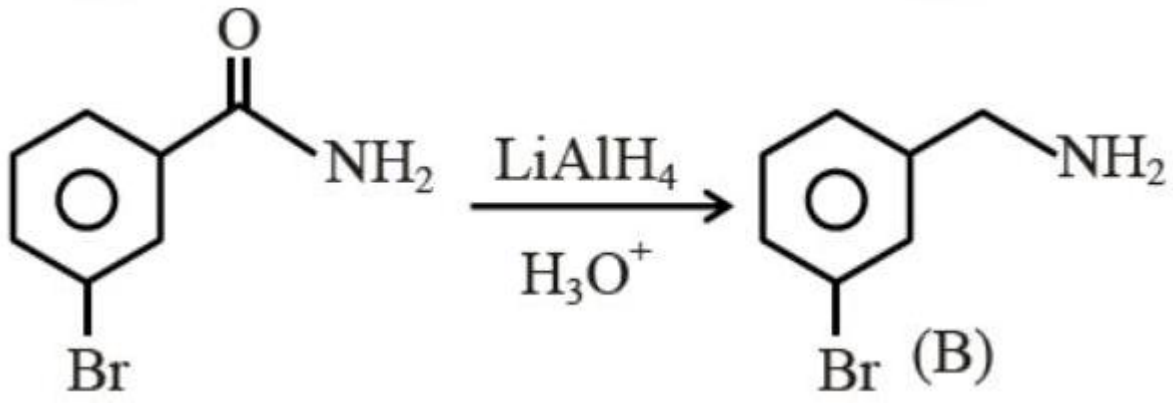




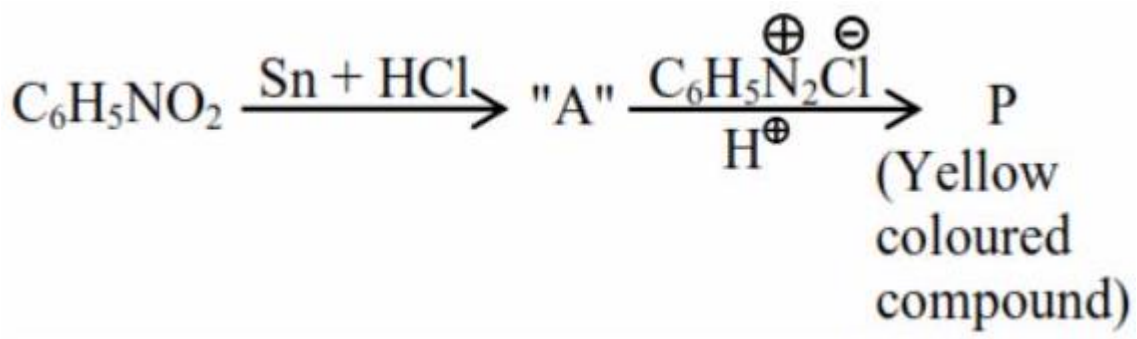
Correct answer: D

Source solution



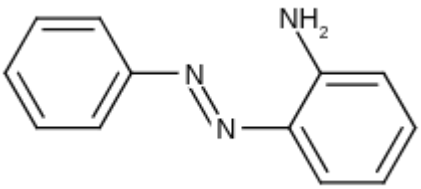


Question 277

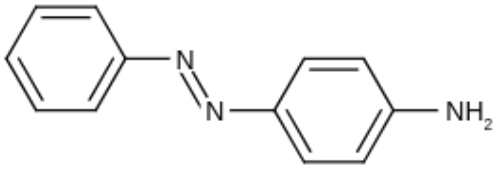


Consider the above reaction, the Product " P " is : []

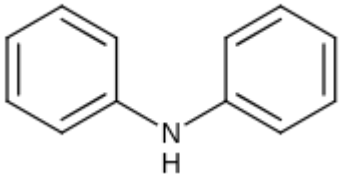
A.



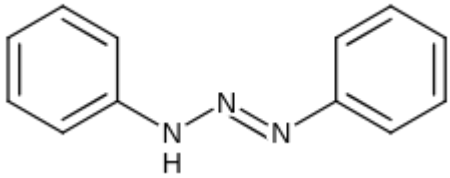
B.



C.

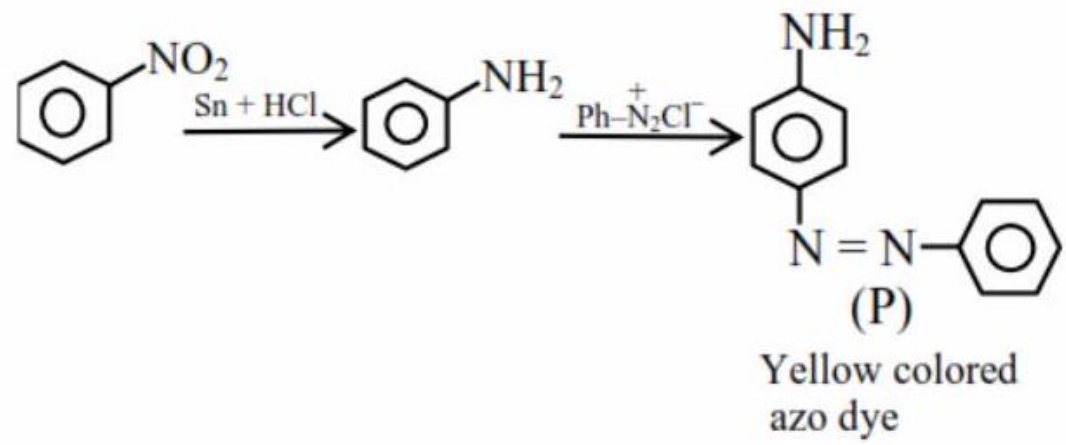


D.



Correct answer: B

Source solution



Biomolecules

Question 278

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)

Correct answer: C

Source solution

(a) $4NH_3(g) + 5O_2(g) \xrightarrow{Pt(s)} 4NO(g) + 6H_2O(g)$ Ostwald process 500 K

(b) $N_2 + 3H_2 \xrightarrow{Fe(s)} 2NH_3(g)$

Haber's process

(c) $\mathrm{C_{12}H_{22}O_{11}}$ (aq.) $+\mathrm{H_2O}(\ell) \xrightarrow{\mathrm{H^+}} \underset{\text{(glu cose)}}{\mathrm{C_6H_{12}O_6}} + \underset{\text{(fructose)}}{\mathrm{C_6H_{12}O_6}}$

Inversion of sugar cane

(d) $\mathrm{2SO_2(\ g) + O_2(\ g)} \xrightarrow{\mathrm{NO(g)}} \mathrm{2SO_3(\ g)}$

Question 279

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

Correct answer: B

Source solution

Sol. Glucose $\xrightarrow[\Delta]{NaHCO_3}$ no reaction

Glucose $\xrightarrow[\Delta]{HNO_3}$ saccharic acid

Glucose $\xrightarrow[\Delta]{HI}$ n-hexane

Glucose $\xrightarrow[\Delta]{Br_2}$ Gluconic acid

Question 280

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

Correct answer: B

Source solution

Sol.
$\mathbf{A} \rightarrow (\mathbf{II})$
$\mathbf{C} \rightarrow (\mathrm{III})$
$\mathbf{B} \rightarrow (\mathbf{I})$
$\mathrm{D} \rightarrow (\mathrm{IV})$

Question 281

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

Correct answer: C

Source solution

Sol. Invertase : Cane sugar $\rightarrow$ Glucose and fructose
Zymase : Glucose $\rightarrow$ Ethanol and CO_2
Diastase : Starch $\rightarrow$ Maltose
Maltase : Maltose $\rightarrow$ Glucose

Question 282

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

Correct answer: C

The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

Sol. Factual

Question 283

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)

Correct answer: D

Source solution

Sol. Sucrose $\rightarrow$ α-D- Glucose and β-D- Fructose
Lactose $\rightarrow$ β-D- Galactose and β-D- Glucose
Maltose $\rightarrow$ α-D- Glucose and α-D- Glucose

Question 284

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

Correct answer: D

Source solution

Sol. A-II, B-III, C-I, D-IV
Fact based.

Question 285

Match List-I with List-II.

List-I

List-II

(A) Adenine

(I)

(B) Cytosine

(II)

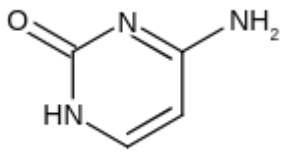
(C) Thymine

(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)

Correct answer: A

Source solution

Sol.

(A) Adenine

(III)

(B)

Cytosine

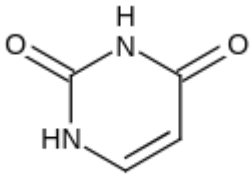
(IV)

(C) Thymine

(II)

(D) Uracil

(I)



Question 286

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)

Correct answer: B

Source solution

Sol. Informative

Question 287

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)

Correct answer: A

Source solution

Sol. (A) Sucrose $\rightarrow \alpha_1-\beta_2$ Glycosidic linkage
(B) Maltose $\rightarrow \alpha$ 1-4 Glycosidic linkage
(C) Lactose $\rightarrow \beta$ 1-4 Glycosidic linkage
(D) Amylopectin $\rightarrow \alpha 1-4$ and $\alpha 1-6$

Glycosidic linkage
A-III, B-I, C-IV, D-II

Question 288

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

Correct answer: D

The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

Sol. Factual

Practical Chemistry (NCERT Laboratory Manual)

Questions 289-289 / 1 selected / 0.3% practice weight / Consolidate

Question 289

For reaction: $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$
$K_p = 2 \times 10^{12}$ at $27°C$ and 1 atm pressure. The K_c for the same reaction is $\times 10^{13}$. (Nearest integer) (Given $R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}$)

Numerical answer: _____

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

Correct answer: 1

Source solution

$K_c = 1 \times 10^{13}$
$SO_2(g) + \frac{1}{2}O_2 \rightleftharpoons SO_3(g)$
$\Delta n = \frac{-1}{2}$
$K_P = 2 \times 10^{12}$
$K_P = K_C(RT)^{\Delta ng}$
$P = 1\ atm$
$2 \times 10^{12} = K_C(0.082 \times 300)^{-1/2}$
$T = 27°C$
$K_c = 1 \times 10^{13}$

States of Matter

Questions 290-290 / 1 selected / 0.3% practice weight / Historical appendix

Question 290

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.

Correct answer: 74

Source solution

$AB_{2(g)} \rightleftharpoons A_{(g)} + 2B_{(g)}$
initial 1-x $\quad x \quad 2x$
at eq. $\frac{1}{1+2x} \quad \frac{1}{1.9}$
By ratio of pressure & mole
$\frac{1}{1+2x} = \frac{0.985}{1.9}$
$1.9 = 0.985 + 1.9x$
$0.915 = 1.9x$
$\frac{0.915}{1.9} = x; \quad K_p = \frac{4x^2 \cdot x}{(1-x)}\left[\frac{P_{\text{total}}}{n_{\text{total}}}\right]^2$
$\Rightarrow \frac{4x^3}{1-x}\left(\frac{RT}{V}\right)^2$
On substituting the values
$\mathbf{K_p = 74 \times 10^{-2}}$

Hydrogen

Questions 291-291 / 1 selected / 0.3% practice weight / Historical appendix

Question 291

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

Correct answer: D

Source solution

In basic medium, oxidising action of $\mathbf{H_2O_2}$. $\mathbf{Mn^{2+} + H_2O_2 \rightarrow Mn^{+4} + 2OH^-}$
In basic medium, reducing action of $\mathbf{H_2O_2}$ $\mathbf{I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2}$
In acidic medium, oxidising action of $\mathbf{H_2O_2}$. $\mathbf{PbS(s) + 4H_2O_2(aq) \rightarrow PbSO_4(\ s) + 4H_2O(\ell)}$ Hence correct option (4)

The s-Block Elements

Questions 292-293 / 2 selected / 0.7% practice weight / Historical appendix

Question 292

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

Correct answer: A

Source solution

K^+- Sodium - Potassium Pump
KCl -Fertiliser
KOH - absorber of CO_2
Li - used in thermonuclear reactions

Question 293

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)

Correct answer: A

Source solution

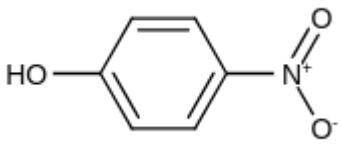
(a) 'Ba' having outer electronic configuration $6\,s^2$ CaC_2O_4 is water insoluble 'Li' is soluble in organic solvents NaOH is strong Monoacidic base among given.

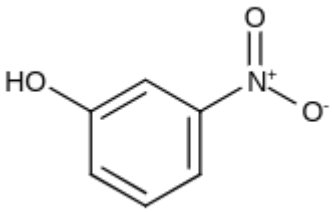
The Solid State

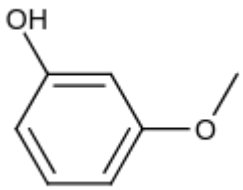
Questions 294-295 / 2 selected / 0.7% practice weight / Historical appendix

Question 294

Arrange the following in decreasing acidic strength.









(A)

(B)

(C)

(D)

A. A > B > C > D

B. $B > A > C > D$

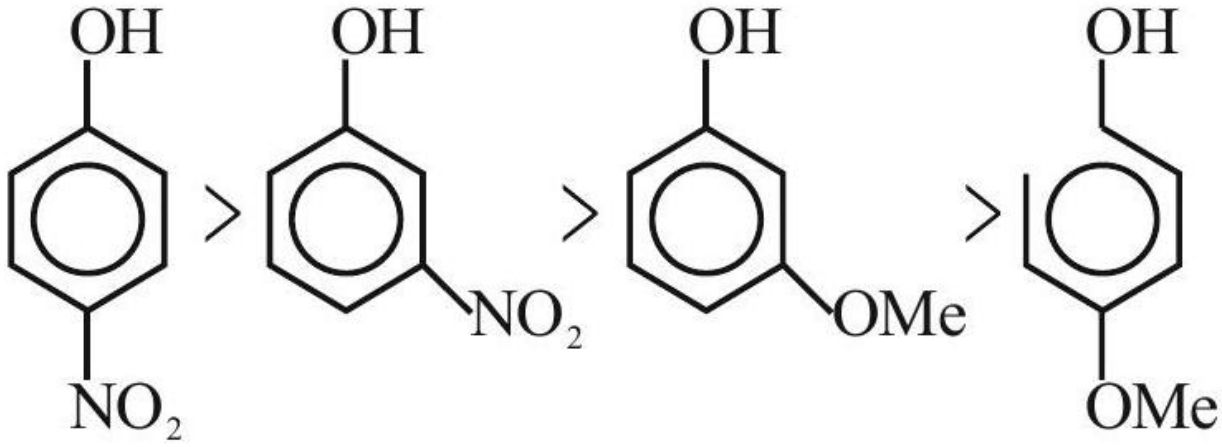
C. $D > C > A > B$

D. $D > C > B > A$

Correct answer: A

Source solution

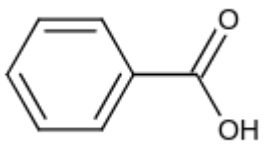
The correct order of acid strength is



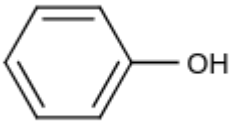
Question 295

The compounds that produce CO_2 with aqueous $NaHCO_3$ solution are :

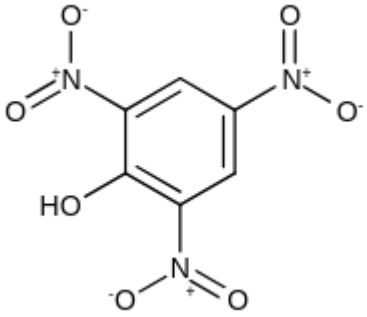
A.



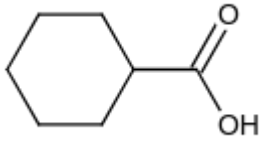
B.



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

Correct answer: C

Source solution

A, C, D produce $\mathbf{CO_2}$ with aqueous $\mathbf{NaHCO_3}$ solution. $\boldsymbol{A, C, D}$ acids are stronger acid than $\mathbf{H_2CO_3}$ (Carbonic acid)

Polymers

Questions 296-297 / 2 selected / 0.7% practice weight / Historical appendix

Question 296

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

Correct answer: B

Source solution

Hexamethylenediamine on reaction with adipic acid forms Nylon 6, 6 which shows H-bonding due to presence of amide group.

$AlEt_3 + TiCl_4$ is Ziegler-Natta catalyst used to prepare high density polyethylene.

2-chloro-1, 3-butadiene (chloroprene) is monomer of neoprene which is a rubber (an elastomer)

Phenol - formaldehyde forms Bakelite which is heavily branched (cross-linked) polymer

Question 297

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

Correct answer: D

The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

FACT

Environmental Chemistry

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

Question 298

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)

Correct answer: A

The source provides a brief answer only. A detailed worked solution is not available for this question.

Source solution

Question 299

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)

Correct answer: A

Source solution

Steel plant produces slag from blast furnace. Thermal power plant produces fly ash, Fertilizer industries produces gypsum. Paper mills produces bio degradable waste

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Question 300

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

Correct answer: A

Source solution

List I Pollutant	List II Source
A. Microorganisms	Domestic sewage
B. Plant nutrients	Chemical fertilizer
C. Toxic heavy metals	Chemical factory
D. Sediment	Strip mining