



Padalsalai's Telegram Groups!

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Transition And Linear
Elements. Transition.

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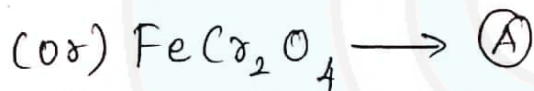
UNIT - 4

4. Transition and inner transition elements.

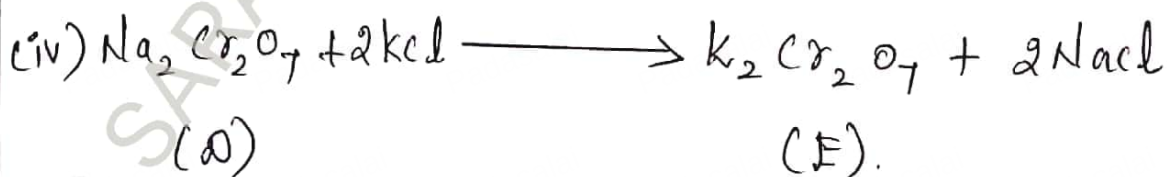
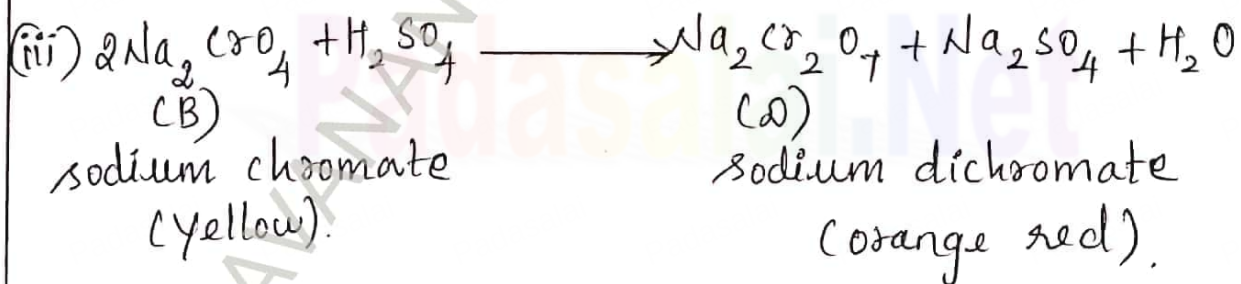
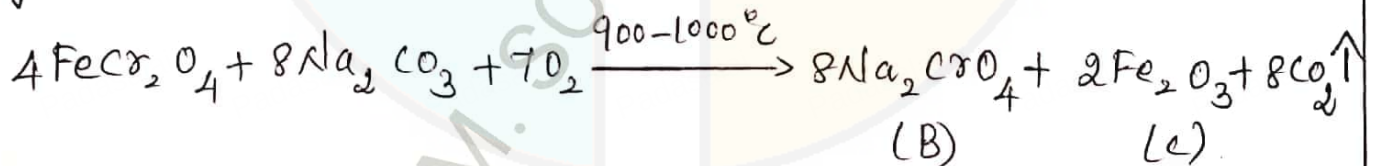
① chief are of chromium (A) on roasting with sodium carbonate gives compound (B) and (C). (B) on acidification gives compound (D) with on treatment with KCl give compound (E). Identify the compound (A), (B), (C), (D) and (E). Explain with proper chemical reaction.

SOLUTION:

(i) chief ore of chromium is chromite - $\text{FeO} \cdot \text{Cr}_2\text{O}_3$



(ii) chromite on roasting with sodium carbonate gives sodium chromate (B) and Ferric oxide (C).

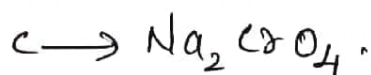
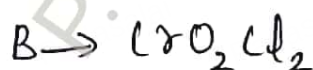
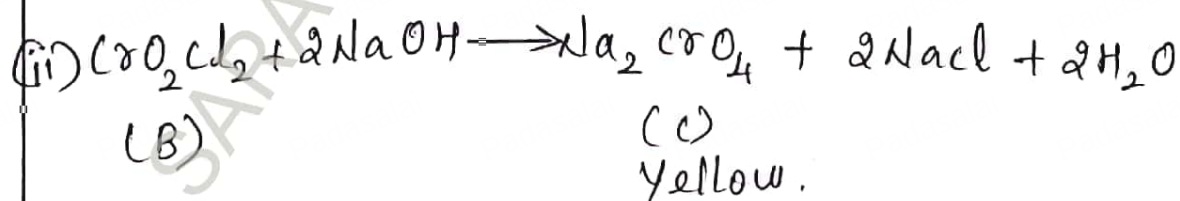
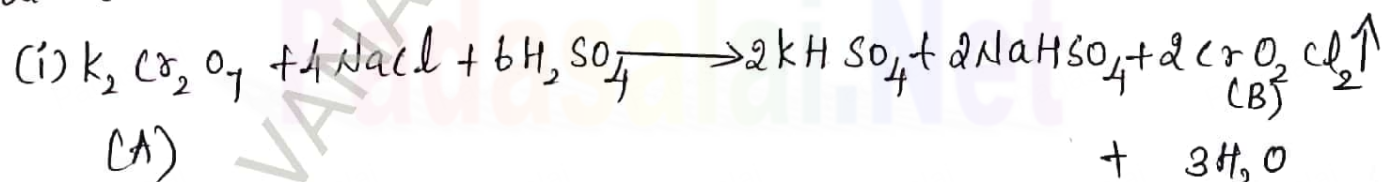


S.No	Compound	Name	Structure.
1	A	chromite	FeCr_2O_4 (or) $\text{FeO} \cdot \text{Cr}_2\text{O}_3$
2	B	sodium chromate	Na_2CrO_4
3	C	Ferric oxide	Fe_2O_3
4	D	sodium dichromate	$\text{Na}_2\text{Cr}_2\text{O}_7$
5	E	potassium dichromate	$\text{K}_2\text{Cr}_2\text{O}_7$

② Compound (A) is a powerful oxidizing agent and also it is a red orange crystal which melts at 671K . (A) reacts with chloride salt and on H_2SO_4 to give (B) which is orange red vapour. reacts with an alkali to gives (C) which is yellow in colour. Find out (A), (B) and (C). Explain the reaction?

SOLUTION:

(i) Compound (A) $\text{K}_2\text{Cr}_2\text{O}_7$ is powerful oxidizing agent. It is a red orange crystals, which melts at 671K .

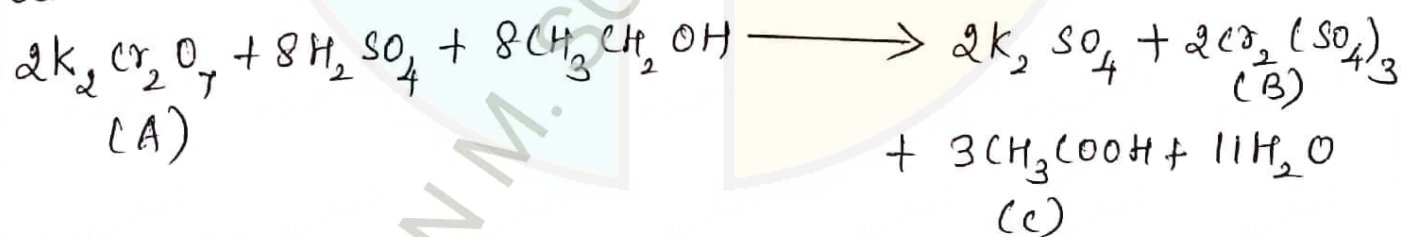


S.No	Compound	Name	Structure
1	A	Potassium dichromate	$K_2Cr_2O_7$
2	B	Chromyl chloride	CrO_2Cl_2
3	C	Sodium chromate	Na_2CrO_4

- ③ Compound (A) is a powerful oxidizing agent and also it is a red orange crystal. which melts at 671K. (A) reacts with ethanal and H_2SO_4 to give (B) and (C). Identify compound (A), (B) and (C). Explain the reaction?

SOLUTION:

(i) Compound (A) $K_2Cr_2O_7$ is a powerful oxidizing agent. it is a red orange crystals which melts at 671K.

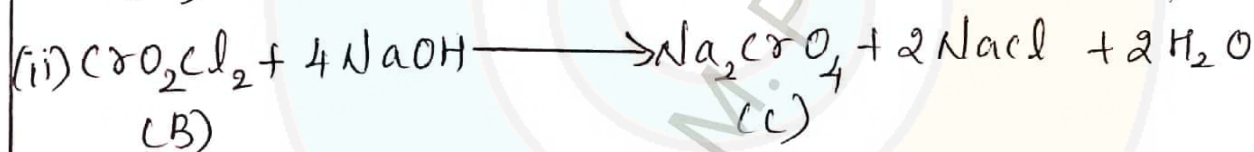


S.No	Compound	Name	Structure
1	A	Potassium dichromate	$K_2Cr_2O_7$
2	B	Potassium sulphate	K_2SO_4
3	C	Chromium sulphate	$Cr_2(SO_4)_3$

- ④ Compound (A) is a powerful oxidizing agent and also it is a red orange crystal which melts at 671K. (A) reacts with chloride salt and H_2SO_4 to give (B) which is orange red vapour. (B) reacts with an alkali to give (C). (C) treated with lead acetate gives a yellow colour precipitate of (D). Find out (A), (B), (C) and (D). Explain the reactions.

SOLUTION:

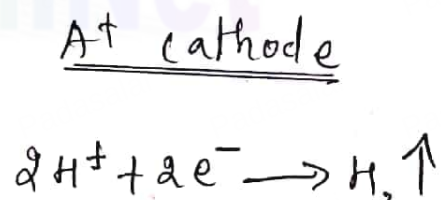
(i) compound (A) $K_2Cr_2O_7$ is a powerful oxidizing agent.



Yellow precipitate

S. No	Compound	Name	Structure
1	A	potassium dichromate	$K_2Cr_2O_7$
2	B	chromyl chloride	CrO_2Cl_2
3	C	sodium chromate	Na_2CrO_4
4	D	lead chromate	$PbCrO_4$

(i) chief ore of manganese is pyrolusite (MnO_2) $\rightarrow$ (CA)
(ii) powdered pyrolusite fused with KOH in the presence of air (or) oxidising agents like KNO_3 (or) KClO_3 . A green coloured potassium manganate is formed.



(iv) The purple coloured solution is concentrated by evaporation and forms crystals of potassium permanganate on cooling.

S.No	Compound	Name	Structure
1	A	Pyrolusite	MnO_2
2	B	potassium manganate	K_2MnO_4
3	C	potassium permanganate	$KMnO_4$

Q. Chief ore of manganese (A) on fused with KOH with air gives (B) which is green colour. (B) on reacts with ozone (or) chloride/chlorine to give (C) which dark purple crystals. find out (A), (B) and (C) and write the reactions?

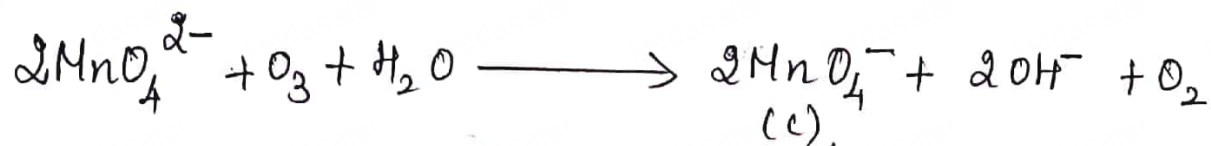
SOLUTION:

(i) chief ore of manganese - pyrolusite (MnO_2) - (A)

(ii) powdered pyrolusite fused with KOH in the presence of air, a green coloured potassium manganate is formed.



(iii) potassium manganate. is treated with ozone (O_3) (or) chlorine (Cl_2) to get potassium permanganate.

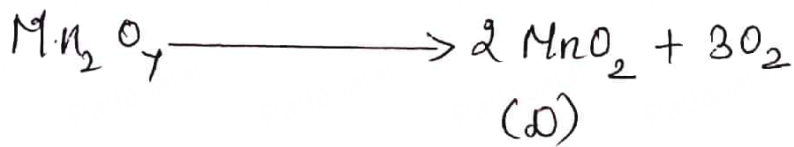
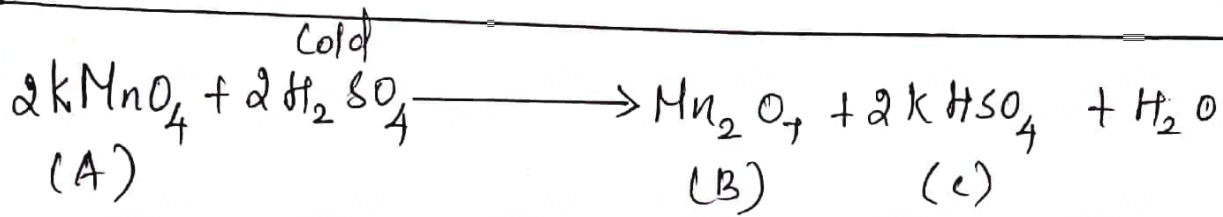


S.No	Compound	Name	Structure
1	A	pyrolusite	MnO_2
2	B	potassium manganate	K_2MnO_4
3	C	potassium permanganate	KMnO_4

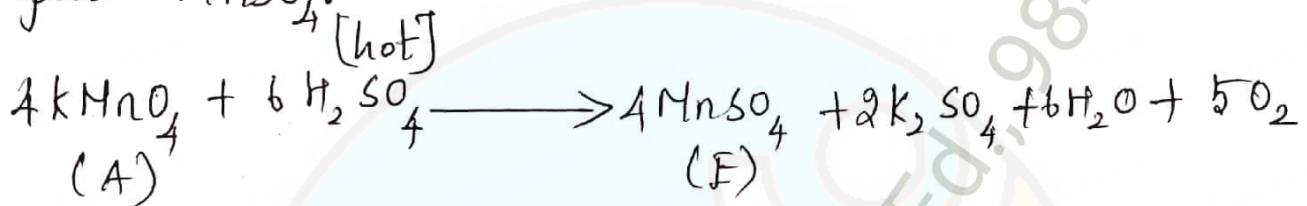
- ⑦ Compound (A) is powerful oxidizing agent and also it is a dark purple crystals which melts at 513K. (A) reacts with cold conc H_2SO_4 , it decomposes into (B) and (C). (B) further decompose on heating gives (D). (A) also reacts with hot H_2SO_4 give (E). Find out compound (A), (B), (C), (D) and (E). Explain the reaction?

SOLUTION:

- (i) Compound (A) KMnO_4 is a powerful oxidizing agent. It is dark purple colour crystals which melts at 513K.
- (ii) potassium permanganate on treating with cold H_2SO_4 , it decomposes to form manganese heptoxide, which subsequently decomposes explosively.



(iii) with hot $(\text{conc}) \text{H}_2\text{SO}_4$ potassium permanganate give MnSO_4 .

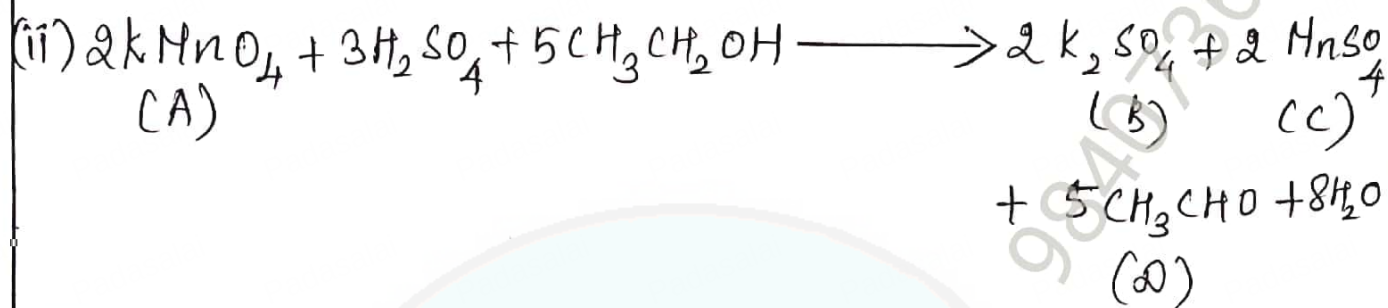


S.No	Compound	Name	Structure.
1	A	potassium permanganate	$KMnO_4$
2	B	manganese heptoxide	Mn_2O_7
3	C	potassium bisulphate	$KHSO_4$
4	D	manganese per oxide	MnO_2
5	E	manganese sulphate	$MnSO_4$

8) Compound (A) is powerful oxidizing agent and also it is a dark purple colour crystals which melts at 513K. (A) reacts with H_2SO_4 and ethanol gives (B), (C) and (D). Compound (D) reduces Tollen's and Fehling reagents identify (A), (B) and (C). Explain the chemical reactions?

SOLUTION:

(i) compound (A) KMnO_4 is a powerful oxidizing agent and it is a dark purple colour crystals, which melts at 513K .

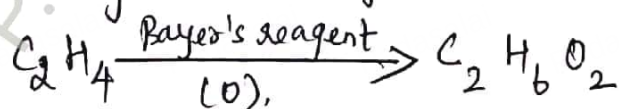


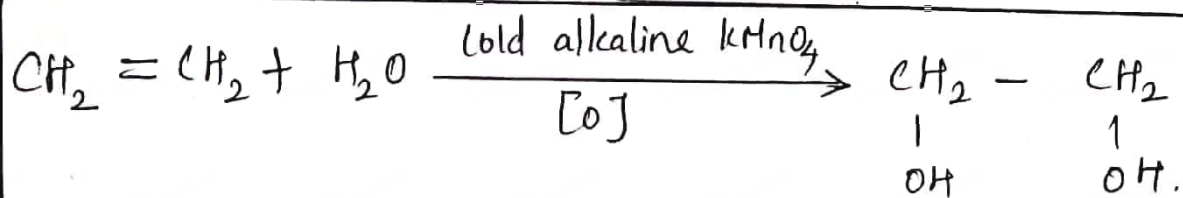
S.No	Compound	Name	Structure.
1	A	potassium permanganate	KMnO_4
2	B	potassium sulphate	K_2SO_4
3	C	Manganese sulphate	MnSO_4
4	D	acetaldehyde.	CH_3CHO

Q) Compound (A) is a powerful oxidizing agent and also which is known "Bayer's reagent" (A) oxidise an unsaturated organic compound (B) has the molecular formula C_2H_4 into compound (C) ($\text{C}_2\text{H}_6\text{O}_2$) which is used as anti freeze in auto mobile radiator. Find out (A), (B) and (C). Explain the reaction.

SOLUTION:

(i) compound (A) and alkaline solution and KMnO_4 is a bayer's reagent.





S.No	Compound	Name	Structure
1	A	cold alkaline	KMnO ₄
2	B	Ethylene	CH ₂ =CH ₂
3	C	Ethylene glycol.	HO-CH ₂ -CH ₂ -OH

standard electrode potential of transition metals:-

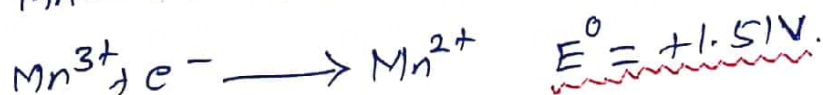
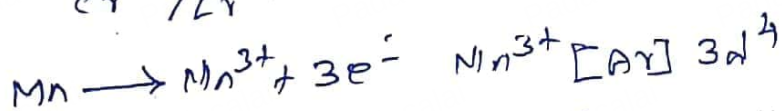
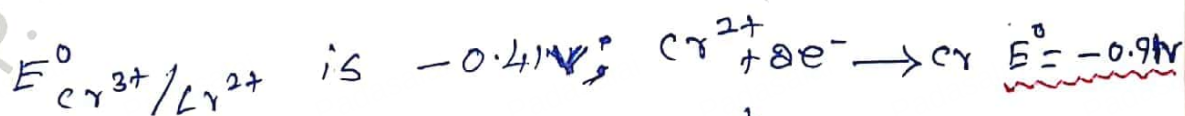
Reaction Redox	Standard reduction potential (V)
$Ti^{3+} + e^- \rightarrow Ti^{2+}$	-1.63
$V^{2+} + 2e^- \rightarrow V$	-1.19
$Cr^{2+} + 2e^- \rightarrow Cr$	-0.91
$Mn^{2+} + 2e^- \rightarrow Mn$	-1.18
$Fe^{2+} + 2e^- \rightarrow Fe$	-0.44
$Co^{2+} + 2e^- \rightarrow Co$	-0.28
$Ni^{2+} + 2e^- \rightarrow Ni$	-0.23
$Cu^{2+} + 2e^- \rightarrow Cu$	+0.34
$Zn^{2+} + 2e^- \rightarrow Zn$	-0.76

Reaction	Std. reduction potential (V)
$Ti^{3+} + e^- \rightarrow Ti^{2+}$	-0.37
$V^{3+} + e^- \rightarrow V^{2+}$	-0.26
$Cr^{3+} + e^- \rightarrow Cr^{2+}$	-0.41
$Mn^{3+} + e^- \rightarrow Mn^{2+}$	+1.51
$Fe^{3+} + e^- \rightarrow Fe^{2+}$	+0.77
$Co^{3+} + e^- \rightarrow Co^{2+}$	+1.81

(*) If the standard electrode potential E^0 of a metal is large and negative, the metal is a powerful reducing agent because it loses electron easily.

(*) If the standard electrode potential E^0 of a metal is large and positive, the metal is a powerful oxidising agent because it gains electron easily.

Example: Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing - why?



E° - value	agent.
large and negative	Reducing agent.
large and positive	oxidising agent.

$\therefore \text{Cr}^{2+}$ is strong reducing. while Mn^{3+} is strongly oxidising.

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Hydroxy Derivatives And Esters,

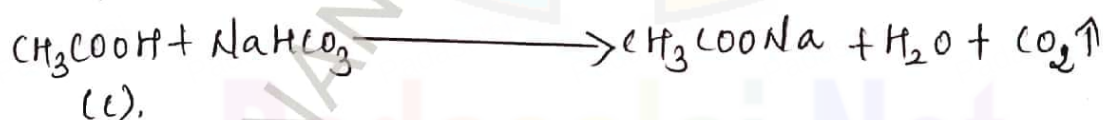
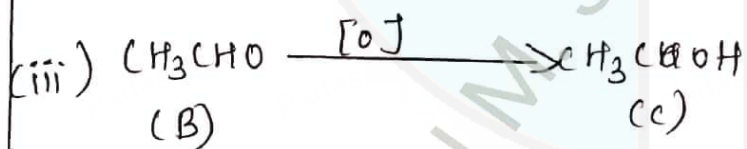
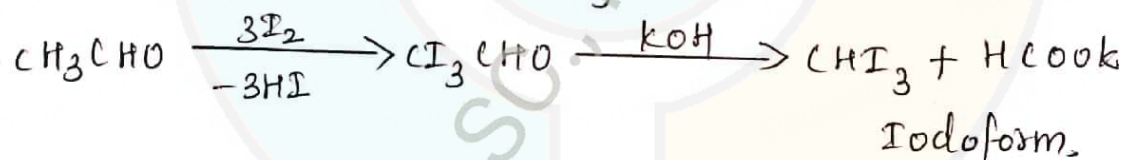
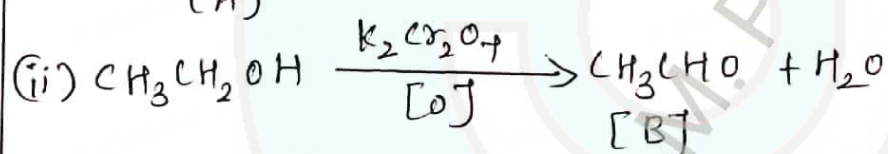
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11. HYDROXY DERIVATIVES AND ETHERS.

- ① An organic compound 'A' has the formula C_2H_6O . It liberates hydrogen with metallic sodium. 'A' on oxidation with acidified dichromate gives 'B' (C_2H_4O). 'B' undergoes iodoform test. 'B' on further oxidation gives 'C' ($C_2H_4O_2$). 'C' gives effervescence with sodium bicarbonate solution. Identify A, B, and C. Explain the reactions?

SOLUTION:

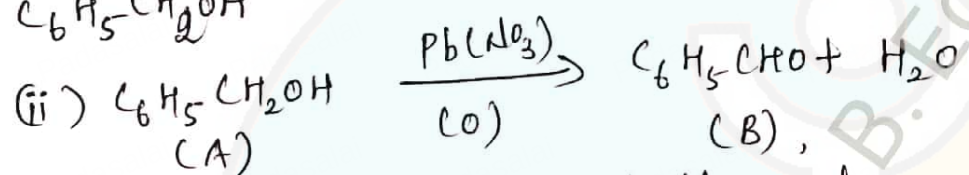
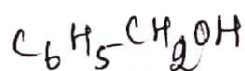


S.No	Compound	Structure	Name
1	A	CH_3CH_2OH	Ethanol
2	B	CH_3CHO	Acetaldehyde
3	C	CH_3COOH	Acetic acid.

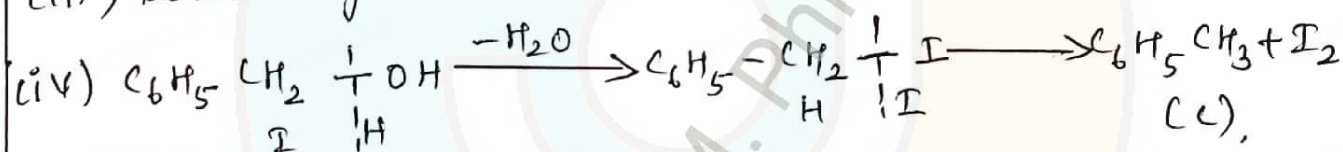
- ② An organic compound (A) (C_7H_8O) on oxidation with $Pb(NO_3)_2$ gives 'B' (C_7H_6O) 'B' has a bitter almond smell 'A' when reduced with H_2/P gives the hydrogen 'C' what are A, B and C? Explain the reaction?

SOLUTION:

(i) An organic compound 'A' Benzyl Alcohol

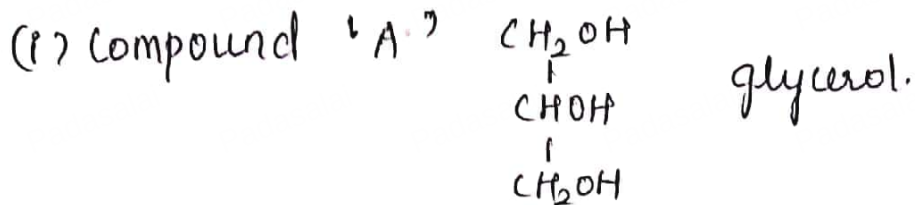


(iii) Benzaldehyde has a bitter almond smell.

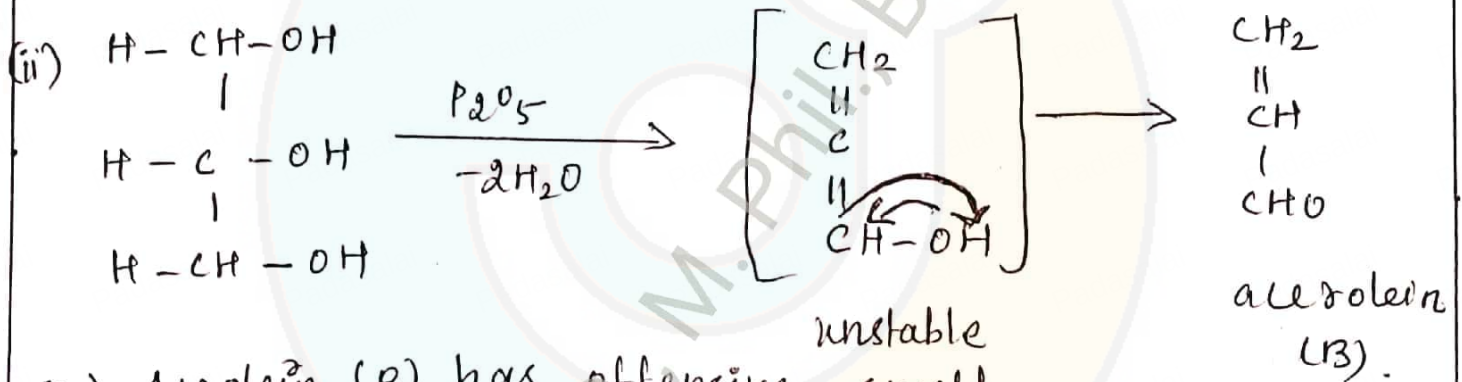
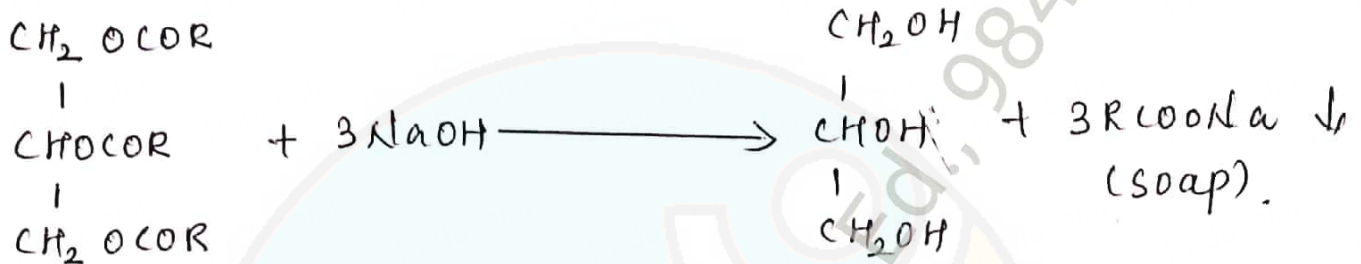


Compound	Structure	Name
A	$C_6H_5CH_2OH$	Benzyl alcohol
B	C_6H_5CHO	Benzaldehyde
C	$C_6H_5CH_3$	Toluene

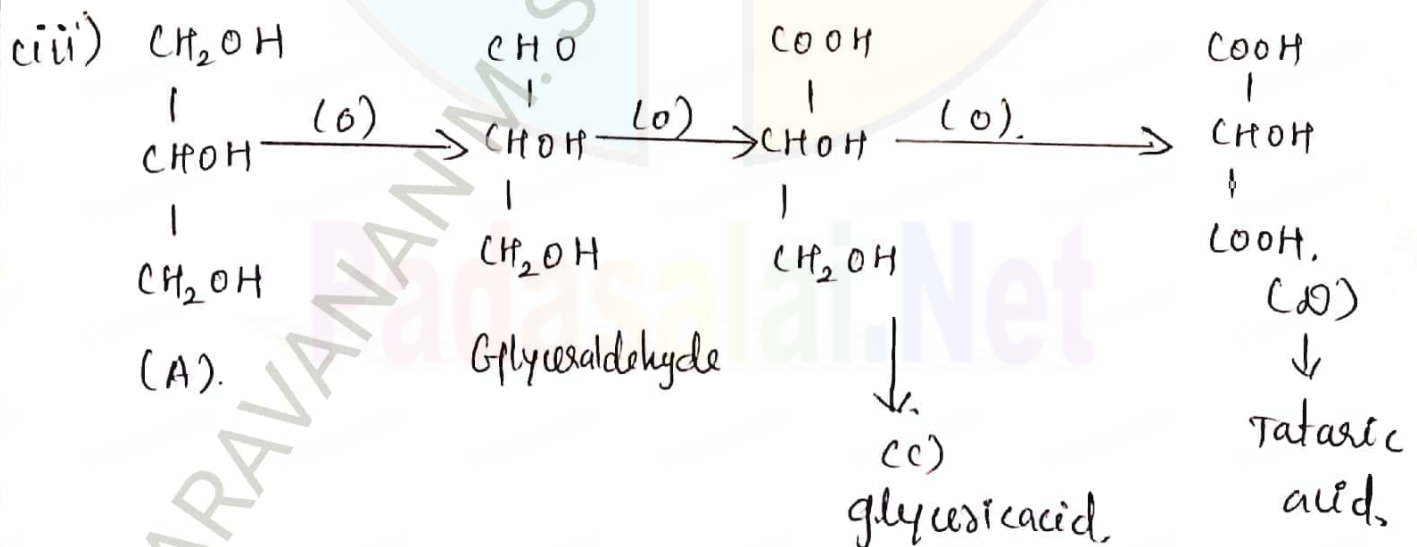
- ③ An organic compound 'A' ($C_3H_8O_3$) is obtained as a by-product manufacture of soap. with P_2O_5 'A' gives 'B' (C_3H_4O) which has an effensive smell. 'A' on oxidation with con. HNO_3 gives 'C' ($C_3H_6O_4$) and 'D' ($C_3H_4O_5$) what are A, B, C and D? explain the reactions?

SOLUTION:

Glycerol (A) is obtained as a by-product in the manufacture of soap.



(iv) Acrolein (B) has offensive smell.

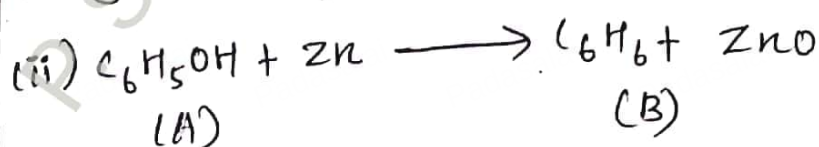


Compound	Structure	name
A	$ \begin{array}{c} \text{CH}_2\text{OH} \\ \\ \text{CHOH} \\ \\ \text{CH}_2\text{OH} \end{array} $	glycerol
B	$ \begin{array}{c} \text{CH}_2 \\ \\ \text{CH} \\ \\ \text{CHO} \end{array} $	Acrobin
C	$ \begin{array}{c} \text{COOH} \\ \\ \text{CHOH} \\ \\ \text{CH}_2\text{OH} \end{array} $	glycolic acid,
D	$ \begin{array}{c} \text{COOH} \\ \\ \text{CHOH} \\ \\ \text{COOH} \end{array} $	Tartaric acid,

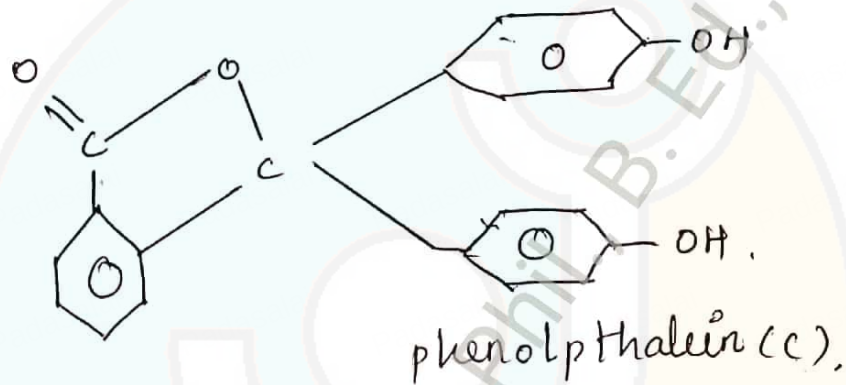
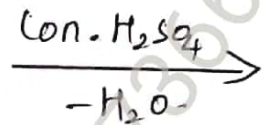
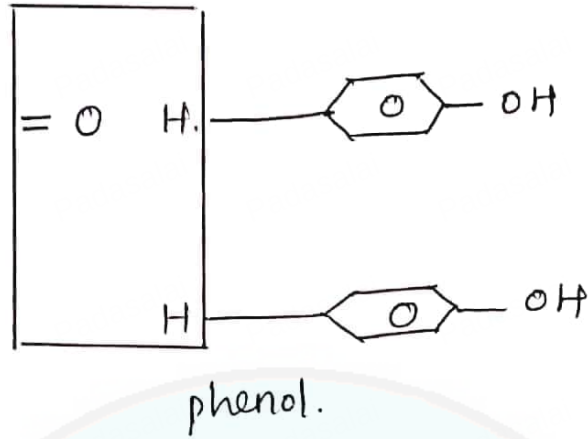
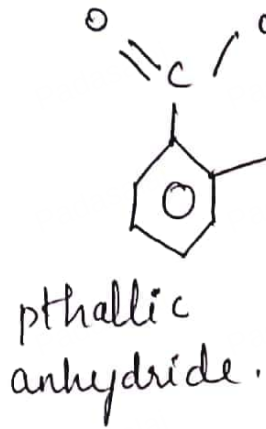
(iv) An organic compound 'A' ($\text{C}_6\text{H}_6\text{O}$) - $\text{C}_6\text{H}_6\text{O}$ gives violet colour with neutral FeCl_3 solution. when distilled in zinc dust it gives the hydrocarbon 'B'. 'A' with phthalic anhydride in the presence of con. H_2SO_4 gives 'C' ($\text{C}_{12}\text{H}_{10}\text{O}_4$) on indicator what are A, B and C? Explain the reaction?

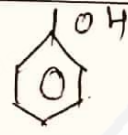
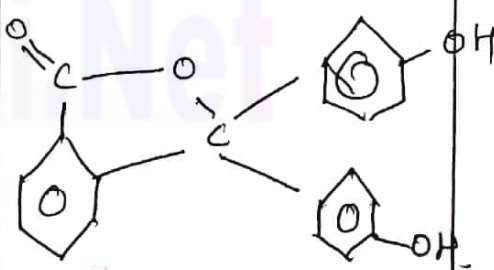
SOLUTION:

(i) compound 'A' phenol, it reacts with neutral FeCl_3 soln give violet colour



(iii)

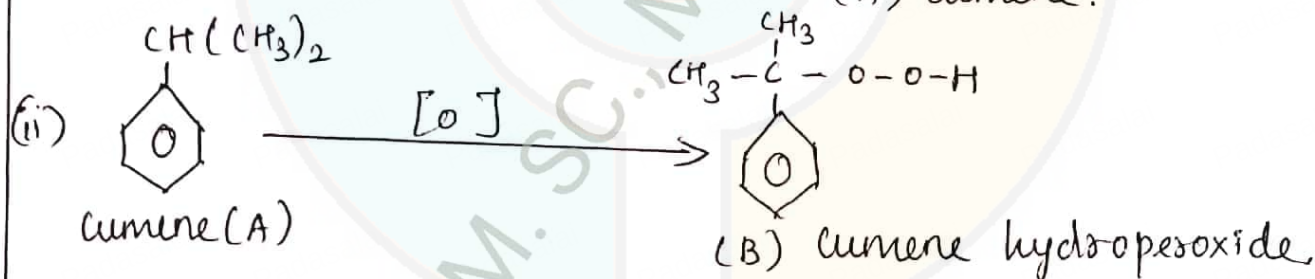
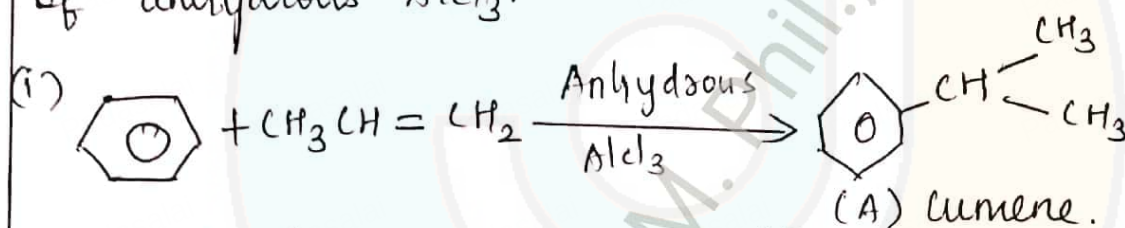


S.No	Compound	Name	Structure
1	A	phenol	
2	B	Benzene	C_6H_6
3	C	phenolphthalein	

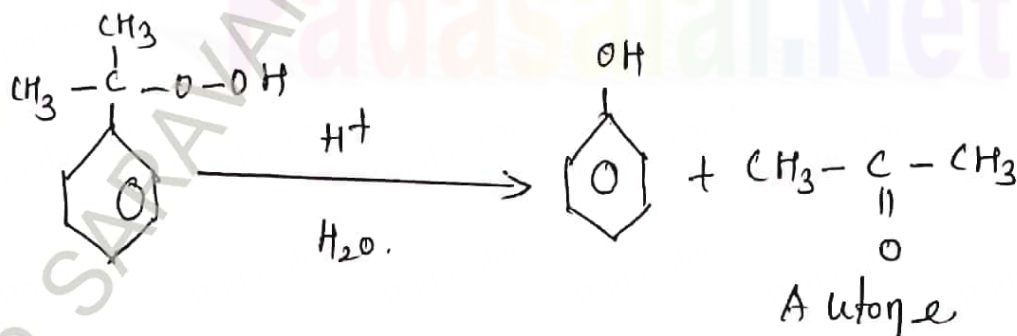
- (5) An aromatic hydrocarbon 'A' (C_9H_{12}) is obtained from benzene and propylene in the presence of anhydrous $AlCl_3$. 'A' on air oxidation gives 'B' ($C_9H_{12}O_2$). 'B' on acidification gives 'C' (C_6H_6O) and 'D' (C_3H_6O) and 'C' gives violet colour with neutral $FeCl_3$ solution. 'D' undergoes iodoform test. Identify A, B, C and D. Explain the reactions?

SOLUTION:

(i) An aromatic hydrocarbon 'A' cumene. It is obtained from benzene and propylene in the presence of anhydrous $AlCl_3$.



(iii) 'B' on acidification gives phenol (C) and Acetone (D).

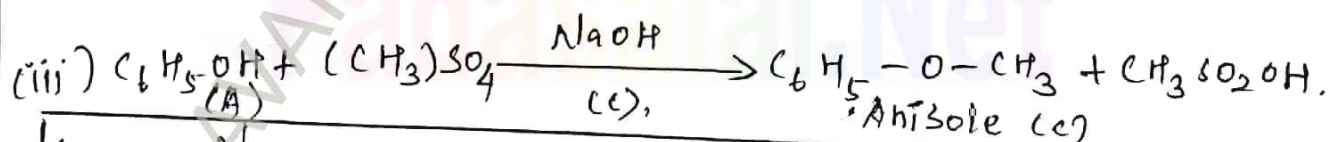
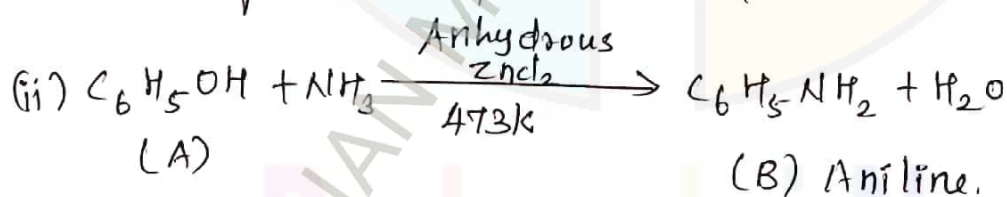


Phenol (C) reacts with neutral $FeCl_3$ solution gives violet colour.

Compound	Name	Structure
A	Cumene	
B	Cumene hydroperoxide	
C	phenol	
D	Acetone	

⑤ An organic compound 'A' (C_6H_6O) is a weak acid with NH_3 in presence of anhydrous $ZnCl_2$, 'A' gives 'B' (C_6H_7N) 'A' with dimethyl sulphate gives 'C' (C_7H_8O) what are A, B, C? explain the reaction?

(i) An organic compound "A" phenol it is weak acid.

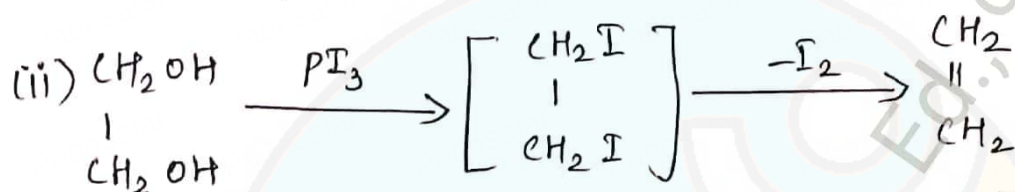


Compound	Structure	Name
A	C_6H_5OH	phenol
B	$C_6H_5NH_2$	Aniline
C	$C_6H_5-O-CH_3$	Anisole.

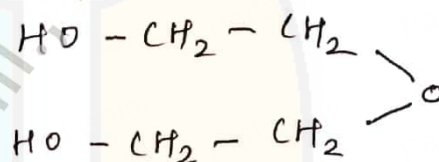
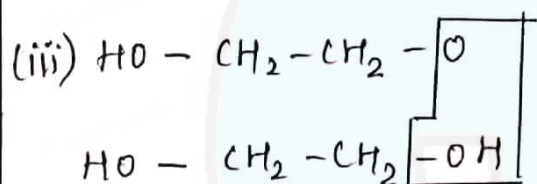
- ④ An organic compound 'A' ($C_2H_6O_2$) with PI_3 gives an alkene 'B'. 'A' with con. phosphoric acid gives a linear molecule 'C' with con. H_2SO_4 give acidic compound 'D'. what are A, B and C? Explain the reaction?

SOLUTION:

(i) An organic compound 'A' Ethylene glycol.

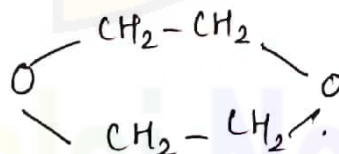
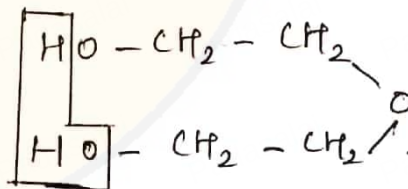
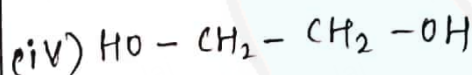


(B) Ethylene



diethylene glycol

(C)



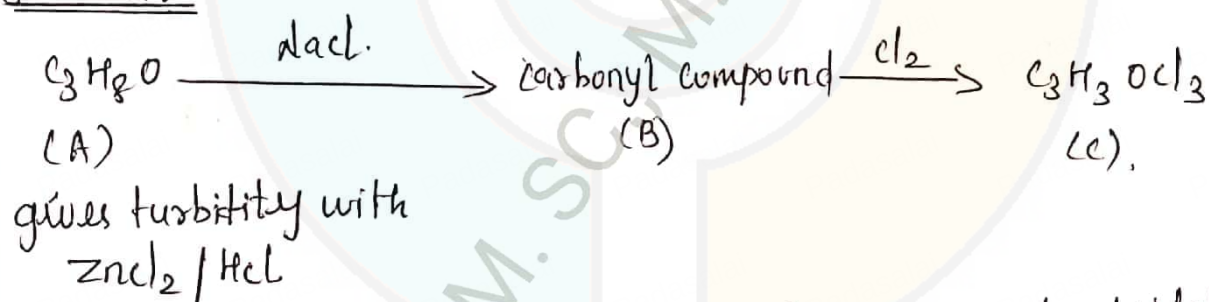
(D) dioxen.

Compound	Structure	Name
A	$\begin{array}{c} CH_2-OH \\ \\ CH_2OH \end{array}$	Ethylene glycol
B	$\begin{array}{c} CH_2 \\ \\ CH_2 \end{array}$	Ethylene.

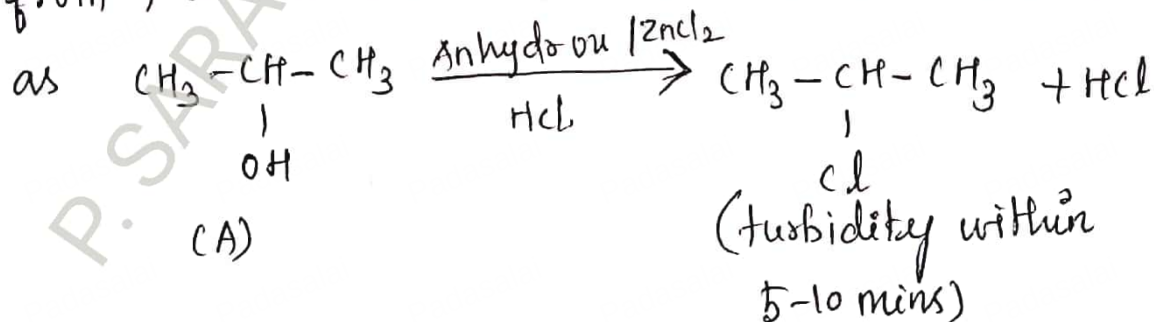
C	$\begin{array}{c} \text{HO}-\text{CH}_2-\text{CH}_2 \backslash \\ \text{HO}-\text{CH}_2-\text{CH}_2 / \end{array} \text{O}$	diethylene glycol
D	$\begin{array}{c} \text{CH}_2-\text{CH}_2 \backslash \\ \text{O} \quad \quad \quad \text{O} \\ \text{CH}_2-\text{CH}_2 / \end{array}$	dioxan.

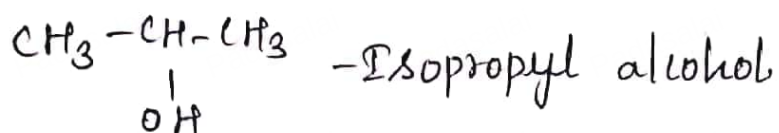
- ⑧ An organic compound (A) of molecular formula $\text{C}_3\text{H}_8\text{O}$ gives turbidity within 5-10 mins on reaction with anhydrous ZnCl_2/HCl compound (A) on treatment with sodium hypochlorite gives a carbonyl compound (B) which on further chlorination gives compound (C) of molecular formula $\text{C}_3\text{H}_3\text{OCl}_3$. Identify (A), (B) and (C). Explain the reaction?

SOLUTION:

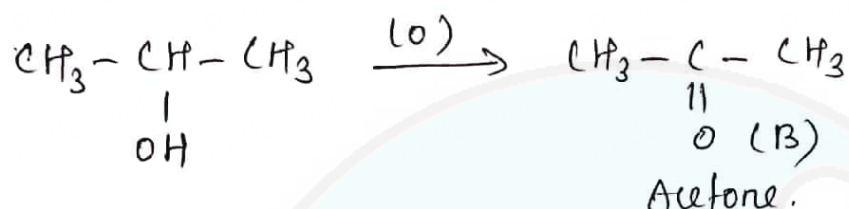


(i) An organic compound (A) that gives turbidity within 5-10 minutes on reaction with anhydrous ZnCl_2/HCl means it must be secondary alcohol from the molecular formula it is identified as

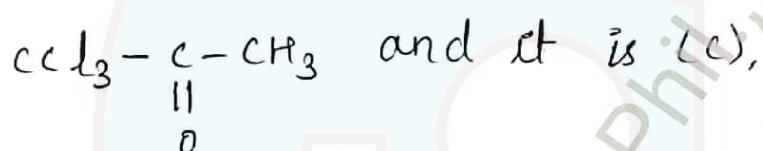




(ii) Isopropyl alcohol on treatment with sodium hypochloride undergoes oxidation to give acetone compound (B).



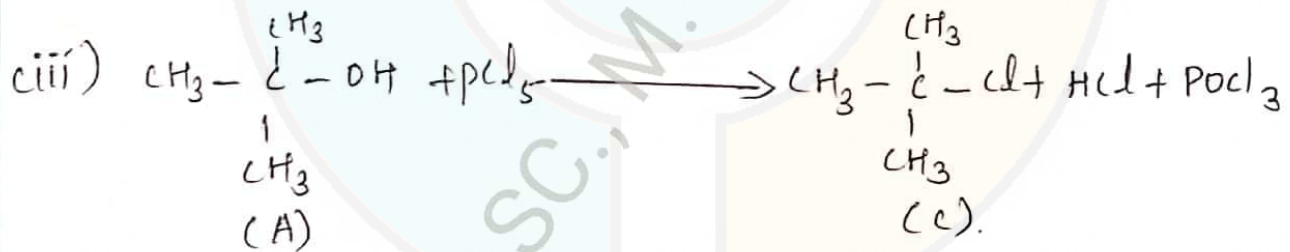
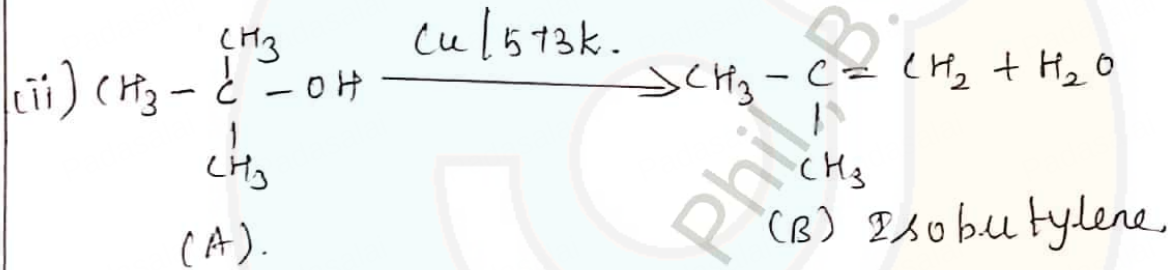
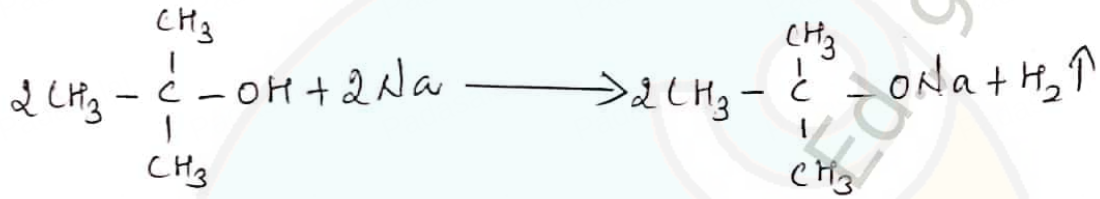
(iii) Acetone on treatment with chlorine trichloro acetone



Compound	structure	name
A	$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_3 \\ \\ \text{OH} \end{array}$	Isopropyl alcohol
B	$\begin{array}{c} \text{CH}_3 - \text{C} - \text{CH}_3 \\ \\ \text{O} \end{array}$	Acetone
C	$\begin{array}{c} \text{CCl}_3 - \text{C} - \text{CH}_3 \\ \\ \text{O} \end{array}$	Trichloro acetone

- ⑨ An organic compound 'A' $C_4H_{10}O$ liberates hydrogen with sodium when heated with copper at 573K it gives 'B' (C_4H_8) 'A' with PCl_5 gives 'C'. what are A, B and C? Explain the reaction?

(i) Compound 'A' 3° Alcohol $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - OH$



Compound	Structure	Name
A	$CH_3 - \overset{\overset{CH_3}{ }}{\underset{\underset{CH_3}{ }}{C}} - OH$	t-butyl alcohol.
B	$CH_3 - \overset{\overset{CH_3}{ }}{\underset{\underset{CH_3}{ }}{C}} = CH_2$	Iso butylene.
C	$CH_3 - \overset{\overset{CH_3}{ }}{\underset{\underset{CH_3}{ }}{C}} - Cl$	1,1-dimethyl ethyl chloride.

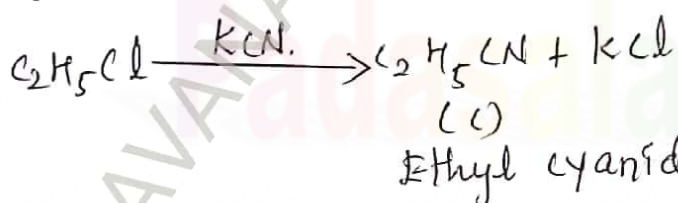
- (16) An organic compound (A) of molecular formula C_2H_6O on treatment with PCl_5 gives compound (B). Compound (B) reacts with KCN to give a compound (C) of molecular formula C_3H_5N which undergoes acid hydrolysis to give compound (D) which on treatment with soda lime gives a hydrocarbon. Identify (A), (B), (C) and (D), and explain the reactions?

(i) from the molecular formula (A) is identified as Ethyl alcohol CH_3-CH_2OH .

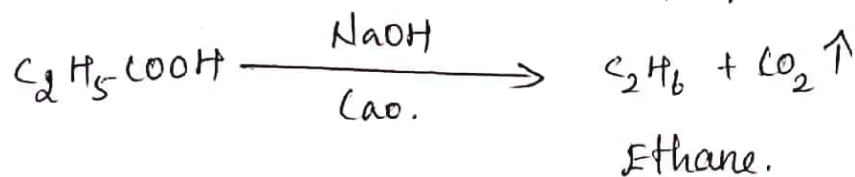
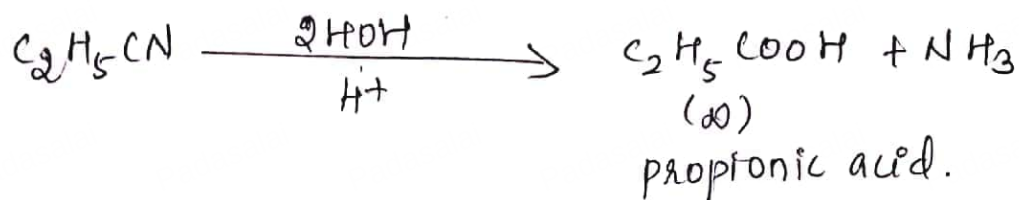
(ii) Ethyl alcohol on treatment with PCl_5 gives chloride C_2H_5Cl as (B).



(iii) Ethyl chloride on treatment with KCN gives ethyl cyanide C_2H_5CN as (C).

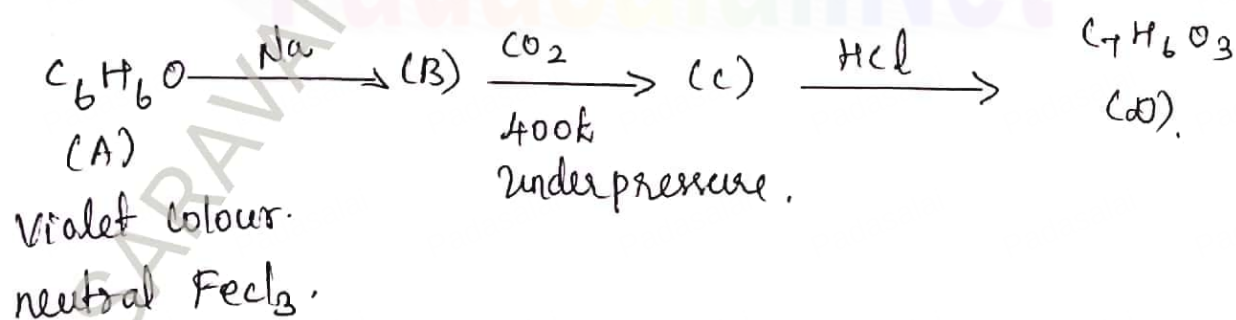


(iv) Ethyl cyanide on hydrolysis gives propionic acid CH_3CH_2COOH as (D) propionic acid on treatment with soda lime gives ethane a hydrocarbon.



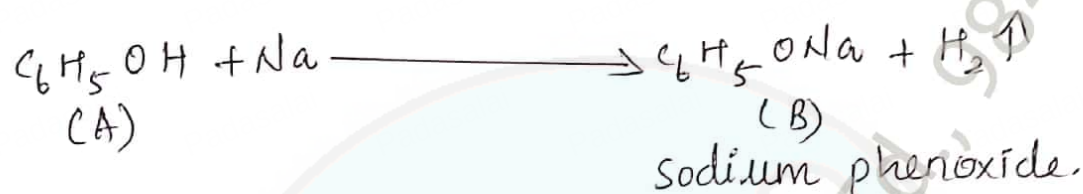
Compound	Structure	Name
A	$\text{C}_2\text{H}_5\text{OH}$	Ethyl alcohol
B	$\text{C}_2\text{H}_5\text{Cl}$	Ethyl chloride
C	$\text{C}_2\text{H}_5\text{CN}$	Ethyl cyanide
D	$\text{C}_2\text{H}_5\text{COOH}$	propionic acid.

- (ii) An organic compound A of molecular formula $\text{C}_6\text{H}_6\text{O}$ gives violet colouration with neutral FeCl_3 . Compound A treatment with metallic Na gives compound B. Compound B on treatment with CO_2 at 400K under pressure gives C. This product on acidification gives compound D ($\text{C}_7\text{H}_6\text{O}_3$) which is used in medicine. Identify A, B, C and D and explain the reactions?

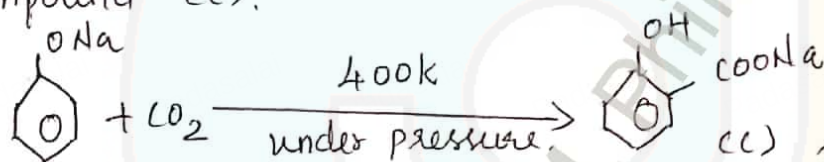


(i) from the molecular formula compound (A) is identified as phenol C_6H_5OH . it gives violet colour with neutral Ferric chloride

(ii) phenol on reaction with metallic sodium phenoxide C_6H_5ONa and it is (B).



(iii) sodium phenoxide on reaction with CO_2 at 400k under pressure (Kolbe's rxn) gave sodium salicylate compound (C).



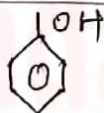
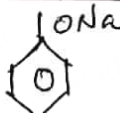
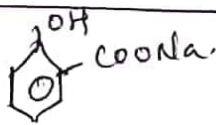
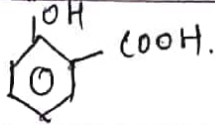
(C) sodium salicylate.

(iv) sodium salicylate on treatment with acid give salicylic acid compound (D) which is used as a medicine.



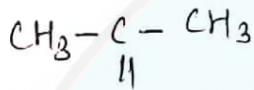
sodium salicylate.

(D) salicylic acid.

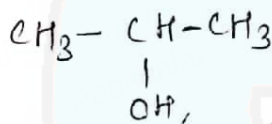
Compound	Structure	Name
A		phenol
B		sodium phenoxide
C		sodium salicylate
D		Salicylic acid.

- (15) An organic compound A of molecular formula C_3H_6O on reduction with $LiAlH_4$ gives B. Compound B gives blue colour in Victor Meyer's test and also form a chloride C with $SOCl_2$. The chloride on treatment with alcoholic KOH gives D. Identify A, B, C, and D. Explain the reactions?

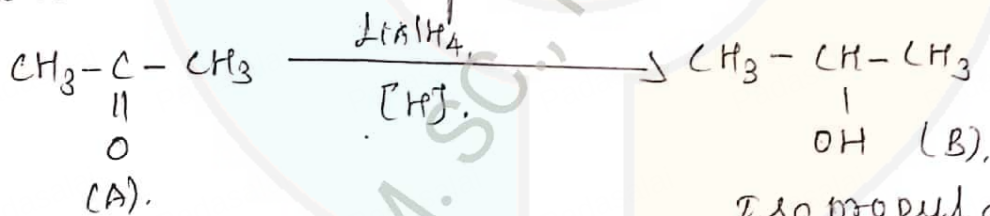
(i) An organic compound (A) of molecular formula C_3H_6O must be a carbonyl compound and it is acetone.



(ii) Acetone on reduction with $LiAlH_4$ gives, Isopropyl alcohol.

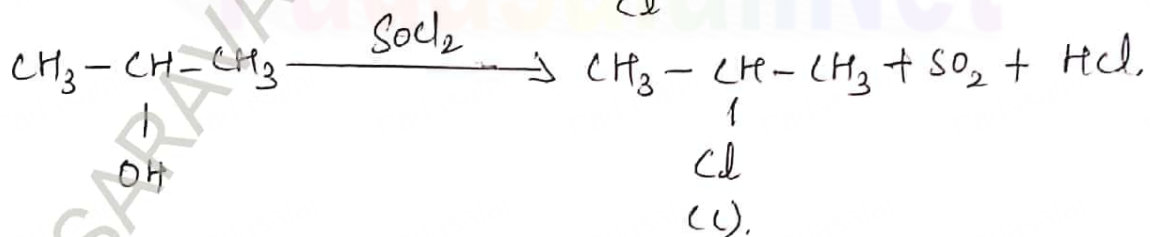


which is secondary alcohol and it gives blue colour in Victor Meyer's test.



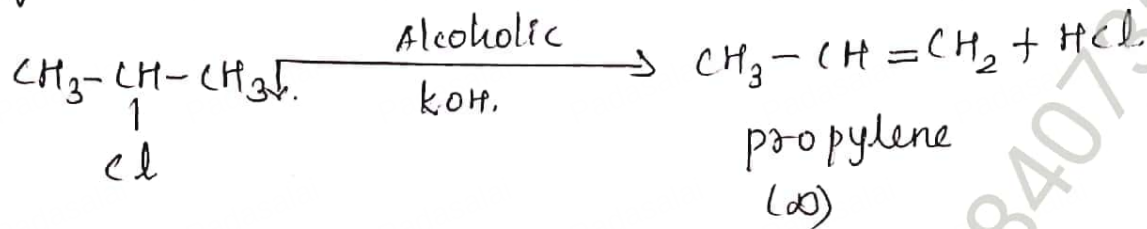
Isopropyl alcohol.

(iii) Isopropyl alcohol reacts with $SOCl_2$ to give isopropyl chloride $CH_3 - CH - CH_3$ and it is (C).



Isopropyl chloride

(iv) Isopropyl chloride. on treatment with alcoholic KOH propylene $\text{CH}_3-\text{CH}=\text{CH}_2$ will be formed by elimination reaction.



Compound	Structure	Name
A	$\text{CH}_3-\underset{\text{O}}{\underset{ }{\text{C}}}-\text{CH}_3$	Acetone
B	$\text{CH}_3-\underset{\text{OH}}{\underset{ }{\text{C}}}-\text{CH}_3$	Isopropyl alcohol.
C	$\text{CH}_3-\underset{\text{Cl}}{\underset{ }{\text{C}}}-\text{CH}_3$	Isopropyl chloride
d	$\text{CH}_3-\text{C}=\text{CH}_2$	propylene.

(13) An Organic compound (A) ($\text{C}_3\text{H}_8\text{O}$) answer Lucas test within 5-10 minutes on oxidation form B ($\text{C}_3\text{H}_6\text{O}$) this on further oxidation form C ($\text{C}_2\text{H}_4\text{O}_2$) when it gives effervescence with Na_2CO_3 / NaHCO_3 B also undergoes iodoform reaction Identify A, B, C. Explain the conversion of A to B and C.

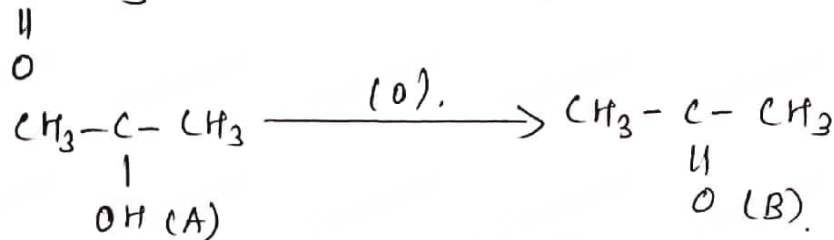
SOLUTION:

(i) $\text{C}_3\text{H}_8\text{O}$ answer Lucas test within 5-10 minutes means it must be a second alcohol $\text{CH}_3-\underset{\text{OH}}{\underset{|}{\text{CH}}}-\text{CH}_3$

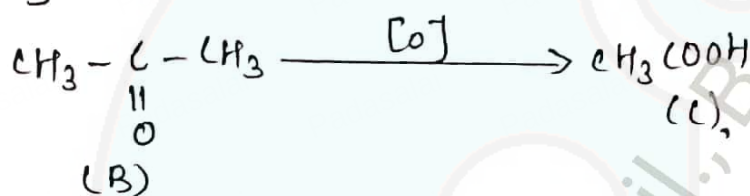
Isopropyl alcohol (A).

(ii) Isopropyl alcohol on oxidation gives acetone.

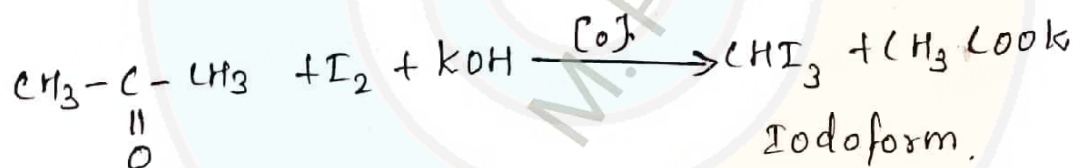
$\text{CH}_3-\text{C}-\text{CH}_3$ and it is (B).



(iii) Acetone on further oxidation gives acetic acid CH_3COOH which gives brisk effervescence with Na_2CO_3 and acetic acid (C).



acetone answer Iodoform reaction.



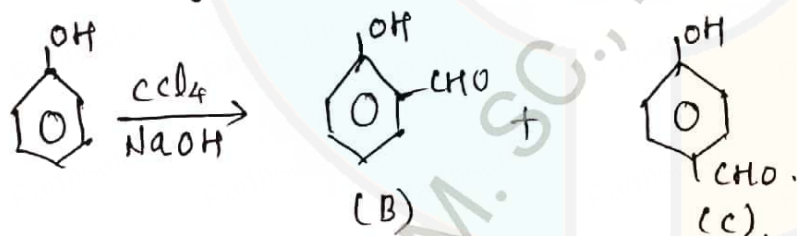
Compound	Structure	Name
A	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_3 \\ \\ \text{OH} \end{array}$	Isopropyl alcohol.
B	$\begin{array}{c} \text{CH}_3-\text{C}-\text{CH}_3 \\ \\ \text{O} \end{array}$	Acetone
C	CH_3COOH	Acetic acid.

12. An organic compound (A) of molecular formula C_6H_6O gives violet colour with neutral $FeCl_3$ (A) gives maximum of two isomers (B) and (C). when an alkaline solution of (A) is refluxed with CCl_4 . (A) also reacts with $C_6H_5N_2Cl$ to give the compound (D) which is red orange dye. Identify (A), (B), (C) and (D). Explain with suitable chemical reactions?

SOLUTION:

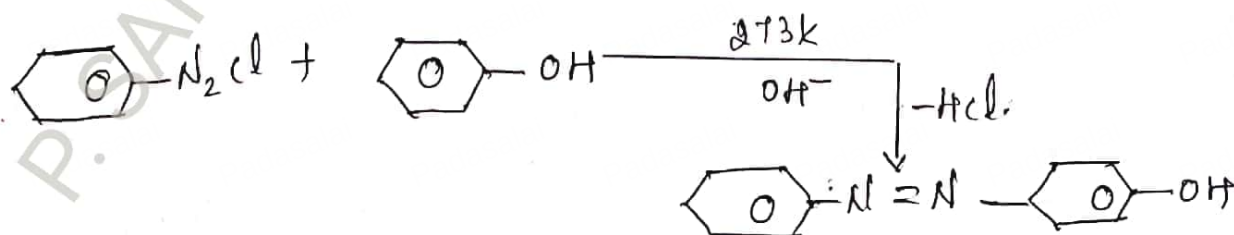
(i) An organic compound (A) gives violet colour with neutral $FeCl_3$. it is the test for phenol, from the molecular formula (A) is identified as C_6H_5OH phenol.

(ii) phenol on heating with CCl_4 in an alkaline medium gives isomers of salicylaldehyde (B) and (C).

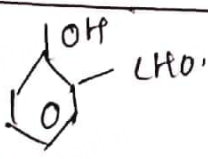
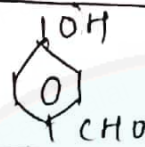
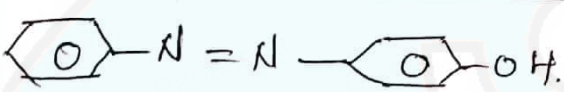


O & p - hydroxy benzaldehyde.

(iii) phenol reacts with benzene diazonium chloride to give p - hydroxy azobenzene as orange dye and it is compound (D).



p - hydroxy azobenzene.

Compound	Structure	Name
A	C_6H_5OH	phenol
B		p-hydroxy Benzaldehyde
C		o-hydroxy Benzaldehyde
29		p-hydroxy azobenzene.

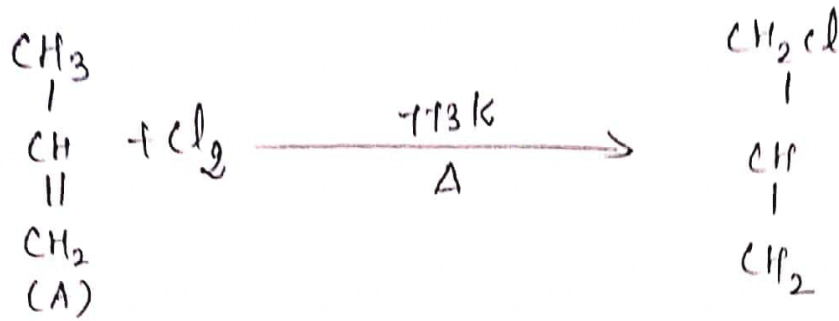
15

Compound A with molecular formula C_3H_6 is obtained from petroleum. When A is treated with chlorine at 773K compound B of molecular formula C_3H_5Cl is obtained. When B is treated with Na_2CO_3 solution at 773K/12 atm. it gives the compound C with molecular formula C_3H_6O . On treatment with HCl followed by hydrolysis is $NaOH$ gives D having molecular formula C_3H_8O find A, B, C and D. Explain the reactions?

(i) Compound (A) is obtained from petroleum. From the molecular formula it is identified as propylene

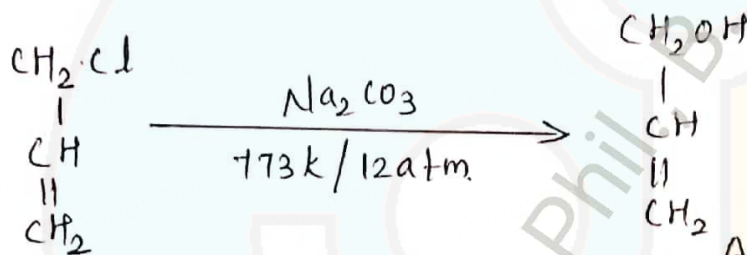
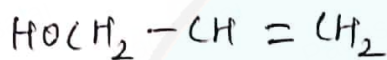


(ii) propylene on treatment with chlorine at 773K Alkyl chloride $CH_3-CH_2-CH_2Cl$ compound (B) will be formed.



Allyl chloride (B).

ciii) Allyl chloride on treatment with Na_2CO_3 at 773K 12atm pressure compound (c) Allyl alcohol will be formed.



Allyl alcohol (c).

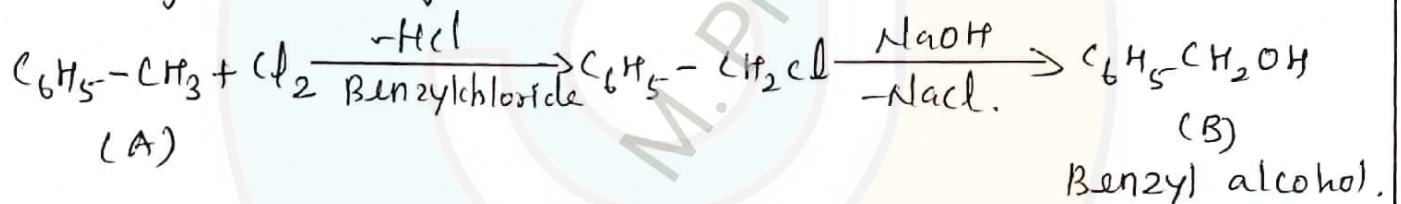
Allyl alcohol on treatment with HCl followed by hydrolysis with NaOH , glycerol, is formed as pressure (B).

Compound	Structure	Name
A	$\text{CH}_3 - \text{CH} = \text{CH}_2$	propylene
B	$\text{ClCH}_2 - \text{CH} = \text{CH}_2$	Allyl chloride
C	$\text{HOCH}_2 - \text{CH} = \text{CH}_2$	Allyl alcohol.
D	CH_2OH	Glycerol.
	$\begin{array}{c} \\ \text{CHOH} \\ \\ \text{CH}_2\text{OH} \end{array}$	

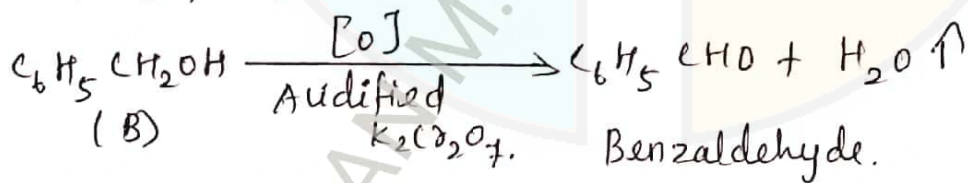
16) Compound A of molecular formula C_7H_8 is treated with chlorine and then with NaOH to get compound B of molecular formula C_7H_8O . B on oxidation by acidified $K_2Cr_2O_7$ gives compound C of molecular formula C_7H_6O . Compound C on treatment with 50% caustic soda gives the compound B and also D. Find A, B, C and D. Explain the reaction?

(i) From the molecular formula, compound (A) is identified as $C_6H_5-CH_3$ Toluene.

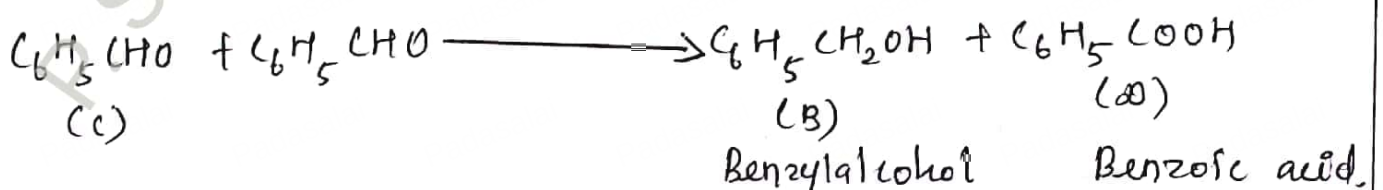
(ii) Toluene on reaction with chloride and then with NaOH gives Benzyl alcohol $C_6H_5CH_2OH$ as compound (B)



(iii) Benzyl alcohol on oxidation with acidified $K_2Cr_2O_7$ gives Benzaldehyde C_6H_5CHO as product (C).



(iv) Benzaldehyde when reacting with 50% caustic soda Cannizzaro take place and the product formed as Benzyl alcohol (B) Benzoic acid (D)

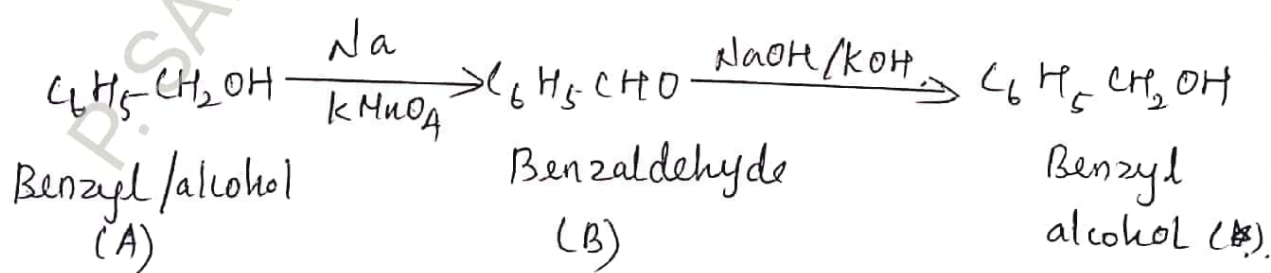


Compound	Structure	Name
A	$C_6H_5-CH_3$	Toluene
B	$C_6H_5CH_2OH$	Benzyl alcohol
C	C_6H_5CHO	Benzaldehyde
D	C_6H_5COOH	Benzoic acid.

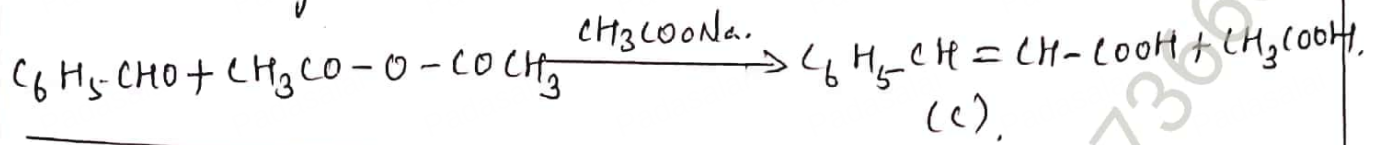
- (17) An organic compound (A) (C_7H_8O) liberates hydrogen with metal sodium (A) on treatment with acidic potassium dichromate gives (B) (C_7H_6O). Compound (B) when treated with $con. H_2H_4$ and $NaOH/KOH$ gives (A) (B) with acetic anhydride in the presence of sodium acetate gives (C) of molecular formula ($C_9H_8O_2$). Identify (A) (B) and (C). Explain the reaction involved?

(i) An organic compound C_7H_8O (A) which liberates hydrogen with metal sodium is benzyl alcohol having formula $C_6H_5CH_2OH$.

(ii) $C_6H_5CH_2OH$ (A) on treatment with acidic $K_2Cr_2O_7$ C_6H_5CHO (B) which when treated with $NaOH/KOH$ gives back Benzyl alcohol.



ciii) when Benzaldehyde (B) is heated with sodium salt of acetic acid. in presence of acetic anhydride. it form cinnamic acid (C).

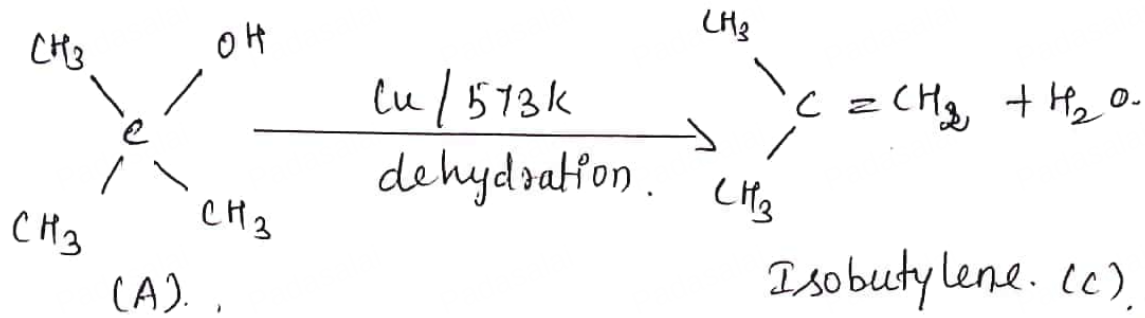


Compound	Structure	Name
A	$\text{C}_6\text{H}_5\text{CH}_2\text{OH}$	Benzyl alcohol
B	$\text{C}_6\text{H}_5\text{CHO}$	Benzaldehyde.
C	$\text{C}_6\text{H}_5\text{CH}=\text{CH}-\text{COOH}$	Cinnamic acid.

18) Two isomers (A) and (B) have the same molecular formula $\text{C}_4\text{H}_{10}\text{O}$. (A) when heated the copper at 573k gives an alkene (C) of molecular formula C_4H_8 . (B) on heating with copper at 573k gives (D) of molecular formula $\text{C}_4\text{H}_8\text{O}$ which does not reduce Tollen's reagent. but answer iodoform test. Identify (A), (B), (C) and (D). Explain the reactions.

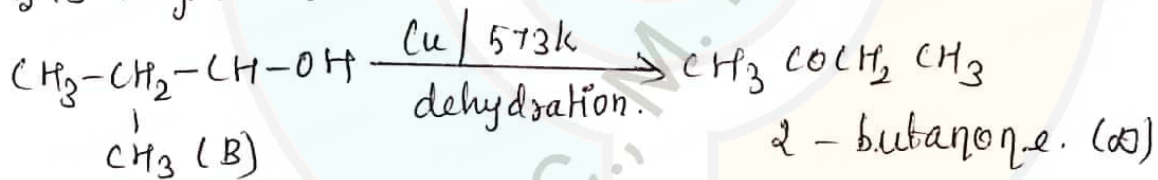
(i) Two isomers (A) and (B) are identified as tertiary butyl alcohol and secondary butyl alcohol.

(ii) tertiary butyl alcohol heated with copper at 573k gives an alkene.



Compound	Structure	Name
A	$ \begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} - \text{OH} \\ \\ \text{CH}_3 \end{array} $	2-methyl 2-propanol.
B	$ \begin{array}{c} \text{CH}_3 \text{CH}_2 \text{CH}(\text{OH})\text{CH}_3 \\ \\ \text{CH}_3 \end{array} $	2-butanol.

(iii) secondary butyl alcohol heated with copper at 573K give & identified as 2-butanone.

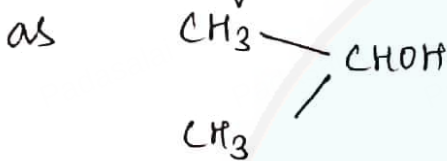


Compound	Structure	Name
A	$ \begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C} - \text{C} - \text{OH} \\ \\ \text{CH}_3 \end{array} $	2-methyl 2-propanol
B	$ \begin{array}{c} \text{CH}_3 \text{CH}_2 \text{CH}(\text{OH})\text{CH}_3 \\ \\ \text{CH}_3 \end{array} $	2 butanol
C	$ \begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{C} = \text{CH}_2 \\ \diagup \\ \text{CH}_3 \end{array} $	Isobutylene
D	$ \text{CH}_3 \text{COCH}_2 \text{CH}_3 $	2-Butanone

- (19) Compound (A) of molecular formula C_3H_8O liberates hydrogen with sodium metal (A) with P/I_2 gives (B). Compound (B) on treatment with silver nitrite gives (C) which gives blue colour with nitrous acid. Identify (A), (B), (C) and explain the reaction?

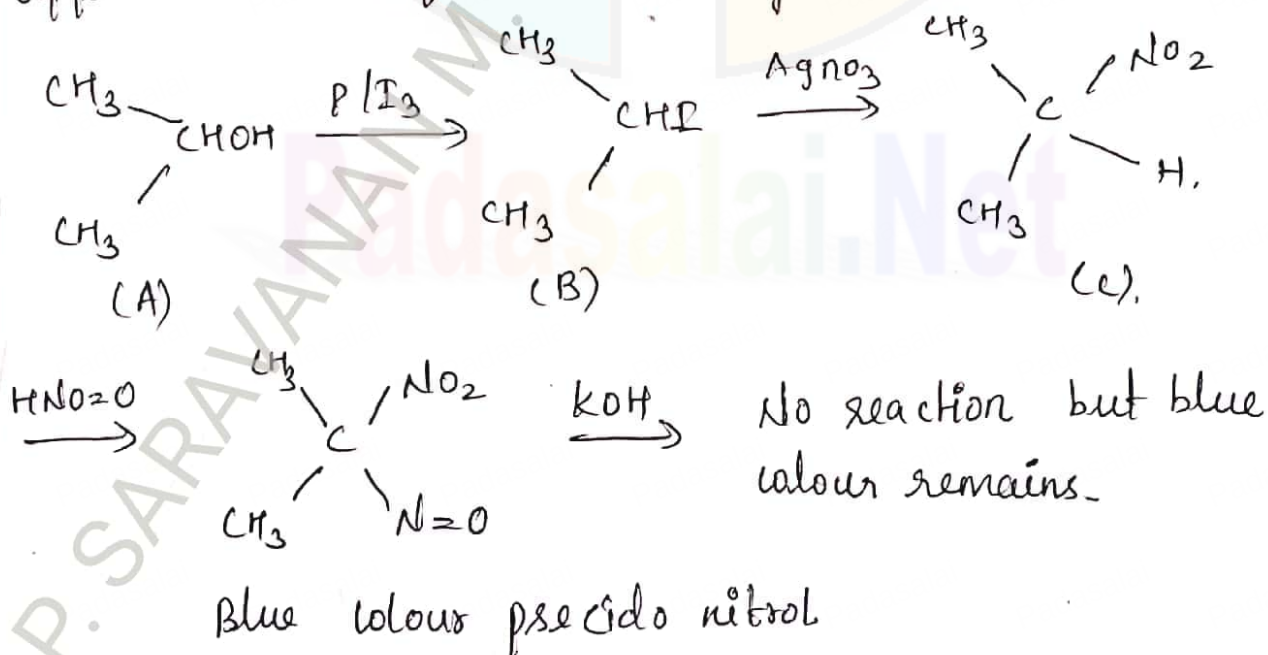
SOLUTION:

(i) Compound (A) of molecular formula C_3H_8O liberating hydrogen with sodium metal is an alcohol. By rearranging we can identify it is as



(ii) when (A) is subjected to Victor Meyer's test it undergoes the specified reaction. Isopropyl iodide and then to 2-nitro propane. This is treated with nitrous acid and aqueous KOH.

Isopropyl alcohol is a secondary alcohol. It doesn't dissolve in alkali, blue colour appears even before treating with alkali.



A $\rightarrow$ Isopropyl alcohol

B $\rightarrow$ Isopropyl iodide

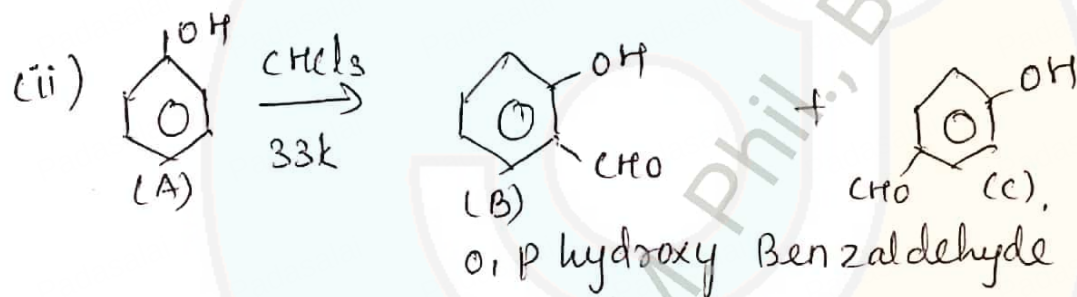
C $\rightarrow$ 2 nitro propane.

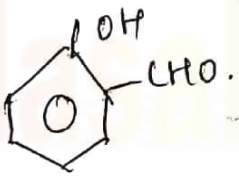
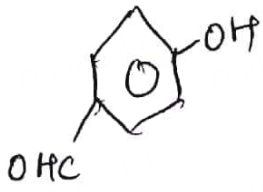
26

An organic compound X (C_6H_6O) gives maximum of two isomers Y and Z when an alkaline solution of X is refluxed with chloroform at 333K?

SOLUTION:

(i) Compound (X) - C_6H_5OH .



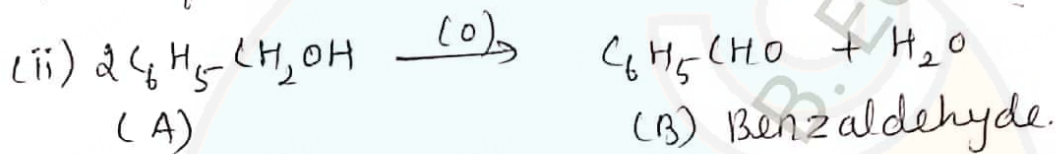
Compound	Structure	Name
X	C_6H_5OH	phenol
Y		o-hydroxy Benzaldehyde
Z		p-hydroxy Benzaldehyde

21

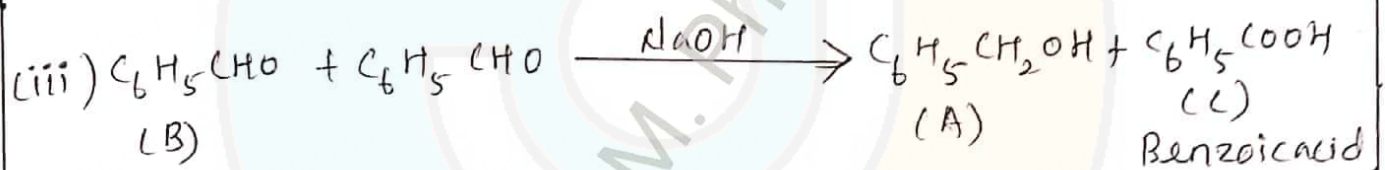
An aromatic compound 'A' with molecular formula C_7H_8O 'A' on oxidation gives 'B' C_7H_6O which does not reduce Fehling's solution. when heated with concentrated NaOH 'B' gives two compound 'A' and 'C' with molecular formula $C_7H_6O_2$. Identify A, B and C? explain the reaction?

SOLUTION:

(i) Compound (A) C_6H_5OH (Benzyl alcohol).



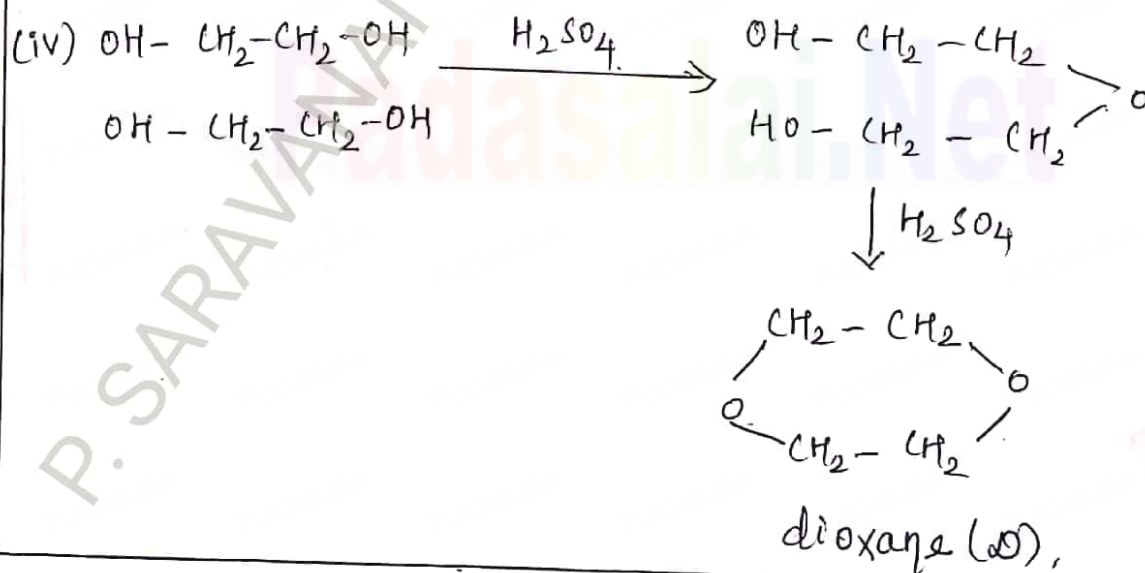
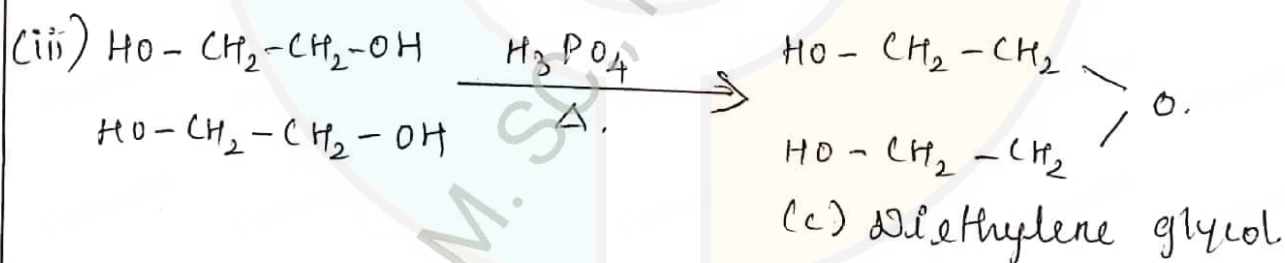
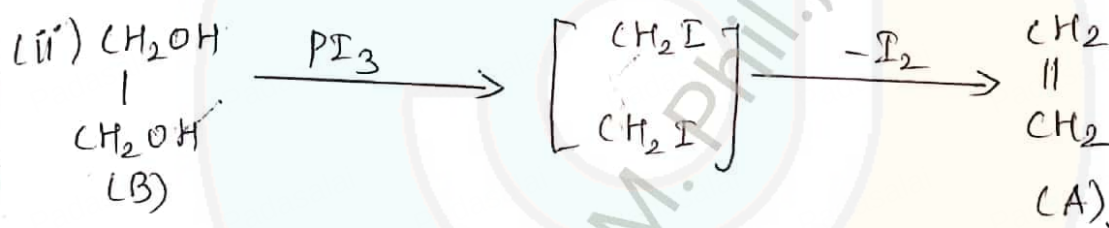
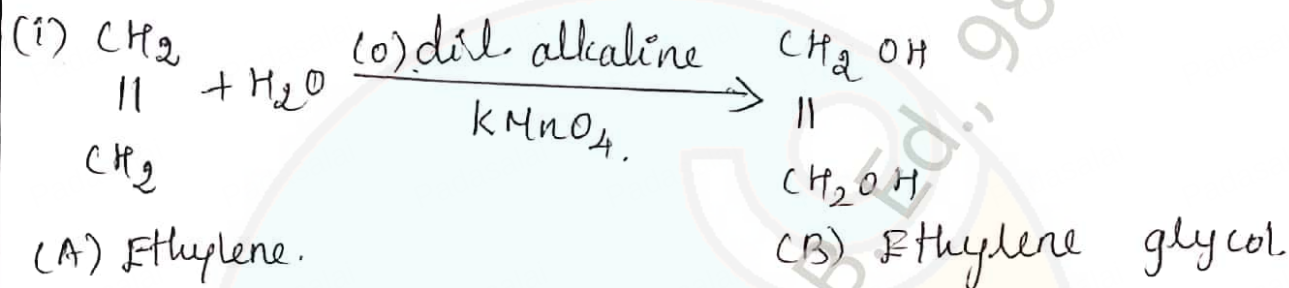
(B) does not reduce Fehling's solution.



Compound	Structure	Name
A	$C_6H_5CH_2OH$	Benzyl alcohol
B	C_6H_5CHO	Benzaldehyde
C	C_6H_5COOH	Benzoic acid.

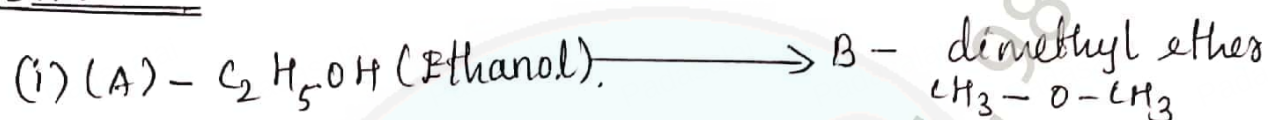
22. A simplest alkene. 'A' with Bayer's reagent gives 'B' with PI_3 'B' gives back 'A' B with con. phosphoric acid gives a linear molecule 'C', where as with con. H_2SO_4 give a cyclic molecule 'D' what are A, B, C, and D. Explain the reactions?

SOLUTION:

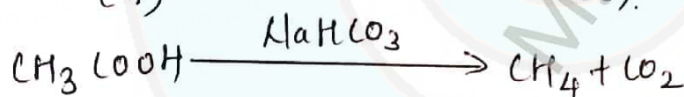
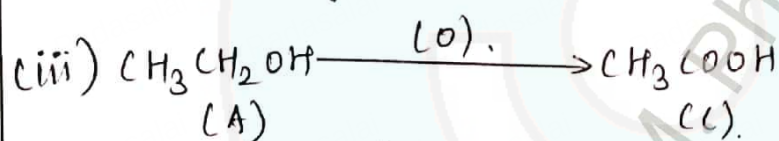


- Q3) Two organic compound A and B have the same molecular formula C_2H_6O . A react with metallic sodium to give 'B'. A on strong oxidation gives C. 'C' gives effervesence with $NaHCO_3$. Identify A, B and C. Explain the reactions?

SOLUTION:



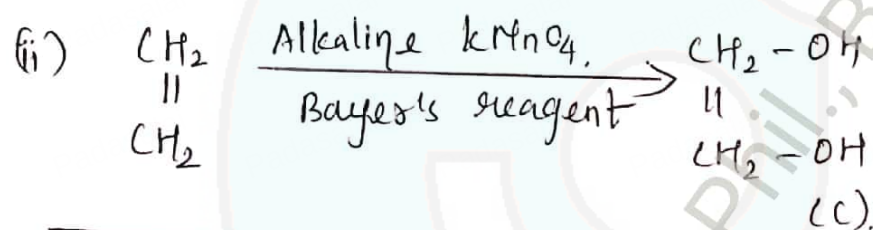
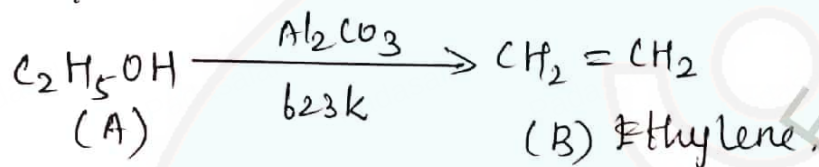
(ii) dimethyl ether react with metallic sodium does not give hydrogen.



Compound	structure	Name
A	C_2H_5OH .	Ethanol
B	CH_3-O-CH_3	dimethyl ether
C	CH_3COOH	acetic acid.

24. An aromatic compound 'A' has the molecular formula C_2H_6O . 'A' when heated with Al_2CO_3 at $623K$ gives 'B' C_2H_4 . 'B' when treated with Alkaline $KMnO_4$ gives 'C' ($C_2H_6O_2$). What are 'A', 'B', and 'C'. Explain the reactions?

(i) compound (A) - Ethanol (C_2H_5OH)

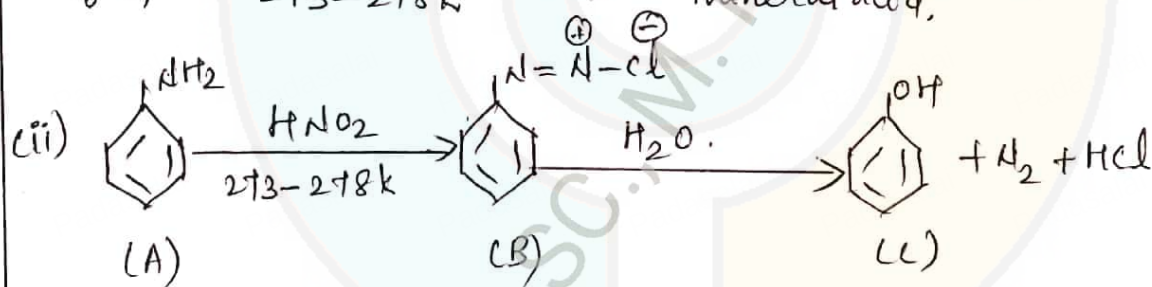
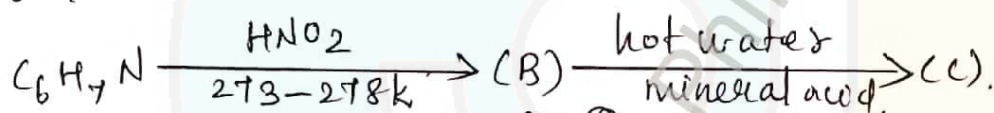


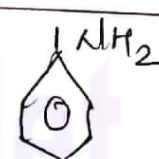
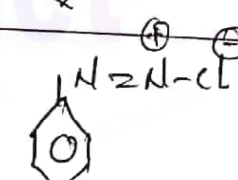
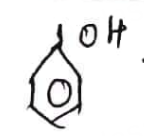
Compound	Structure	Name
A	C_2H_5OH	Ethanol
B	$CH_2=CH_2$	Ethylene
C	$\begin{array}{c} CH_2OH \\ \\ CH_2OH \end{array}$	Ethylene glycol

- (Q5) An aromatic primary amine (A) with molecular formula C_6H_7N is diazotized with nitrous acid at 273-278 K gives (B), (B) on further treated with hot water in the presence of mineral acid gives (C), which gives violet colour with neutral Ferric chloride. Identify (A), (B) and (C). and explain the reactions?

SOLUTION:

(i) An aromatic primary amine (A) aniline ($C_6H_5NH_2$) identified from its molecular formula C_6H_7N .

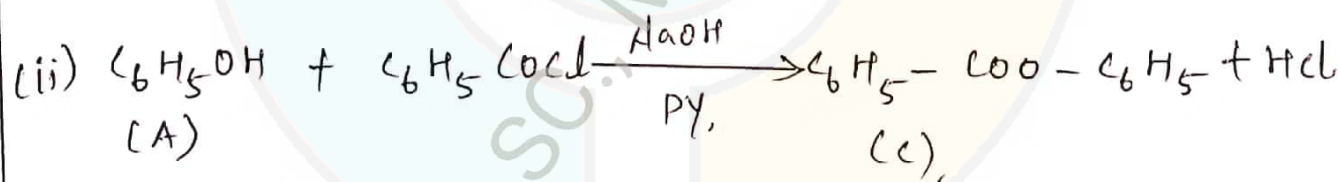
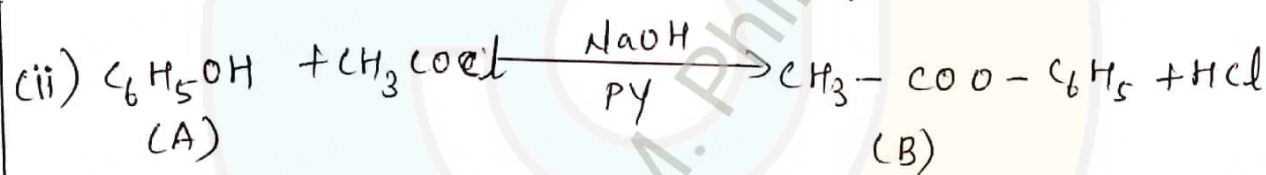


S.No	Compound	Name	Structure
1	A	Aniline	
2	B	Benzene diazonium chloride	
3	C	phenol	

- Q1) An aromatic compound (A) of molecular formula C_6H_6O gives violet colour with neutral ferric chloride (A) on treatment with acetyl chloride and benzoyl chloride in the presence of sodium hydroxide and pyridine gives (B) and (C). Find out A, B, and C. Explain the reaction?

SOLUTION:

(i) An aromatic compound (A) gives violet colour with neutral ferric chloride, it is the test for phenol, from the molecular formula (A) is identified as (C_6H_5OH) phenol.

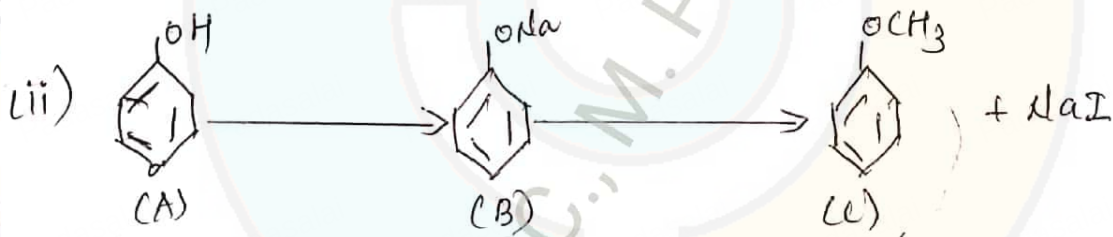


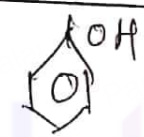
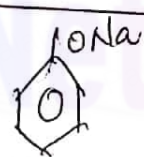
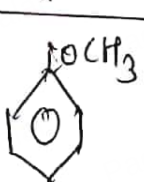
S.No	Compound	Name	Structure
1	A	phenol	C_6H_5OH
2	B	phenyl ethanoate	$CH_3COOC_6H_5$
3	C	phenyl Benzoate	$C_6H_5COOC_6H_5$

- Q7) An aromatic compound (A) reacts with $C_6H_5N_2Cl$ gives a red orange dye with molecular formula $C_{12}H_{10}O$. (A) on treated with alkali gives (B). (B) on further heated with methyl iodide gives (C), which is used to prepare perfumes. Identify (A), (B) and (C). write the chemical reactions.

SOLUTION:

(i) An aromatic compound (A) gives red orange dye with $C_6H_5N_2Cl$ from the molecular formula (A) is identified as phenol (C_6H_5OH).



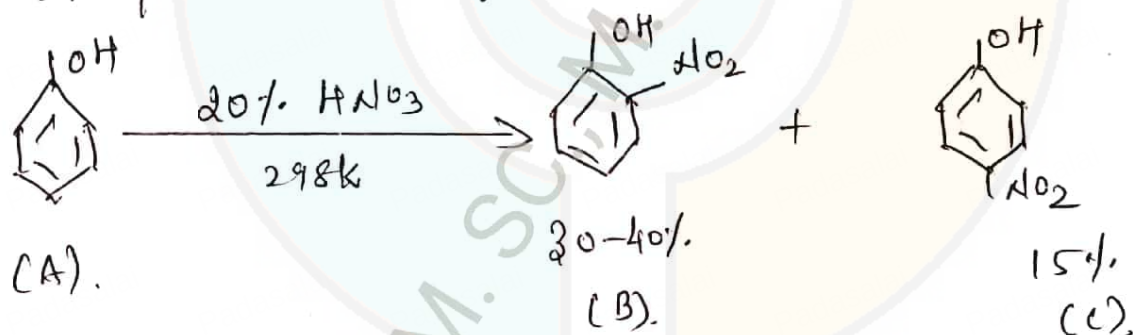
S.No	Compound	Name	Structure
1	A	phenol	
2	B	sodium phenoxide	
3	C	Anisole (methoxy Benzene)	

- Q28) An aromatic compound (A) with molecular formula C_6H_6O treated with 20% HNO_3 at 298K gives two isomeric forms (B) and (C). (A) also heated with nitrating mixture at 298K gives (D). Find out (A), (B), (C) and (D). Explain the reaction.

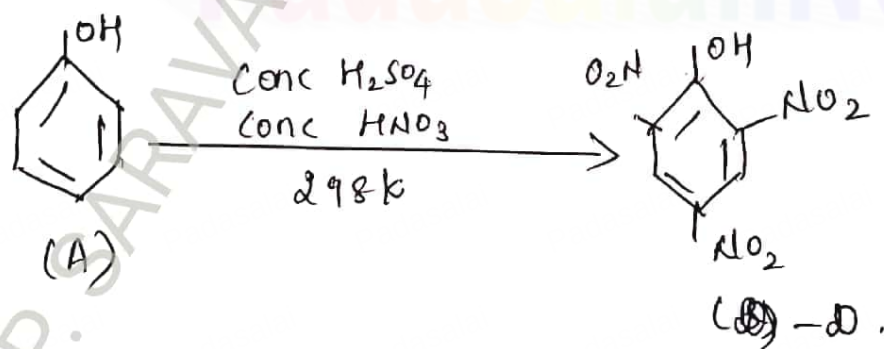
SOLUTION:

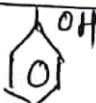
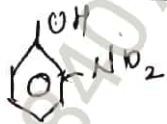
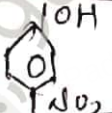
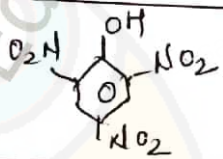
(i) An aromatic compound (A) is identified from the molecular formula (C_6H_6O) is phenol-
 C_6H_5OH .

(ii) phenol can be nitrated using 20% nitric acid even at room temperature, a mixture of ortho and para nitro phenol are formed



(iii) phenol on nitrating with conc HNO_3 + conc H_2SO_4 gives picric acid.



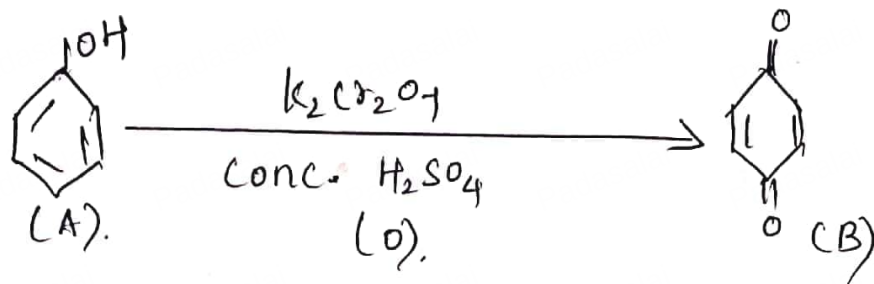
S.No	Compound	Name	Structure
1	A	phenol	
2	B	O-nitro phenol	
3	C	p-nitro phenol	
4	D	2,4,6-trinitrophenol (picric acid)	

29) An aromatic compound (A) reacts with sodium hydride gives sodium phenoxide with the molecular formula $C_6H_5O \cdot (A)$ undergo oxidation and reduction gives (B) and (C). (A) also undergo nitrosylation with nitrous acid gives (D). Find out (A), (B), (C) and (D) and explain the reaction?

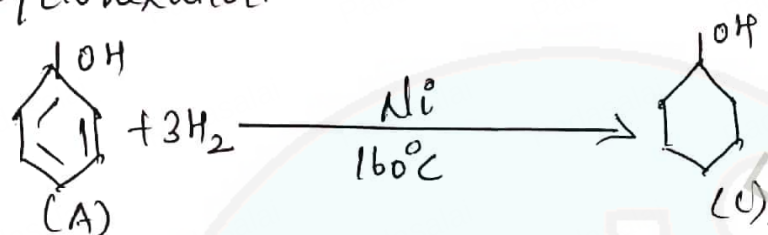
SOLUTION:

(i) An aromatic compound (A) gives sodium phenoxide with NaOH, (A) is identified from the molecular formula is phenol.

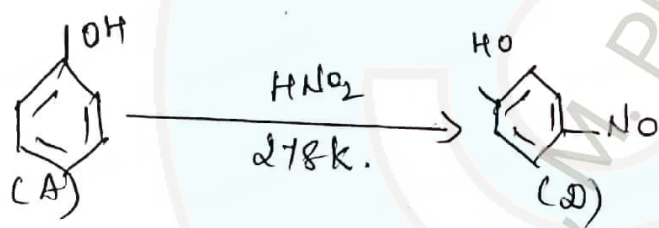
(ii) phenol undergoes oxidation with air (or) acidified $K_2Cr_2O_7$ with conc. H_2SO_4 to form 1,4-benzo quinone.



(iii) phenol on catalytic hydrogenation gives cyclohexanol.



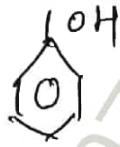
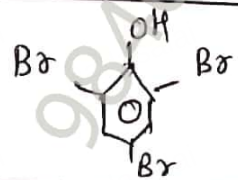
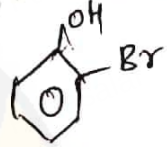
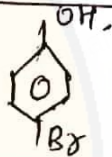
(iv) phenol can be readily nitrosated at low temperature with HNO₂ gives p-nitroso phenol.



S.No	Compound	Name	Structure
1	A	phenol	<chem>c1ccccc1O</chem>
2	B	1,4-benzoquinone	<chem>O=C1C=CC(=O)C=C1</chem>
3	C	cyclohexanol.	<chem>C1CCCCC1O</chem>
4	D	p-nitrosophenol.	<chem>Oc1ccc([N+](=O)[O-])cc1</chem>

SOLUTION:

(A) $\xrightarrow[278K]{Br_2, CCl_4}$ (C) + (D)

S.No	Compound	Name	Structure
1	A	phenol	
2	B	2,4,6 - tribromo phenol	
3	C	O - bromo phenol.	
4	D	p - bromo phenol.	

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R. CARBONYL
COMPOUNDS
AND
CARBOXYLIC ACIDS

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KEY WORDS

	ACETALDEHYDE	ACETONE	BENZALDEHYDE (A smell of bitter almond)
MOLECULAR FORMULA	C_2H_4O	C_3H_6O	C_7H_6O
FEHLING'S TOLLEN'S	Both reduce Tollen's & Fehling's	Do not reduce Tollen's & Fehling's	It can reduce Tollen's but not Fehling's.
IODOFORM REACTION	undergoes Iodoform	undergoes Iodoform reaction	undergoes Iodoform reaction
WITH SCHIFF'S REAGENT	gives pink colour in cold		It gives pink colour
POLYMERISATION With conc H_2SO_4	Forms paraldehyde A cyclic compound	Forms condensation aromatic polymer compound (mesitylene)	Does not polymerise
WITH CAUSTIC SODA (NAOH) Alkaline	undergoes Aldol condensation	undergoes Aldol condensation	undergoes cannizzaro reaction.

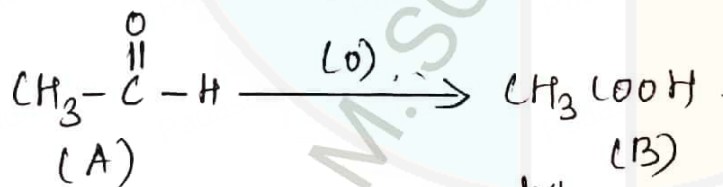
	FORMALDEHYDE ($HCHO$) gives paraldehyde	ACETOPHENONE ($C_6H_5-CO-CH_3$)	BENZOPHENONE ($C_6H_5-CO-C_6H_5$)
MOLECULAR FORMULA	CH_2O	C_8H_8O	$C_{13}H_{10}O$
IODOFORM	does not undergoes Iodoform	Iodoform	does not undergoes Iodo form
	undergoes cannizzaro reaction	undergoes Aldol condensation	does not undergoes self condensation reaction.

- ① Compound (A) with molecular formula C_2H_4O reduces Tollen's reagent and also undergoes condensation. (A) on oxidation gives the compound (B) with molecular formula $C_2H_4O_2$. Calcium salt of (B) on dry distillation gives the compound (C) with molecular formula C_3H_6O . Find A, B, and C. Explain the reaction?

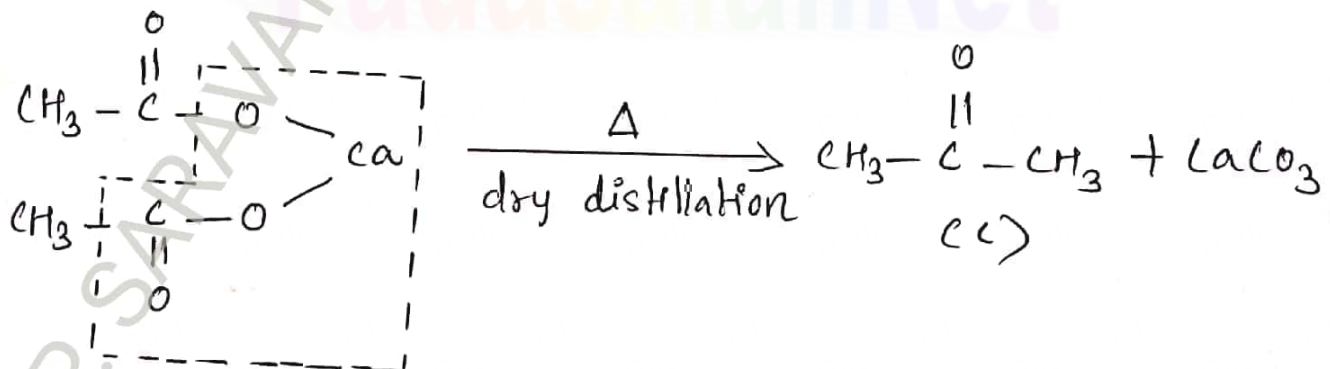
SOLUTION:

(i) Compound (A) reduces Tollen's reagent and so it must contain an aldehyde group. Then it undergoes condensation and it is an aldehyde. with 2 H atom from the molecular formula (A) is identified as acetaldehyde CH_3CHO .

(ii) Acetaldehyde on oxidation gives acetic acid CH_3COOH as compound (B).



(iii) calcium acetate on ^{dry} distillation gives (acetone) as compound (C).



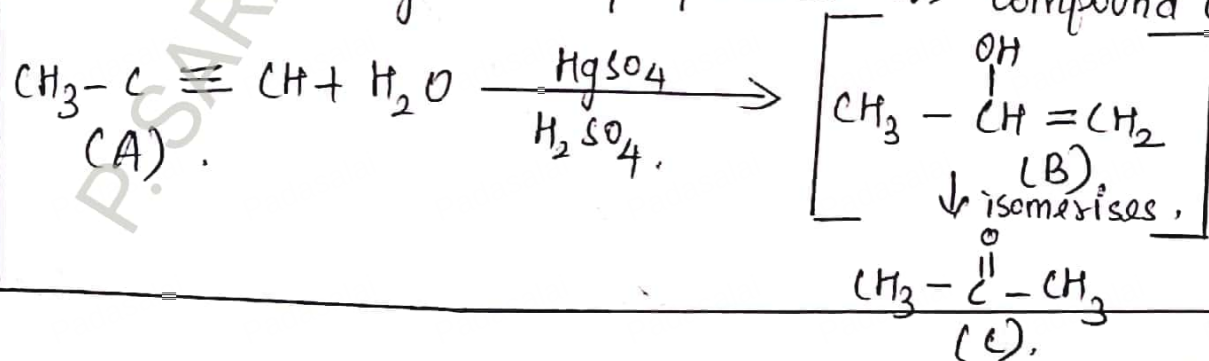
S-No	Compound	Name	Structure
1	A	Acetaldehyde	$\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{H}$
2	B	Acetic acid	$\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{OH}$
3	C	propanone (acetone)	$\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$

- ② An organic compound (A) (C_3H_4) is an unsaturated compound on hydration in the presence of HgSO_4 and H_2SO_4 it gives compound (B) with molecular formula $\text{C}_3\text{H}_6\text{O}$. is an unstable compound. Compound (B) further undergoes isomerisation gives compound (C) does not reduce both Tollen's and Fehling's reagent. Identify compound (A), (B) and (C) write the proper chemical reaction?

SOLUTION:

(i) Compound (A) is a unsaturated compound, from the molecular formula C_3H_4 is identified as propyne ($\text{CH}_3 - \text{C} \equiv \text{CH}$)

(ii) Hydration of prop-1-yne gives enol as a compound (B). Compound (B) further undergoes isomerisation gives propanone as compound (C).

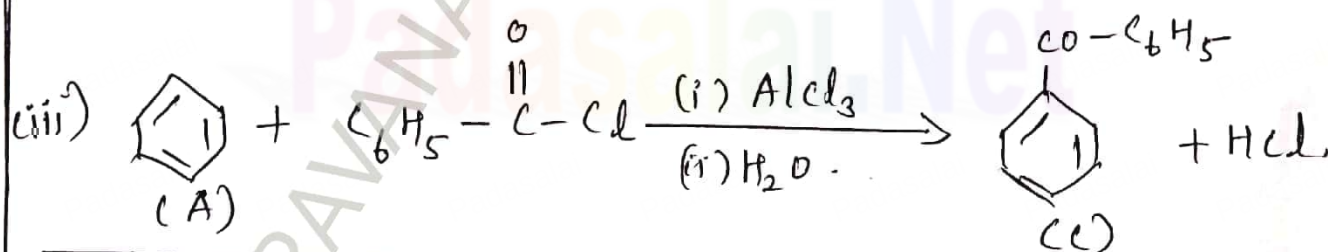
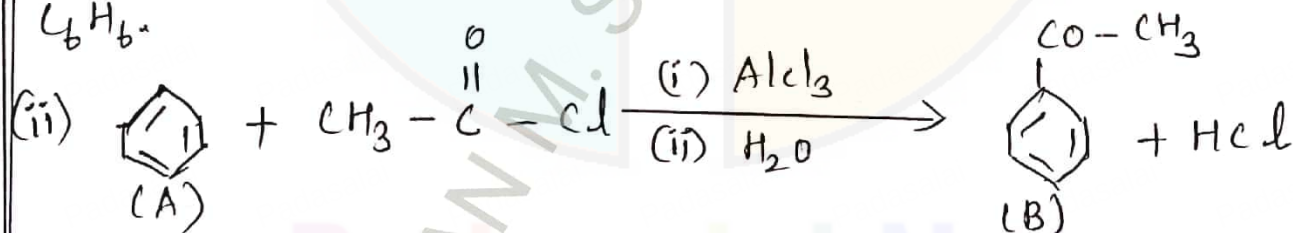


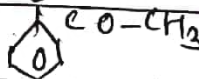
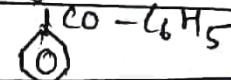
S.No	Compound	Name	Structure
1	A	prop-1-yne	$\text{CH}_3 - \text{C} \equiv \text{CH}$
2	B	enol (prop-en-2-ol)	$\text{CH}_3 - \overset{\text{OH}}{\underset{ }{\text{CH}}} = \text{CH}_2$
3	C	propanone (or) Acetone.	$\text{CH}_3 - \overset{\text{O}}{\underset{ }{\text{C}}} - \text{CH}_3$ $\text{CH}_3 - \text{C} - \text{CH}_3$

- ③ An organic compound A (C_6H_6) is an aromatic compound on treating with acetyl chloride in the presence of $\text{AlCl}_3/\text{H}_2\text{O}$ gives compound (B). Compound (A) also reacts with benzoyl chloride under same condition gives compound (C). Identify (A), (B) and (C) and explain the reactions.

SOLUTION:

(i) compound (A) is an aromatic compound is identified as Benzene from its molecular formula C_6H_6 .



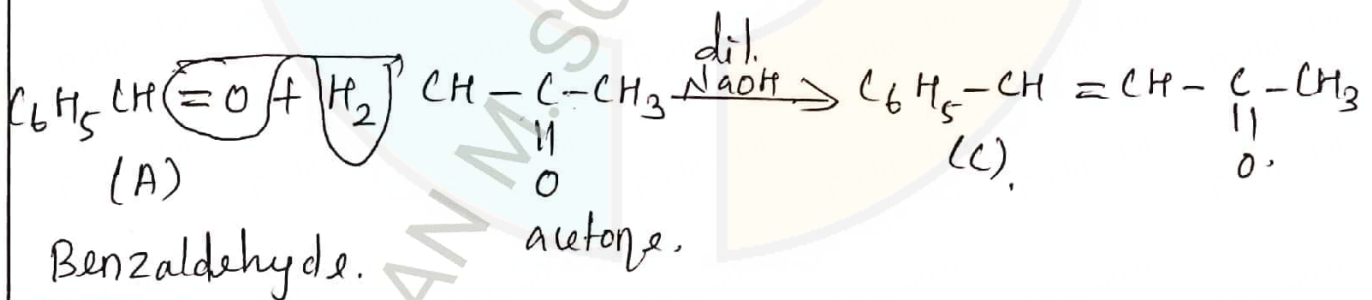
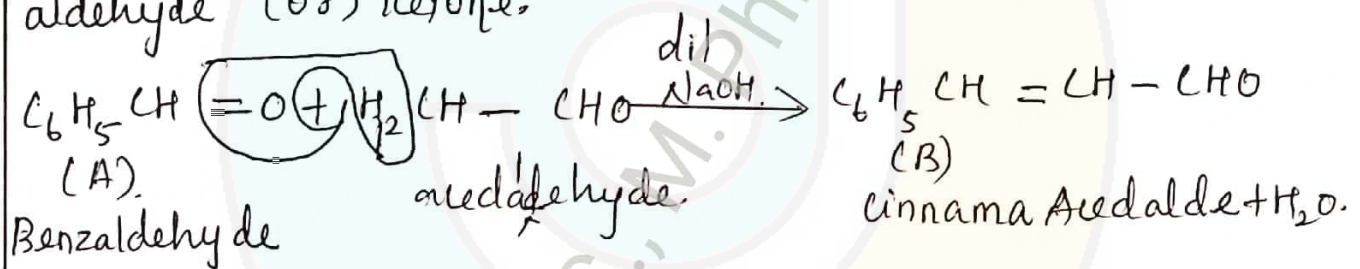
S.No	Compound	Name	Structure
1	A	Benzene	
2	B	Acetophenone	
3	C	Benzophenone.	

- ④ An aromatic compound (A) with molecular formula C_7H_6O has the smell of bitter almonds. (A) reacts with acetaldehyde and acetone in the presence of NaOH gives compound (B) and (C) respectively and out compound (A), (B) and (C). Explain the reaction?

SOLUTION:

(i) Compound (A) which has smell of bitter almonds is benzaldehyde C_6H_5CHO .

(ii) Benzaldehyde condenses with aliphatic aldehyde (or) methyl acetone in the presence of dil NaOH or room temperature to form unsaturated aldehyde (or) ketone.



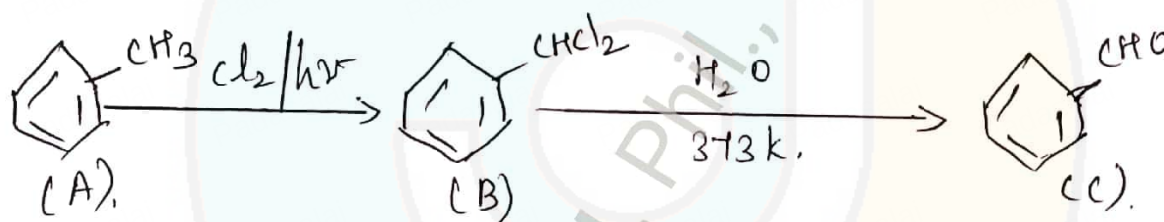
S.No	Compound	Name	Structure
1	A	Benzaldehyde	C_6H_5CHO
2	B	Cinnamaldehyde	$C_6H_5-CH=CH-CHO$
3	C	Benzylidene acetone (Benzal acetone)	$C_6H_5-CH=CH-C(=O)-CH_3$

- 5) An organic compound (A) of molecular formula C_7H_8 on chlorination in the presence of light gives compound (B). B on further hydrolysis gives compound (C) which has the smell of bitter almonds. find out (A), (B) and (C). write the chemical reaction.

SOLUTION:

(i) compound (A) is Toluene (C_7H_8).

(ii) Toluene on chlorination gives Benzal chloride which on hydrolysis gives Benzaldehyde.

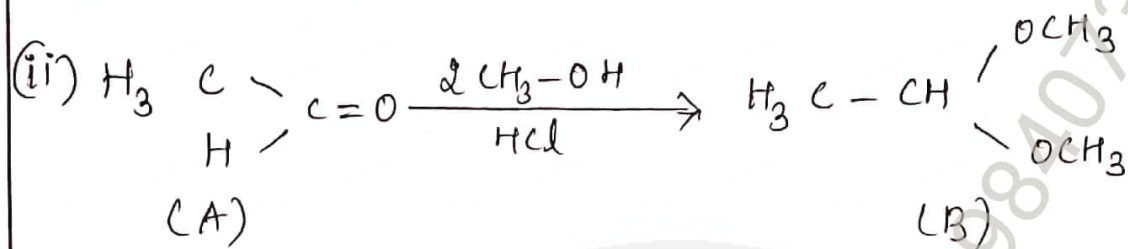


S.No	Compound	Name	Structure.
1	A	Toluene	
2	B	Benzal chloride	
3	C	Benzaldehyde	

- 6) An organic compound (A) (C_2H_4O) undergoes iodo form test with 2 equivalents of an alcohol in the presence of an acid (A) 'A' gives 'B' which is known as acetols. 'A' also reacts with an ethanal solution of ammonia gives compound 'C'. Identify (A), (B), and (C). Explain the reactions?

SOLUTION:

(i) An organic compound 'A' Acetaldehyde (or) ethanal (CH_3CHO).

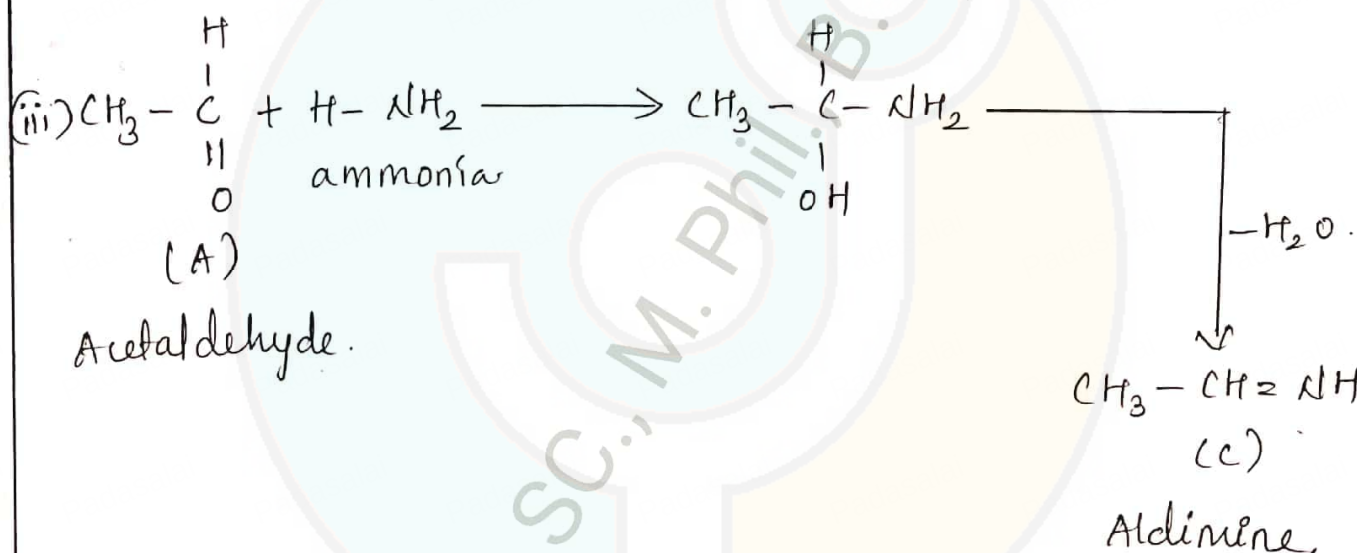


(A)

Acetaldehyde

(B)

1,1-dimethoxy ethane
(acetaldehyde dimethyl acetal)



(A)

Acetaldehyde.

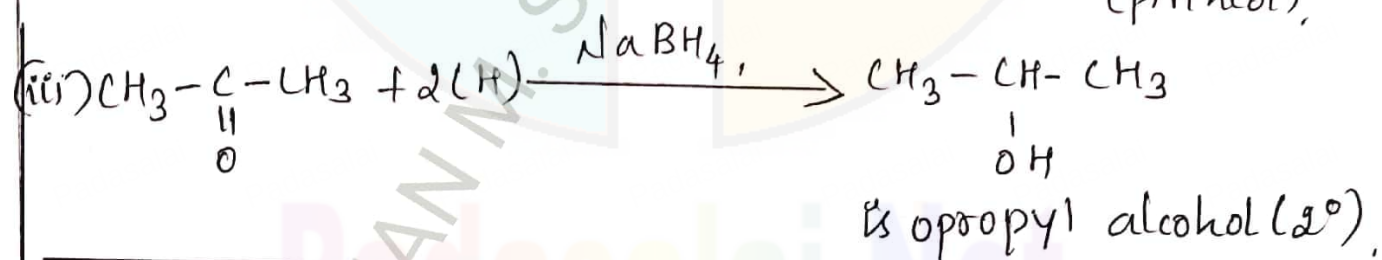
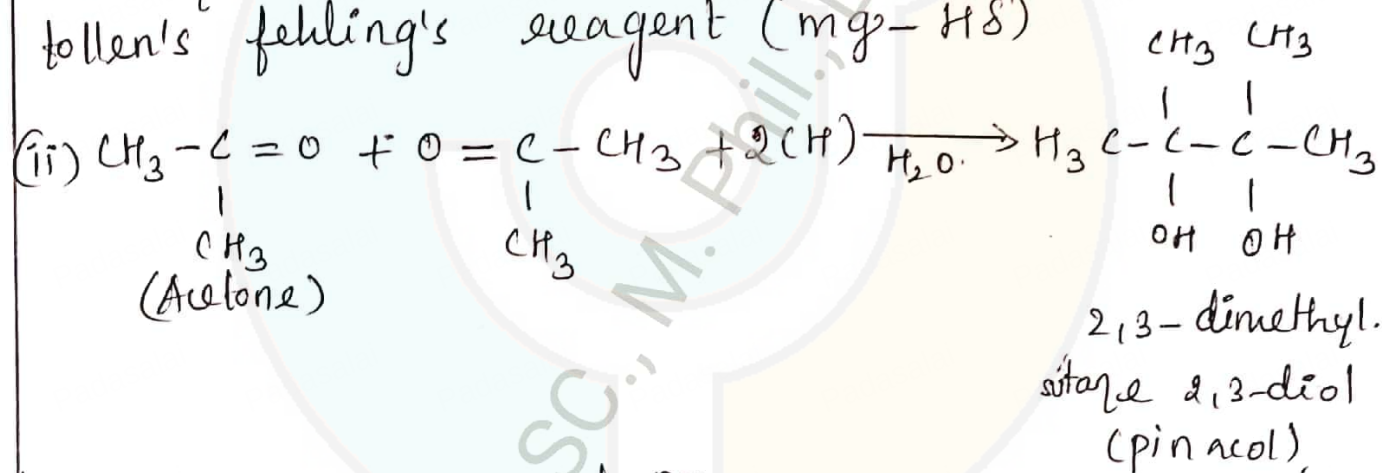
Aldimine.

S.No	Compound	Name	Structure
1	A	Ethanal (Acetaldehyde)	$\text{CH}_3-\overset{\text{O}}{\underset{ }{\text{C}}}-\text{H}$
2	B	1,1-dimethoxy ethane (acetaldehyde dimethyl acetal)	$\text{H}_3\text{C}-\text{CH} \begin{array}{l} \diagup \text{OCH}_3 \\ \diagdown \text{OCH}_3 \end{array}$
3	C	Aldimine.	$\text{CH}_3-\text{CH}=\text{NH}$

- ④ An organic compound 'A' ($C_5H_{10}O$) does not reduce both Tollen's and Fehling's reagent (A) on reduced by magnesium amalgam and water gives symmetrical diols as 'B'. 'A' also reduced by $NaBH_4$ forms 'C', which gives at 10 mins with HCl in the presence of anhydrous $ZnCl_2$. Identify (A), (B) and (C) and explain the reaction?

SOLUTION:

(i) Compound (A) acetone, it does not reduce both Tollen's Fehling's reagent (mg-HS)

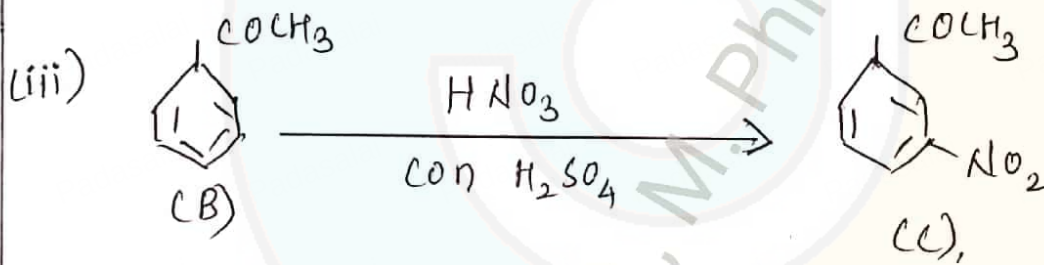
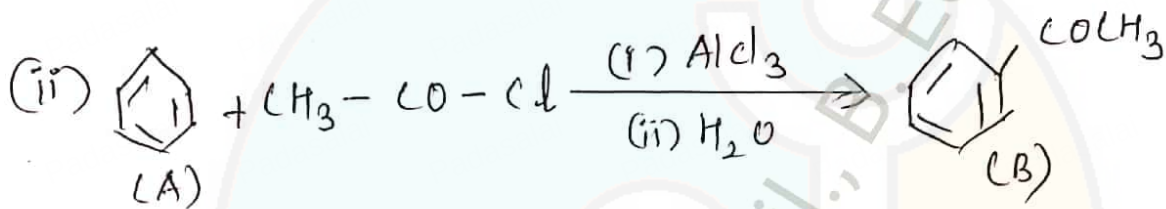


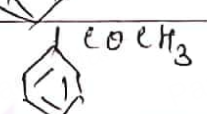
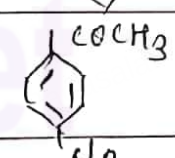
S.No	Compound	Name	Structure
1	A	Acetone	$CH_3 - \overset{O}{\underset{ }{C}} - CH_3$
2	B	2,3-dimethyl sutare 2,3-diol (pinacol)	$\begin{array}{c} CH_3 \quad CH_3 \\ \quad \\ CH_3 - C - C - CH_3 \\ \quad \\ OH \quad OH \end{array}$
3	C	Isopropyl alcohol (2°)	$CH_3 - \underset{OH}{\underset{ }{CH}} - CH_3$

- ⑧ An aromatic compound "A" (C_6H_6) reacts with acetyl chloride in the presence of $AlCl_3/H_2O$ gives "B" which answers iodoform test. "B" further reacts with Nitrating mixture forms "C". Find out (A), (B) and (C), and explain the reactions?

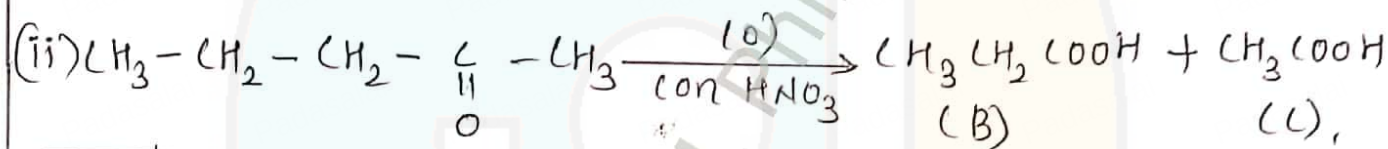
SOLUTION:

(i) An Aromatic compound (A) is Benzene (C_6H_6)



S.No	Compound	Name	Structure
1	A	Benzene	
2	B	Acetophenone	
3	C	m-nitro acetophenone	

(i) compound (A) is pentan-2-one,
 $(\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \overset{\text{O}}{\underset{\text{||}}{\text{C}}} - \text{CH}_3)$, identified from its
 molecular formula $\text{C}_5\text{H}_{10}\text{O}$.



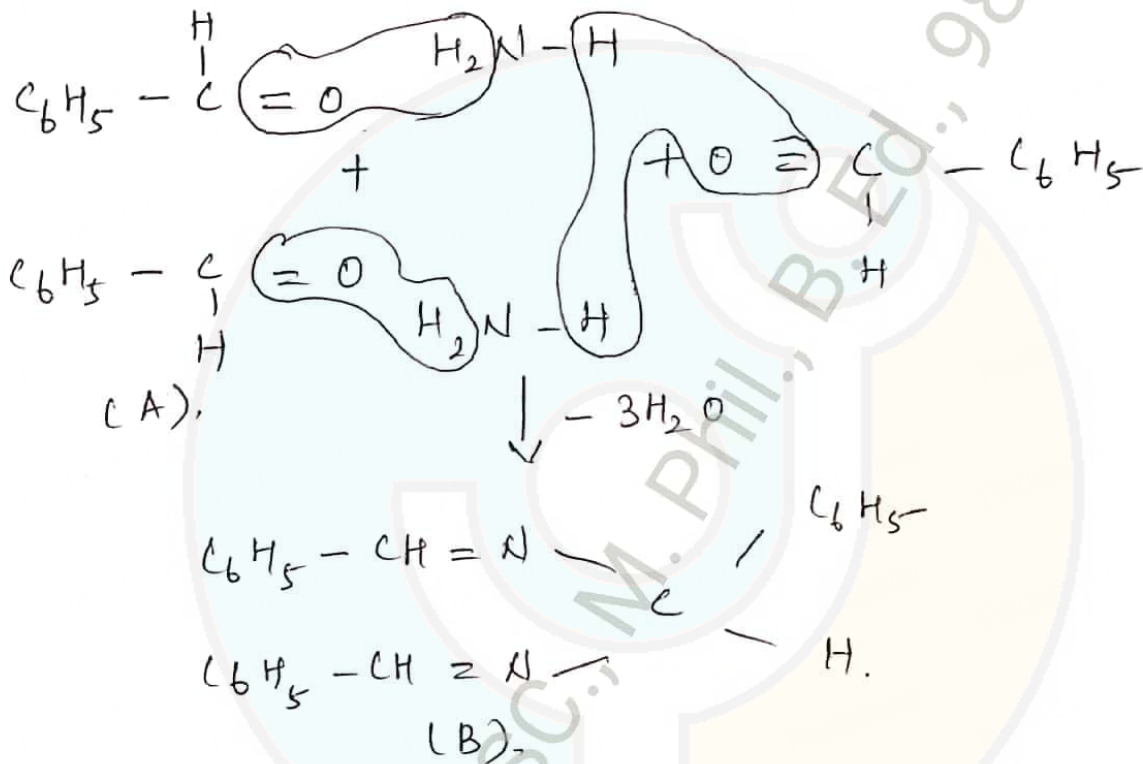
S.No	Compound	Name	Structure
1	A	pentan-2-one	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \overset{\text{O}}{\underset{\text{ }}{\text{C}}} - \text{CH}_3$
2	B	propanoic acid	$\text{CH}_3\text{CH}_2\text{COOH}$
3	C	ethanoic acid	CH_3COOH

Q.16) An organic compound (A) C_7H_6O reduces Tollen's reagent. Compound (A) condenses with ammonia gives complex as 'B'. 'A' also condenses with 3° aromatic amines in the presence of strong acid gives dye as 'C'. Identify (A), (B) and (C) and explain the reactions?

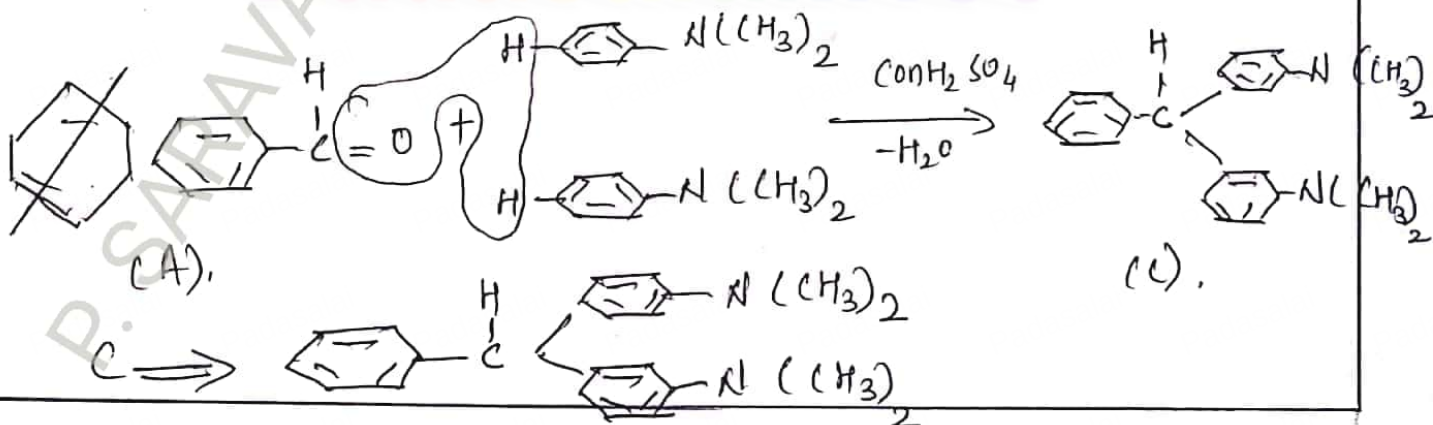
SOLUTION:

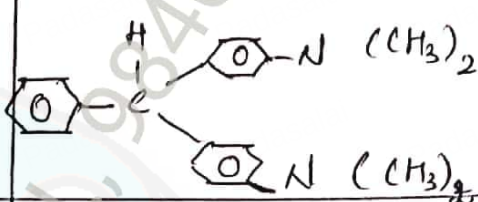
(i) Compound (A) is Benzaldehyde (C_6H_5CHO)
It reduces Tollen's reagent and does not reduce Fehling's solution.

(ii) Benzaldehyde form a complex condensation product with ammonia.



(iii) Benzaldehyde condense with 3° aromatic amines like N, N-dimethyl aniline in the presence of strong acids to form triphenyl methane dye.

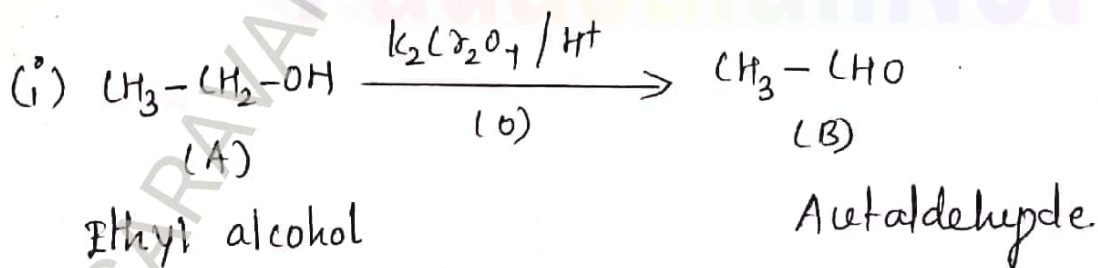
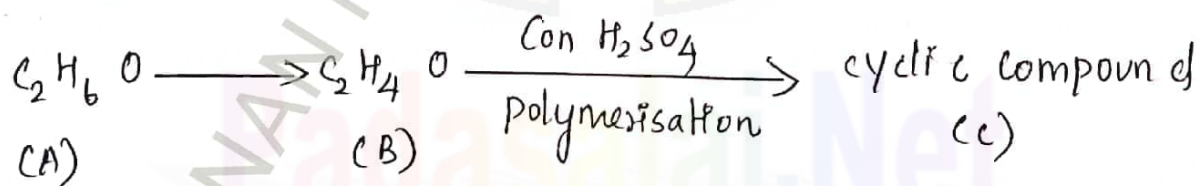


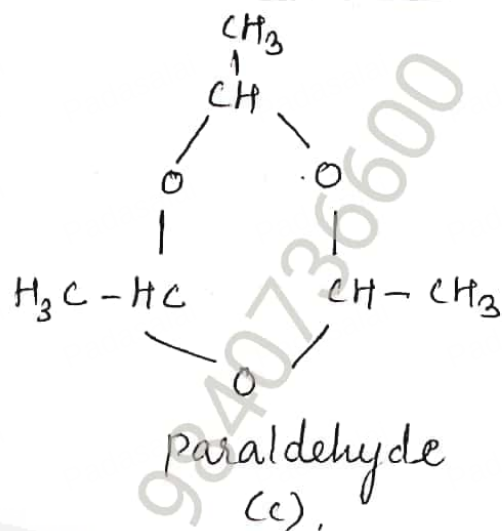
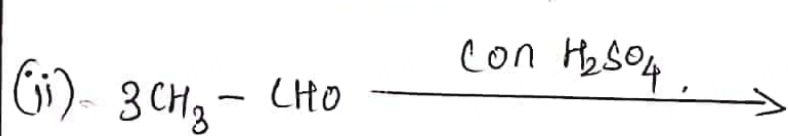
S.No	Compound	Name	Structure
1	A	Benzaldehyde	$C_6H_5 - \overset{O}{\underset{ }{C}} - H$
2	B	Hydrobenzamide	$ \begin{array}{c} C_6H_5 - CH=N \\ C_6H_5 - CH=N \quad \quad \quad \begin{array}{c} C \\ \diagup \quad \diagdown \\ C_6H_5 \quad H \end{array} \end{array} $
3	C	Malachite green dye	

(ii) Compulsory problems

- (i) An organic compound (A) C_2H_6O liberates hydrogen on treatment with metallic sodium (A) on mild oxidation gives (B) C_2H_4O which answers iodoform test. (B) when treated with conc. H_2SO_4 undergoes polymerisation to give (C), a cyclic compound. Identify (A), (B) and (C) and explain the reactions.

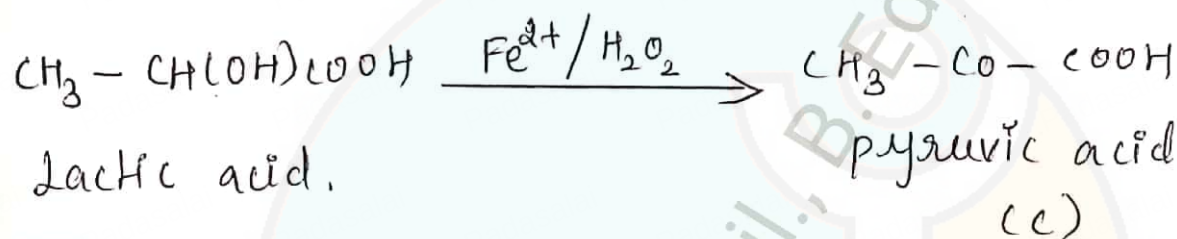
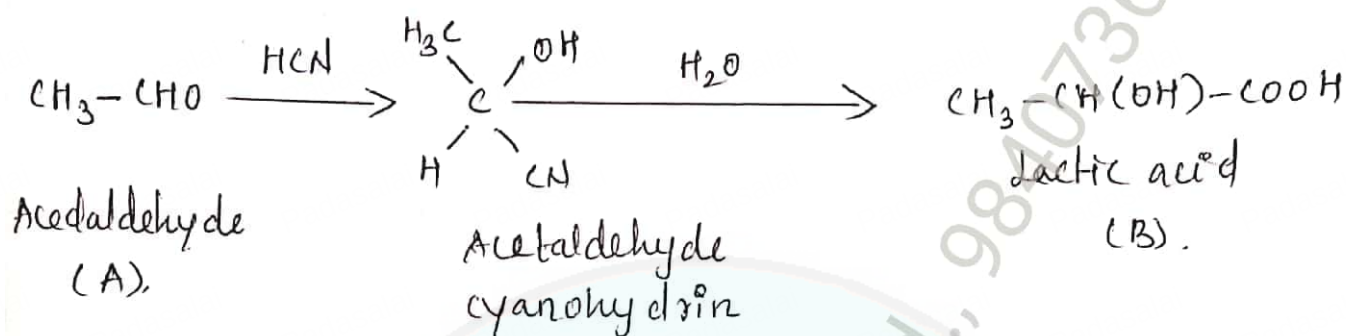
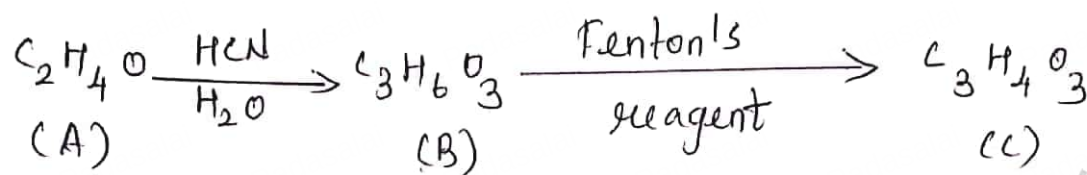
SOLUTION:





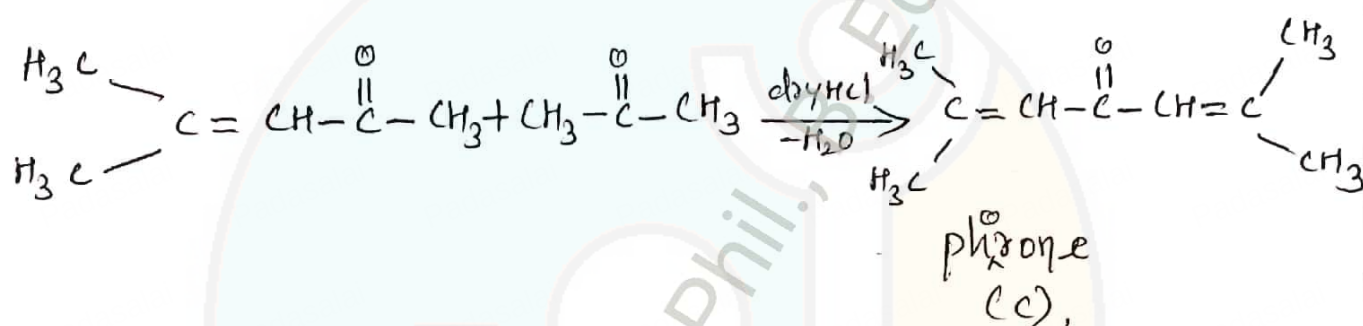
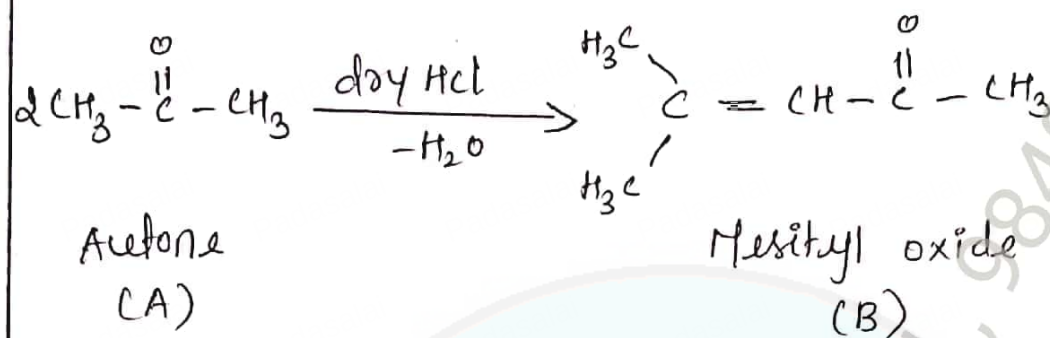
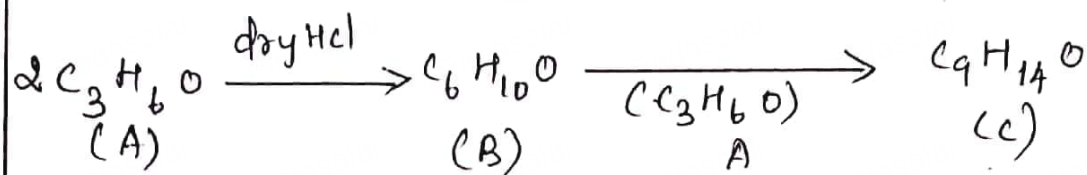
Compound	Structural formula	Name
A	$\text{CH}_3 - \text{CH}_2 - \text{OH}$	Ethyl alcohol
B	$\text{CH}_3 - \text{CHO}$	acetaldehyde.
C		paraldehyde

- ② Organic compound (A) having the molecular formula $\text{C}_2\text{H}_4\text{O}$ reduces Tollen's reagent. (A) on treatment with HCN followed by hydrolysis gives the compound (B) with molecular formula $\text{C}_3\text{H}_6\text{O}_3$. Compound (B) on oxidation by Fenton's reagent gives the compound (C) with the molecular formula $\text{C}_3\text{H}_4\text{O}_3$. Find (A), (B) and (C). Explain the reactions?



Compound	Structural formula	Name
A	CH_3CHO	Acetaldehyde
B	$\text{CH}_3 - (\text{CH}(\text{OH}))\text{COOH}$	Lactic acid
C	$\text{CH}_3 - \text{CO} - \text{COOH}$	Pyruvic acid

An organic compound (A) with molecular formula C_3H_6O undergoes iodoform reaction. Two molecules of compound (A) react with dry HCl to give compound (B) ($C_6H_{10}O$). Compound (B) reacts with one more molecule of compound (A) to give compound (C) ($C_9H_{14}O$). Identify (A), (B), (C). Explain the reaction.



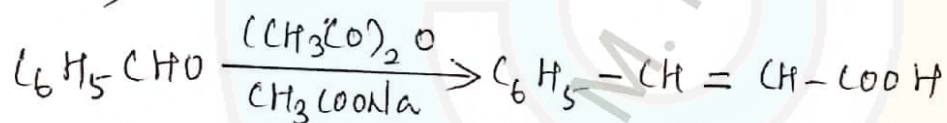
Compound	Structural formula	Name
A	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$	Acetone
B	$\begin{array}{c} \text{H}_3\text{C} \\ \diagdown \\ \text{C} \\ \diagup \\ \text{H}_3\text{C} \end{array} = \text{CH}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$	Mesityl oxide
C	$\begin{array}{c} \text{H}_3\text{C} \\ \diagdown \\ \text{C} = \text{CH}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}=\text{C} \begin{array}{l} \diagup \text{CH}_3 \\ \diagdown \text{CH}_3 \end{array} \\ \diagup \\ \text{H}_3\text{C} \end{array}$	phorone

- ⑭ An aromatic aldehyde (A) of molecular formula C_7H_6O which has the smell of bitter almonds on treatment with $(CH_3CO)_2O$ and CH_3COONa to give compound (B) which is an aromatic unsaturated acid. (A) also reacts with (A) in the presence of alc. KCN to give dimer (C). Identify (A), (B) and (C). Explain the reactions.

SOLUTION:



↓ alc-KCN
Dimer (C)



Benzaldehyde (A)

Cinnamic acid (B)



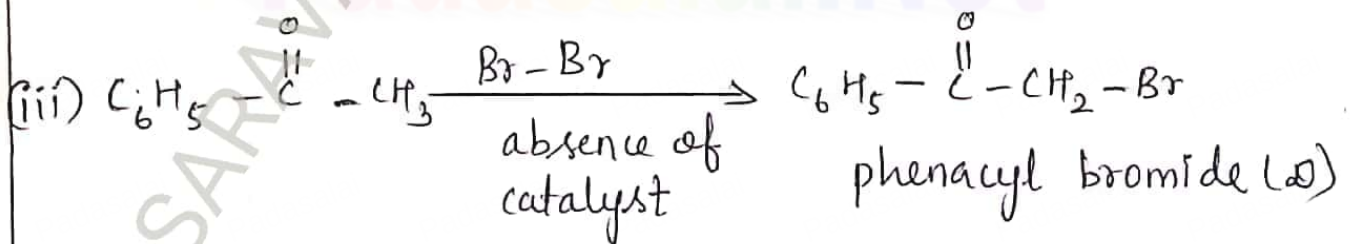
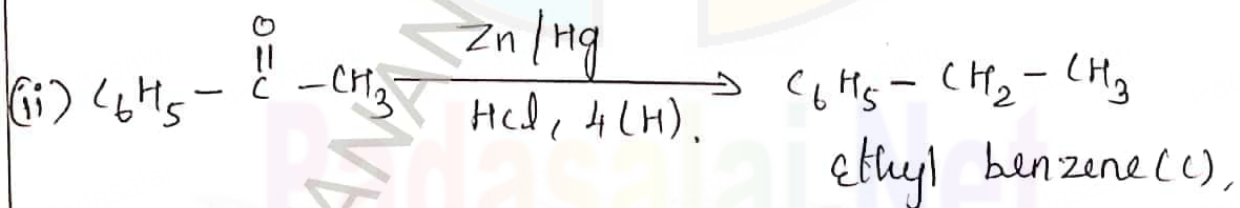
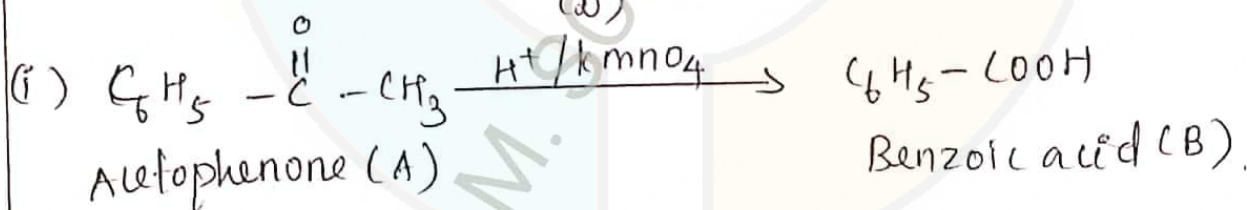
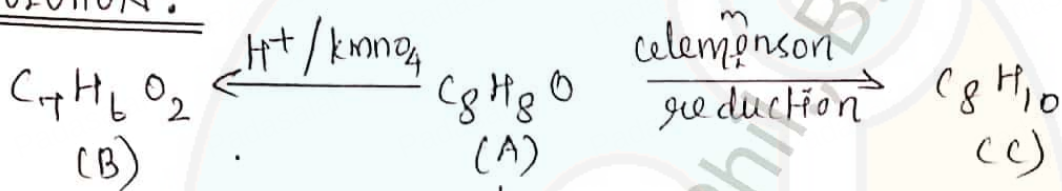
Benzaldehyde (A)

Benzoin (C)

Compound	Structural formula	Name
A	C_6H_5CHO	Benzaldehyde
B	$C_6H_5-CH=CH-COOH$	Cinnamic acid
C	$C_6H_5-CH(OH)-\overset{O}{\parallel}C-C_6H_5$	Benzoin.

5) An organic compound (A) C_8H_8O undergoes Iodoform reaction compound (A) on treatment with acidified $KMnO_4$ forms compound (B) $C_7H_6O_2$. Compound (A) undergoes clemmenson reaction to form (C). C_8H_{10} further compound (A) undergoes halogenation in the absence of catalyst to form (D) C_8H_7OBr . Identify (A), (B), (C) and (D). Explain the reaction?

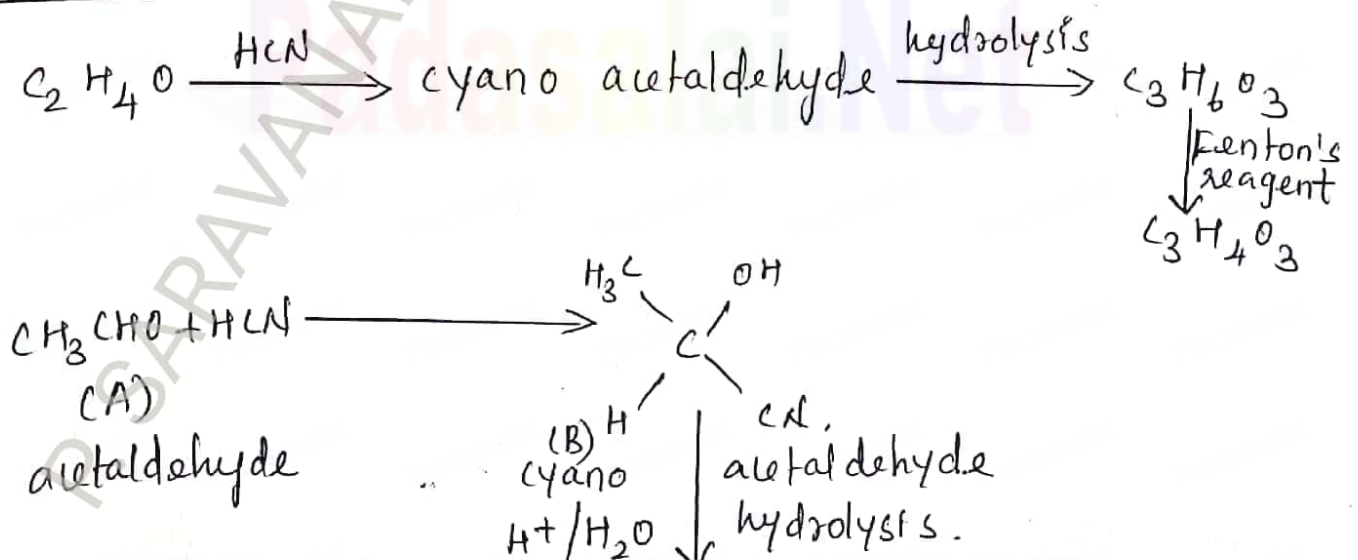
SOLUTION:

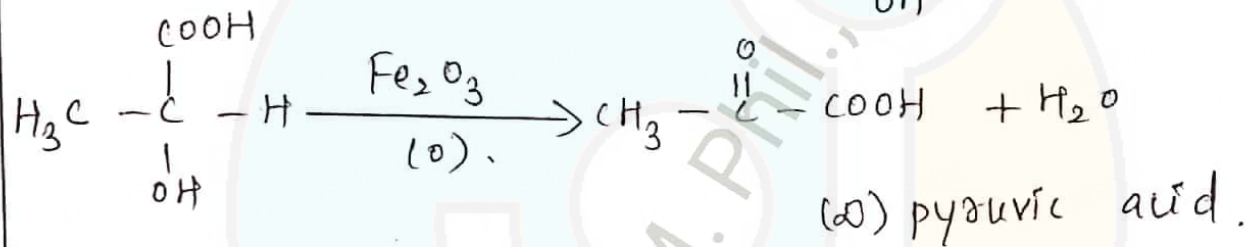
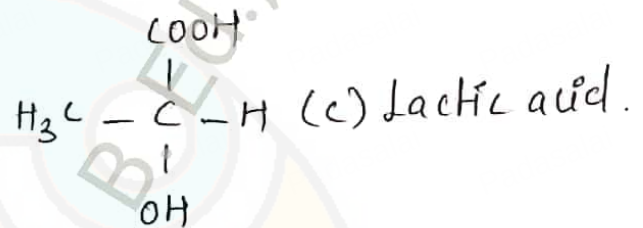
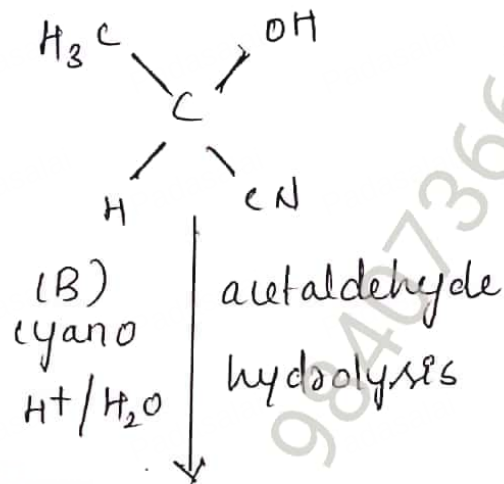
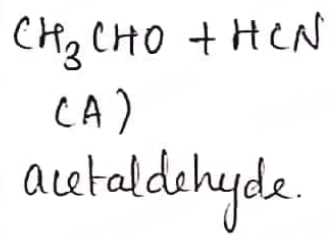


Compound	Structural formula	Name
A	$C_6H_5 - \overset{O}{\parallel} - CH_3$	Acetophenone
B	$C_6H_5 - COOH$	Benzoic acid
C	$C_6H_5 - CH_2 - CH_3$	Ethyl Benzene
D	$C_6H_5 - \overset{O}{\parallel} - CH_2 - Br$	phenacyl bromide

- (16) Compound (A) with molecular formula C_2H_4O reduce Tollen's reagent (A) on treatment with HCN gives compound (B). Compound (B) on hydrolysis with an acid gives compound (C) with molecular formula $C_3H_6O_3$. Compound (C) is optically active. Compound (C) on treatment with Fenton's reagent gives compound (D) with molecular formula $C_3H_4O_3$. Compound (C) and (D) gives with $NaHCO_3$ solution. Identify the compounds (A), (B), (C) and (D) and explain the answer.

SOLUTION:

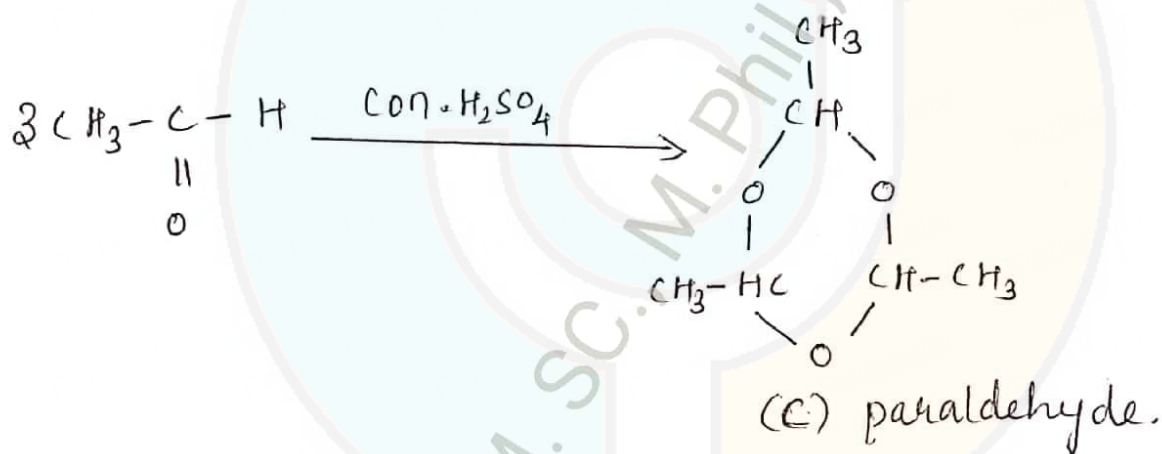
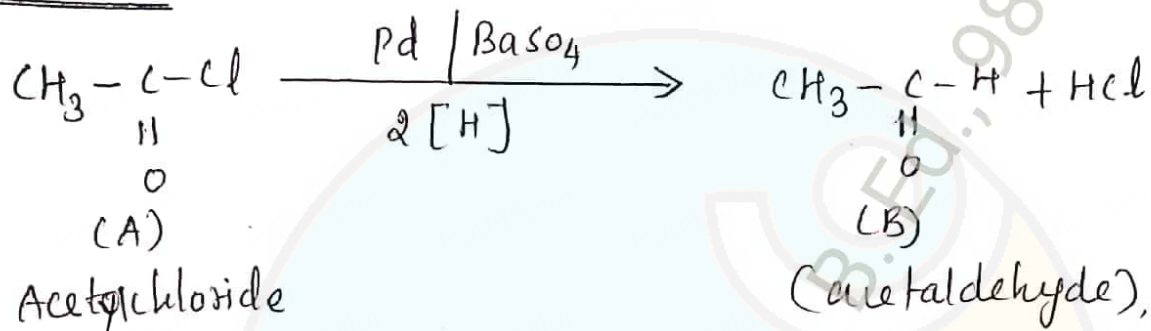




Compound	structural formula	name
A	CH_3CHO	acetaldehyde
B	$\begin{array}{c} \text{CN} \\ \\ \text{H}_3\text{C} - \text{C} - \text{H} \\ \\ \text{OH} \end{array}$	cyano acetaldehyde
C	$\begin{array}{c} \text{COOH} \\ \\ \text{H}_3\text{C} - \text{C} - \text{H} \\ \\ \text{OH} \end{array}$	lactic acid
D	$\begin{array}{c} \text{O} \\ \\ \text{H}_3\text{C} - \text{C} - \text{COOH} \end{array}$	pyruvic acid.

An organic compound (A) C_2H_3OCl on treatment with Pd and $Baso_4$ gives (B) (C_2H_4O), which answers iodoform test. (B) when treated with $con. H_2SO_4$ undergoes polymerisation to give (C) a cyclic compound. Identify (A), (B) and (C) and explain the reaction?

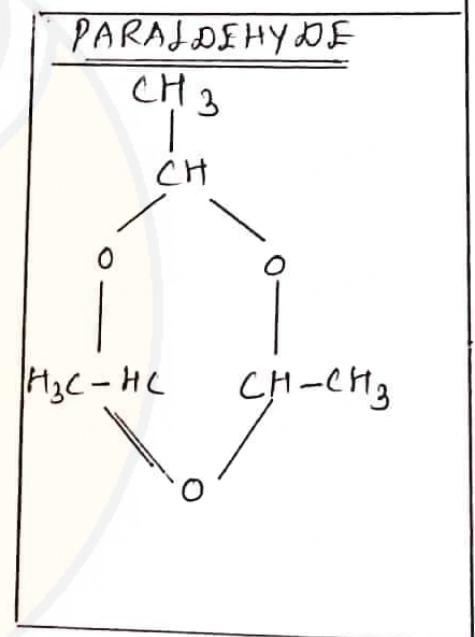
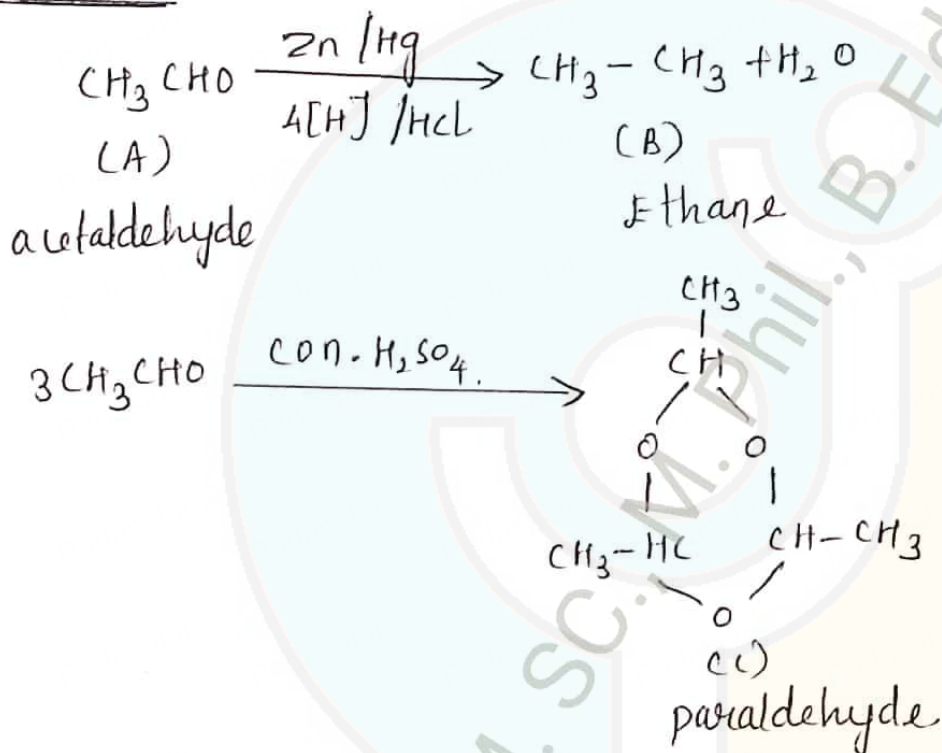
SOLUTION:

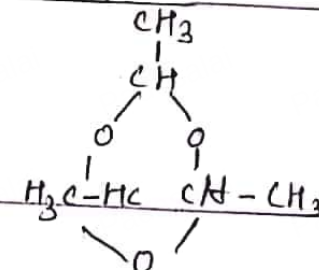


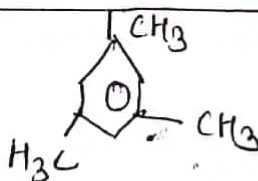
Compound	Structural formula	Name
A	$ \begin{array}{c} CH_3 - C - Cl \\ \\ H \\ \\ O \end{array} $	acetyl chloride
B	CH_3CHO	acetaldehyde
C	$ \begin{array}{c} CH_3 \\ \\ CH \\ / \quad \backslash \\ O \quad O \\ \quad \\ CH_3 - HC \quad CH - CH_3 \\ \backslash \quad / \\ O \end{array} $	paraldehyde.

- (18) Compound (A) (C_2H_4O) reduces Tollen's reagent (A) on treatment with zinc amalgam and conc. HCl gives compound (B). In the presence of conc. H_2SO_4 (A) forms cyclic structure (C) which is used as hypnotic. Identify (A), (B), (C) and explain the reactions.

SOLUTION:

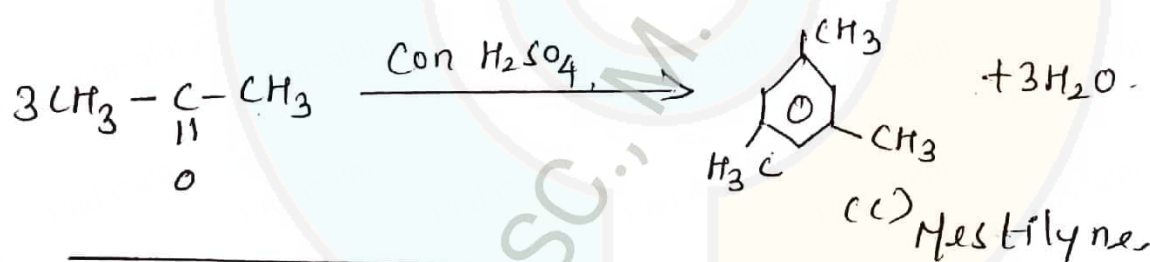
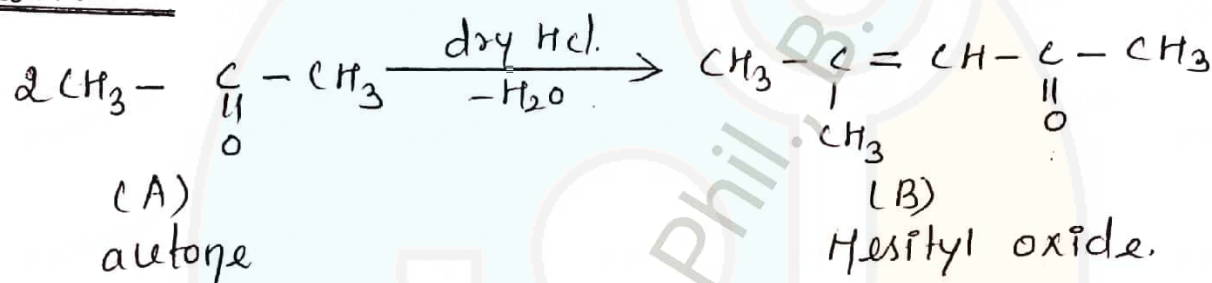


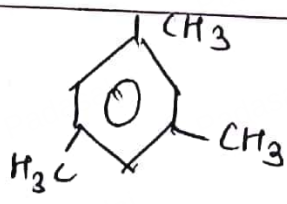
Compound	Structural formula	name.
A	CH_3CHO	Acetaldehyde
B	CH_3-CH_3	Ethane
C		paraldehyde.

Compound	Structural formula	Name
A	$\begin{array}{c} \text{CH}_3 - \text{C} - \text{CH}_3 \\ \parallel \\ \text{O} \end{array}$	Acetone
B	$\text{CH}_3 - \text{CH}_2 - \text{CH}_3$	propane
C		Methylcyclopropane

- 20) Compound (A) (C_3H_6O) does not reduce Tollen's reagent but undergoes haloform reaction. Compound (A) undergoes dehydration reaction in the presence of dry HCl to give compound (B) $C_6H_{10}O$. Three molecules of compound (A) undergoes condensation reaction in the presence of $Con. H_2SO_4$ to give a cyclic hydrocarbon (C). Identify (A), (B) and (C) give the reactions.

SOLUTION:

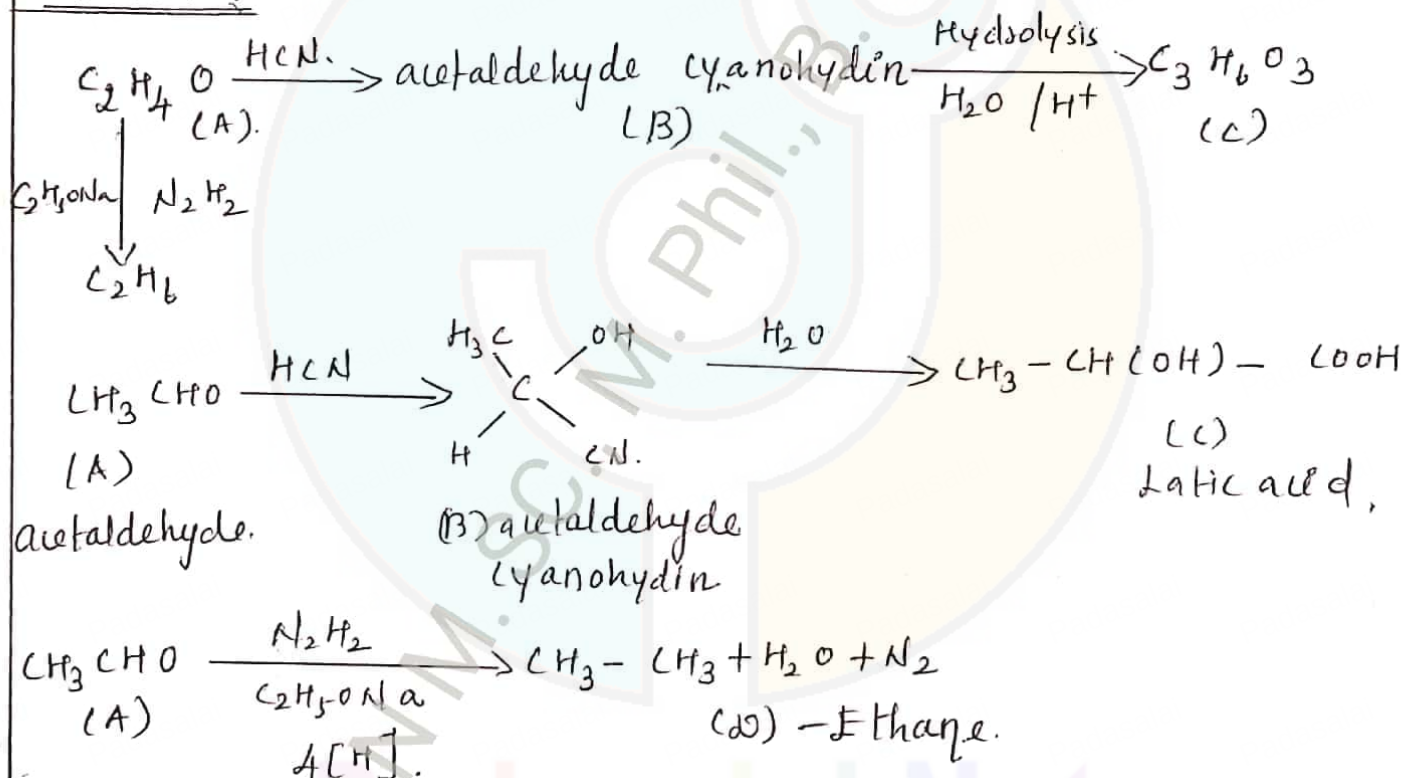


Compound	Structural formula	Names.
A	$\text{CH}_3 - \text{CO} - \text{CH}_3$	Acetone
B	$\text{CH}_3 - \underset{\text{CH}_3}{\underset{ }{\text{C}}} = \text{CH} - \underset{\text{O}}{\underset{\text{ }}{\text{C}}} - \text{CH}_3$	Mesityl oxide
C		Mesitylene.

SOLUTION:

- Q2) Compound (A) with molecular formula C_2H_4O reduces Tollen's reagent (A) on treatment with HCN gives Compound (B). Compound (B) on hydrolysis with an acid gives compound (C) with molecular formula $C_3H_6O_3$ which is an optically active compound. Compound (A) on reduction with N_2H_4/C_2H_5ONa gives a hydrocarbon (D) of molecular formula C_2H_6 . Identify the cpd (A), (B), (C) and (D) and explain the reactions.

SOLUTION:

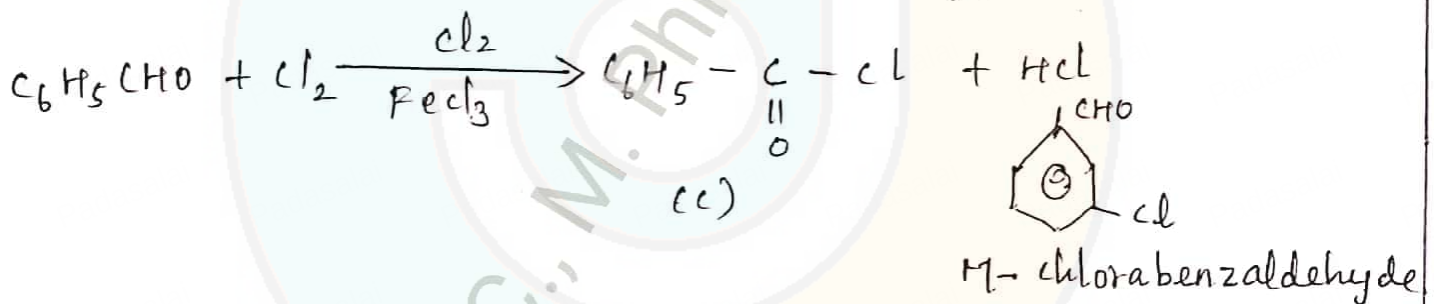
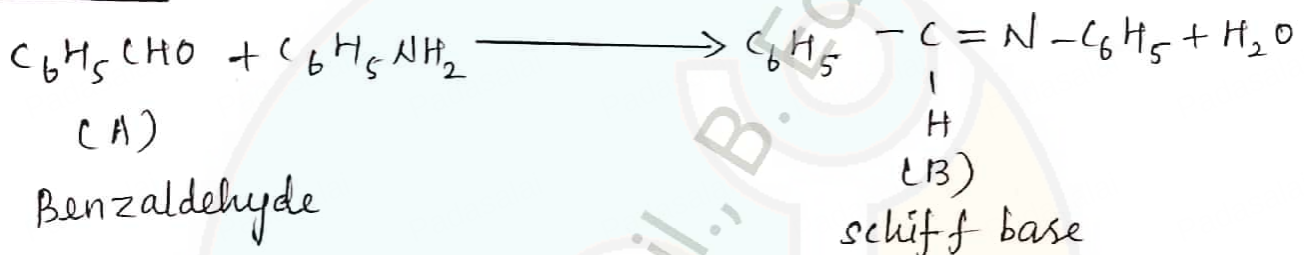


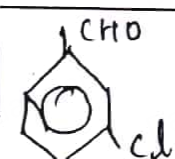
Compound	Structural formula	Name
A	CH_3CHO	Acetaldehyde
B	$\begin{array}{c} H_3C - C - OH \\ \quad \quad \\ H \quad \quad CN \end{array}$	acetaldehyde cyanohydrin
C	$CH_3 - CH(OH) - COOH$	Lactic acid
D	$CH_3 - CH_3$	Ethane.

Q3

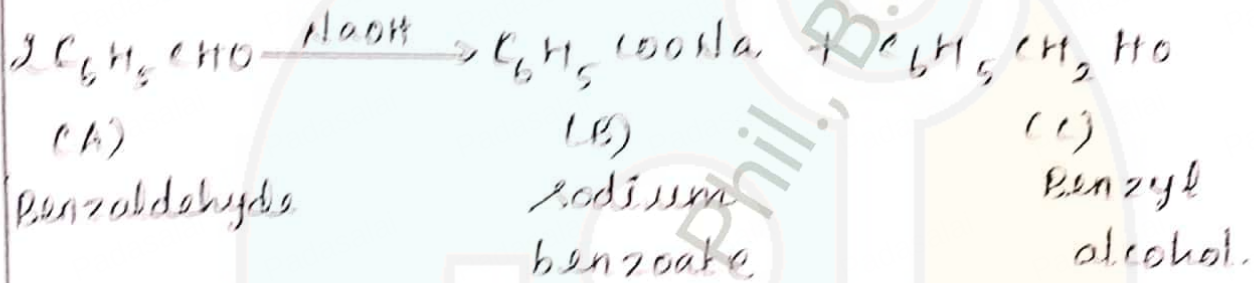
An Organic Compound (A) molecular formula C_7H_6O is not reduced by Fehling's solution but will undergoes cannizzaro reduction compound (A) reacts with aniline to give compound (B). Compound (A) also reacts with Cl_2 in the presence of catalyst to give compound (C). Identify (A), (B), (C) and explain the reactions.

SOLUTION:



Compound	Structural formula	Name.
A	$C_6H_5 - CHO$	Benzaldehyde
B	$C_6H_5 - \underset{\substack{ \\ H}}{C} = N - C_6H_5$	schiff base
C		m-chlorobenzaldehyde

- (31) An organic compound (A) C_7H_6O reduces Tollen's reagent. On treating with an alkali compound A forms B and C. B on treating with sodalime forms benzene and C. (C_7H_8O) is an antiseptic. Identify compound A, B, and C. Explain the reactions.
- Solution:

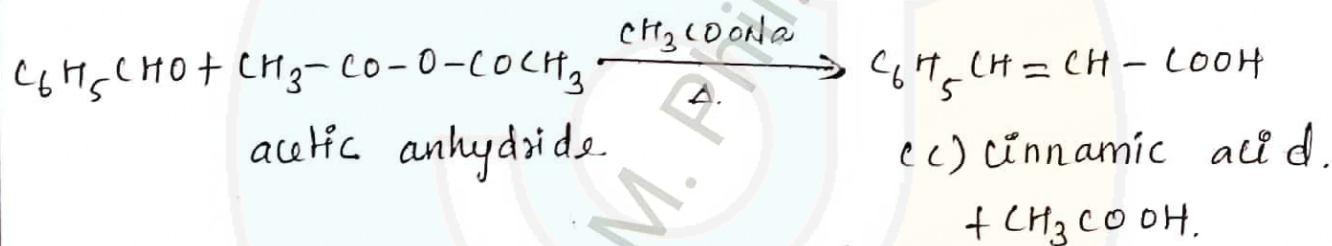
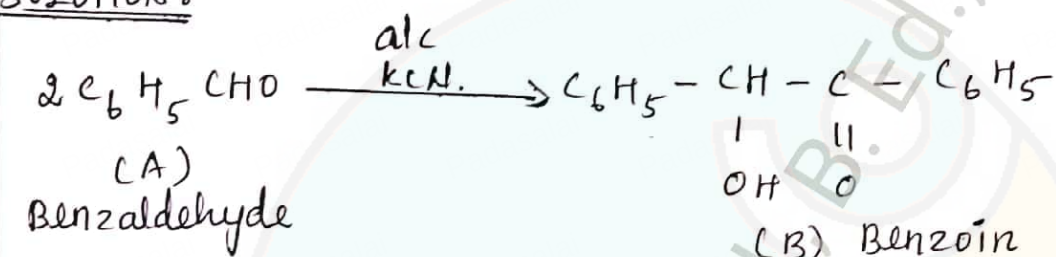


Compound	structural formula	Name
A	C_6H_5CHO	Benzaldehyde
B	C_6H_5COONa	sodium Benzoate
C	$C_6H_5CH_2OH$	Benzyl alcohol.

(25)

An organic compound (A) (C_7H_6O) forms a bisulphite. A when treated with alcoholic KCN forms B ($C_{14}H_{12}O_2$) and A on refluxing with sodium acetate and acetic anhydride forms an acid C ($C_9H_8O_2$). Identify (A), (B) and (C). Explain the conversion of (A) to (B) and (C).

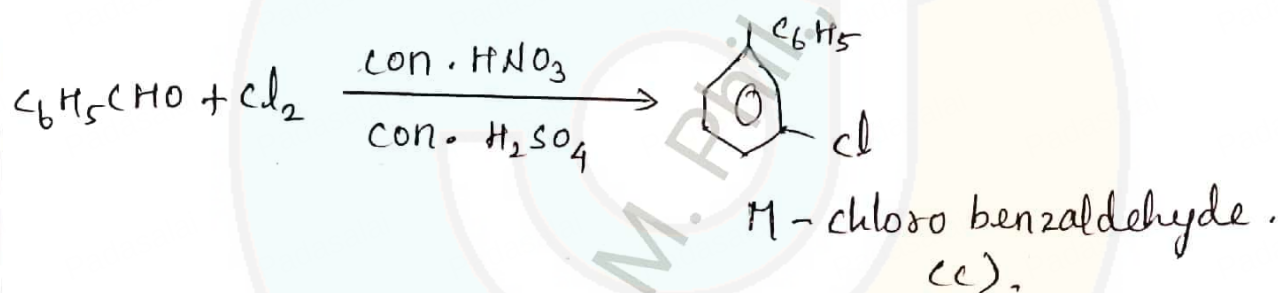
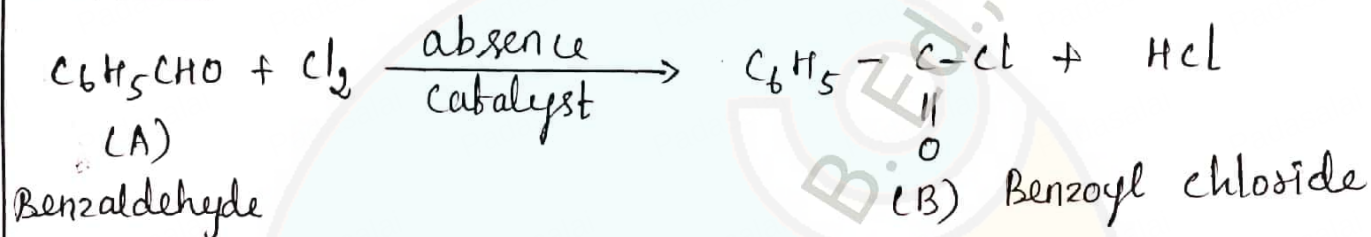
SOLUTION:

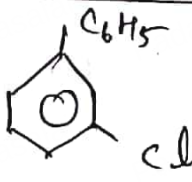


Compound	Structural formula	Name
A	C_6H_5CHO	Benzaldehyde
B	$C_6H_5CH(OH) - \overset{O}{\parallel} C - C_6H_5$	Benzoin
C	$C_6H_5 - CH=CH - COOH$	cinnamic acid.

- 26) An aromatic compound (A) with molecular formula C_7H_6O has the smell of bitter almonds (A) reacts with Cl_2 in the absence of catalyst to give (B) and in the presence of catalyst compound (A) reacts with chlorine to give (C). Identify (A), (B) and (C). Explain the reaction?

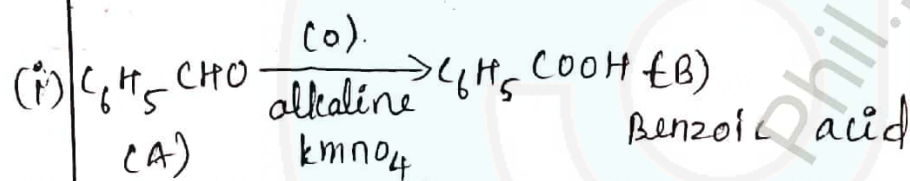
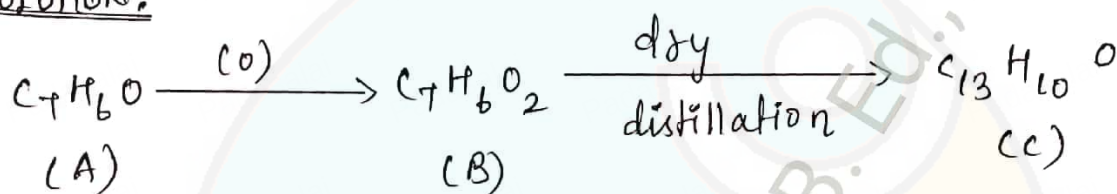
SOLUTION:



Compound	Structural formula	Name
A	C_6H_5CHO	Benzaldehyde
B	$C_6H_5 - \underset{\text{O}}{\underset{ }{C}} - Cl$	Benzoyl chloride
C		1-chloro Benzaldehyde

- 27) Compound (A) with molecular formula C_7H_6O reduces Tollen's reagent and also gives Cannizzaro reaction. (A) on oxidation gives the compound (B) with molecular formula $C_7H_6O_2$. Calcium salt of B on dry distillation gives the compound (C) with molecular formula $C_{13}H_{10}O$. Find (A), (B) and (C). Explain the reaction.

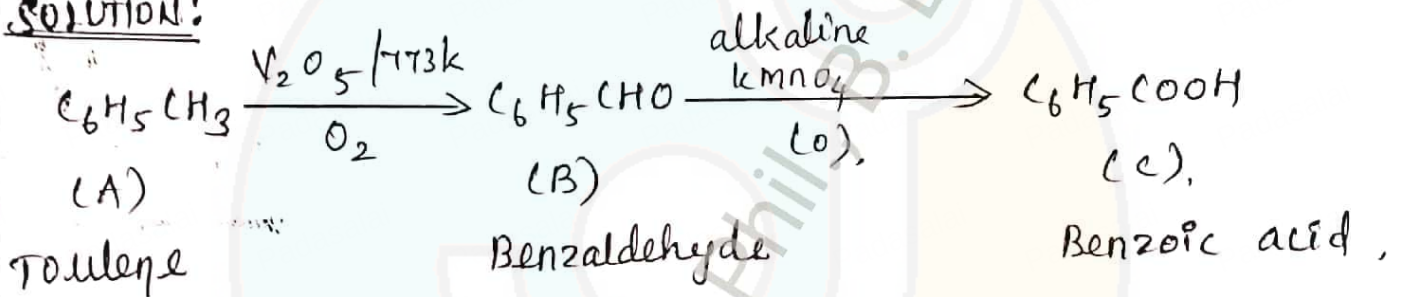
SOLUTION:



Compound	structural formula	name
A	C_6H_5CHO	Benzaldehyde
B	C_6H_5COOH	Benzoic acid
C	$C_6H_5COC_6H_5$	Benzophenone

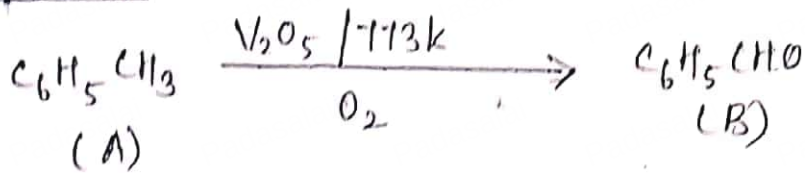
- Q8) Compound (A) of molecular formula C_7H_8 when treated with air in presence of V_2O_5 at $773K$ gives a compound (B) of molecular formula C_7H_6O , which has the smell of bitter almonds. Alkaline $KMnO_4$ oxidises compound (B) to (C) of molecular formula $C_7H_6O_2$. Compound (B) on treatment with N_2H_4 and KOH gives back compound (A). Identify (A), (B) and (C). Explain the reactions.

SOLUTION:



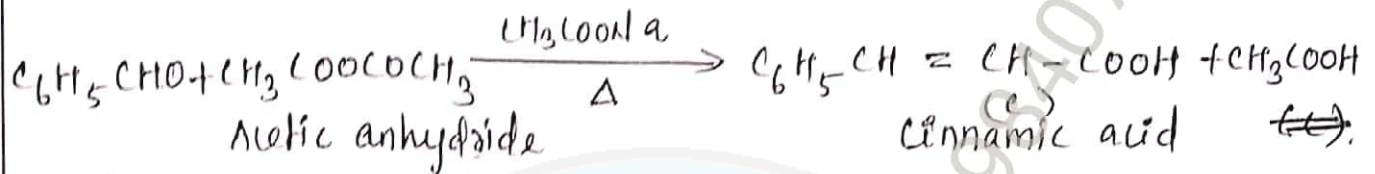
Compound	Structural formula	Name
A	$C_6H_5CH_3$	Toluene
B	C_6H_5CHO	Benzaldehyde
C	C_6H_5COOH	Benzoic acid

- Q9) An organic compound (A) C_7H_8 on oxidation by air in the presence of V_2O_5 at $773K$ gives (B) C_7H_6O , which reduces Tollen's reagent. (B) when heated with acetic anhydride and sodium acetate gives (C) C_9H_8O . Identify (A), (B) and (C). Write the reaction?

SOLUTION:

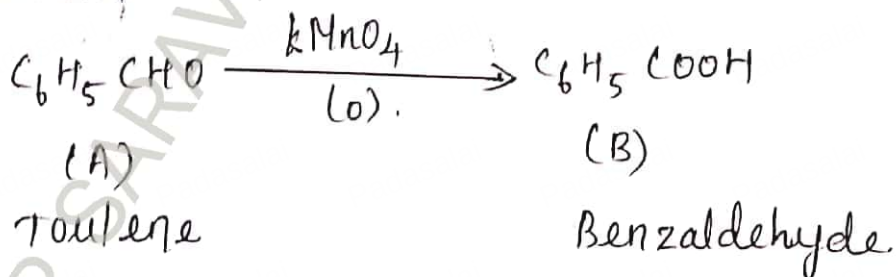
Benzaldehyde

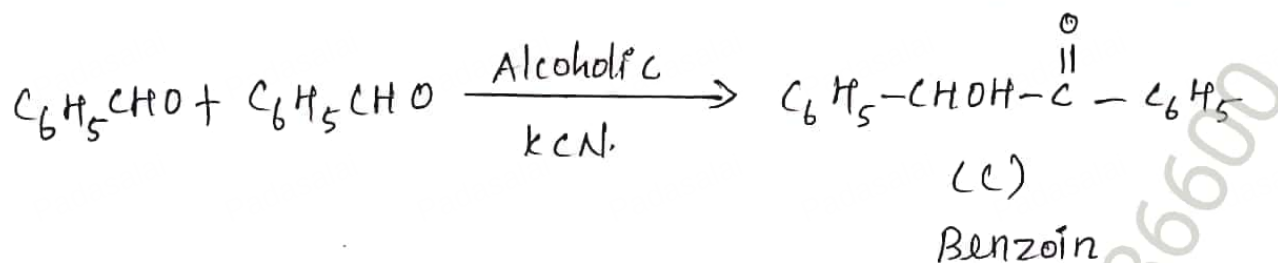
Benzoic acid.



Compound	Structural formula	Name
A	$\text{C}_6\text{H}_5\text{CH}_3$	Toluene
B	$\text{C}_6\text{H}_5\text{CHO}$	Benzaldehyde
C	$\text{C}_6\text{H}_5\text{CH}=\text{CH}-\text{COOH}$	Cinnamic acid

- (36) An organic compound (A) of molecular formula $\text{C}_7\text{H}_6\text{O}$ is called as oil of bitter almonds. (A) on oxidation gives (B) of molecular formula $\text{C}_7\text{H}_6\text{O}_2$ which gives brisk effervescence with NaHCO_3 soln. When (A) is refluxed with aqueous alcoholic KOH , compound (C) is formed. Identify (A), (B) and (C) and write the equations?

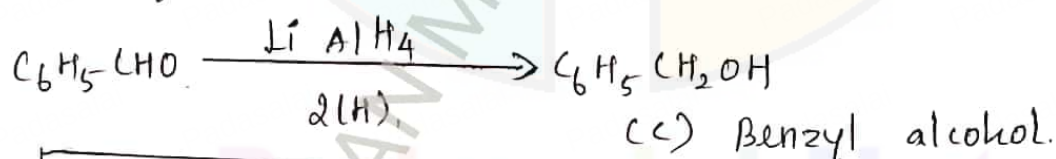
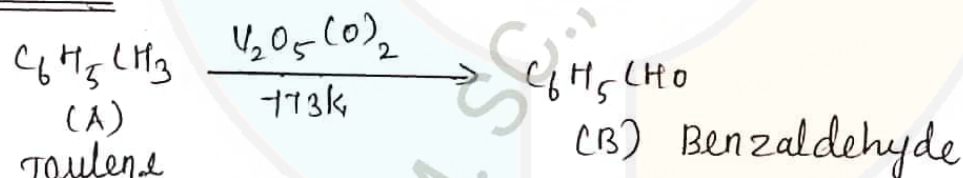
SOLUTION:



Compound	Structural formula	Name
A	C_6H_5CHO	Benzaldehyde
B	$C_6H_5\overset{\overset{O}{\parallel}}{C}H$	Benzoic acid
C	$C_6H_5-CH(OH)-\overset{\overset{O}{\parallel}}{C}-C_6H_5$	Benzoin

- ③) An organic compound (A) of molecular formula C_7H_8 on oxidation with air and in presence of V_2O_5 to form (B) of molecular formula C_7H_6O . (B) on reduction with lithium aluminium hydride to form (C) of molecular formula C_7H_8O . Identify (A), (B) and (C) and explain the reactions.

SOLUTION:

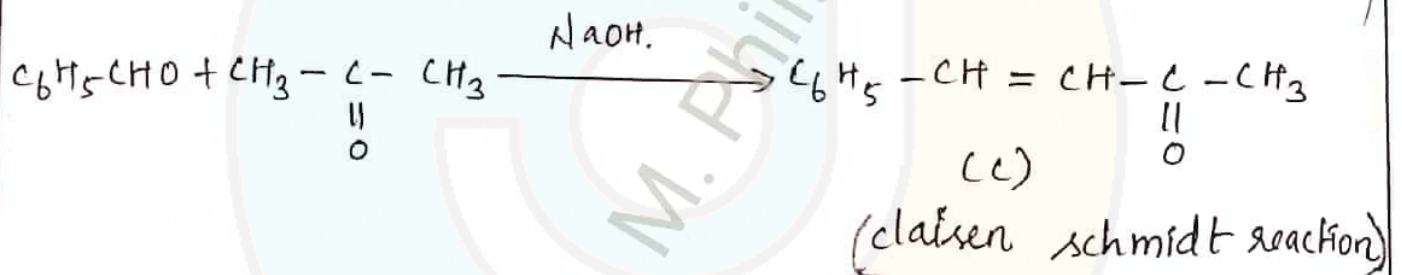
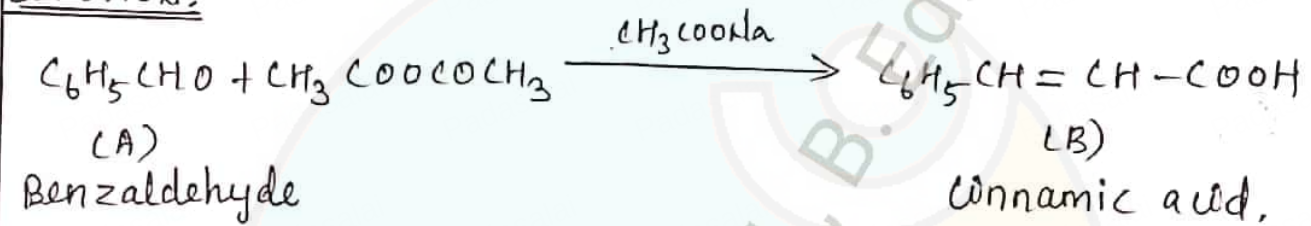


Compound	Structural formula	Name
A	$C_6H_5CH_3$	Toluene
B	C_6H_5CHO	Benzaldehyde
C	$C_6H_5CH_2OH$	Benzyl alcohol.

⑤

An Organic Compound (A) C_7H_6O reduces Tollen's reagent. Compound (A) reacts with acetic anhydride in the presence of anhydrous sodium acetate and gives an unsaturated acid (B). Compound (A) reacts with acetone in the presence of alkali and gives (C). What are (A), (B) and (C)? Explain the reactions?

SOLUTION:



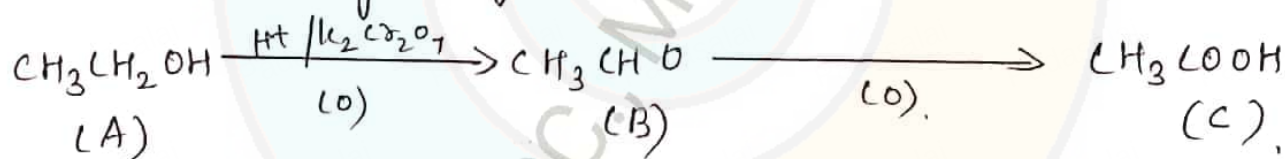
Compound	Structural formula	Name
A	C_6H_5CHO	Benzaldehyde
B	$C_6H_5CH=CH-COOH$	Cinnamic acid
C	$C_6H_5-CH=CH-C(=O)-CH_3$	Benzyl acetone Claisen Schmidt reaction.

- (33) An organic compound (A) C_2H_6O liberates hydrogen on treatment with metallic sodium (A) on oxidation gives (B) which answers iodoform test. (B) when oxidised to gives (C), which gives brisk effervescence with sodium bicarbonate. Find out (A), (B) and (C). Write the reaction.

SOLUTION:

(i) From the molecular formula (A) identified as ethyl alcohol C_2H_5OH . primary alcohol liberates H_2 gas with metallic sodium.

(ii) Primary alcohol and aldehyde can easily be oxidised to the corresponding carboxylic acid with oxidising agent.



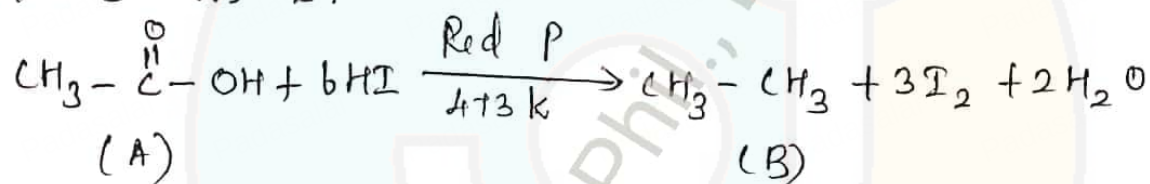
S.No	Compound	Name	Structure
1	A	Ethyl alcohol.	CH_3CH_2OH
2	B	Acetaldehyde.	CH_3CHO
3	C	Acetic acid.	CH_3COOH

- 34) An Organic compound (A) $C_2H_4O_2$ gives brisk effervescence with $NaHCO_3$, treated with HI and red phosphorous gives 'B' (C_2H_6). 'A' also reacts with chlorine in the presence of small amount of red phosphorus gives 'C'. Identify (A), (B) and (C). Explain the reactions.

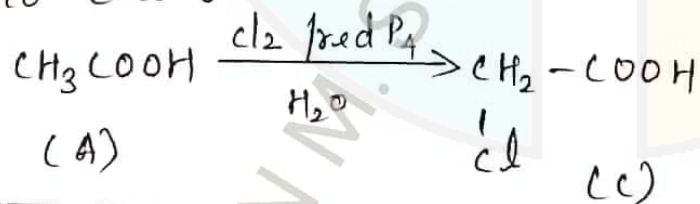
SOLUTION:

(i) compound (A) is acetic acid (CH_3COOH) gives brisk effervescence with sodium bicarbonate.

(ii) "A" treated with HI and red phosphorous, gives Ethane as 'B'.



(iii) "A" also reacts with chlorine in the presence of red phosphorous forms (α -halocarboxylic acid) mono chloro acetic acid.



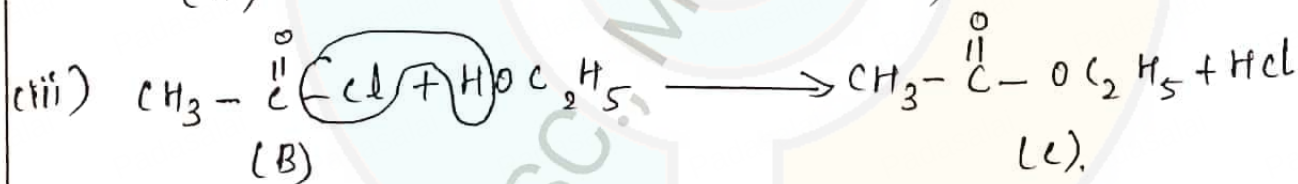
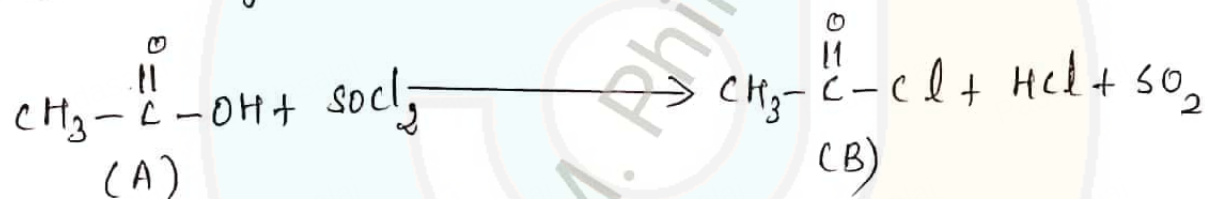
S.No	Compound	Name	Structure
1	A	Acetic acid	$CH_3 - \overset{\overset{O}{\parallel}}{C} - OH$
2	B	Ethane	$CH_3 - CH_3$
3	C	mono chloro acetic acid	$\begin{array}{c} CH_2 - COOH \\ \\ Cl \end{array}$

(35) An organic compound (A) $C_2H_4O_2$, forms blue litmus into red 'A' reacts with thionyl chloride gives 'B' C_2H_3OCl . 'B' further reacts with ethanol gives ester as 'C'. Find out (A), (B) and (C). Explain the reactions.

SOLUTION:

(i) Compound (A) is acetic acid, turns blue litmus into red.

(ii) Acetic acid treated with thionyl chloride gives acetyl chloride as 'B'.



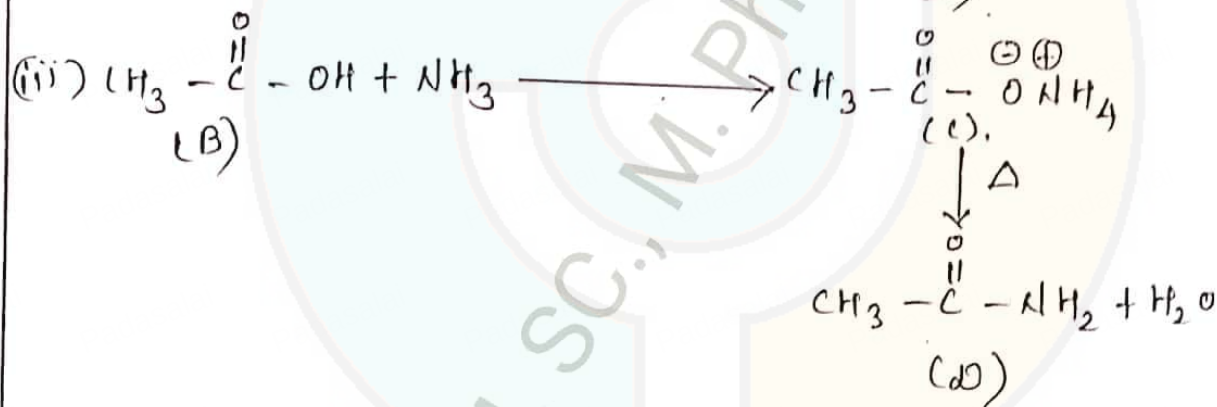
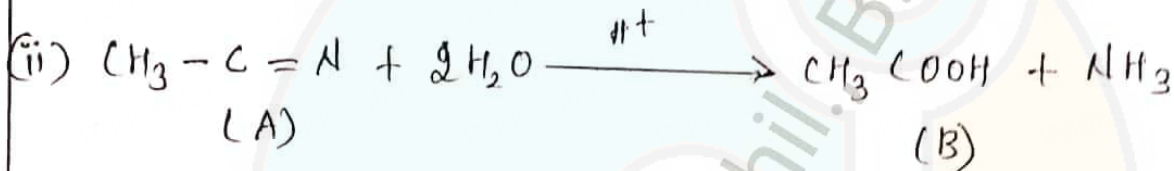
S.No	Compound	Name	Structure
1	A	Acetic acid	$\text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{OH}$
2	B	Acetyl chloride	$\text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{Cl}$
3	C	Ethyl acetate	$\text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{OC}_2\text{H}_5$

(36)

An organic compound (A) (C_2H_3N) on hydrolysis with an acid gives (B), warmed with alcohol and conc. H_2SO_4 , which gives fruity odour (C) on treatment with ammonia gives (d). compound (c) on further heating gives (d). Identify (A), (B), (c) and (d). Explain the reaction.

Solution;

(i) compound (A) is methyl cyanide (CH_3CN) is identified from its molecular formula C_2H_3N .

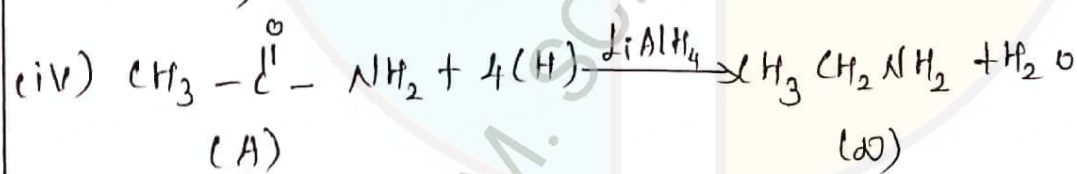
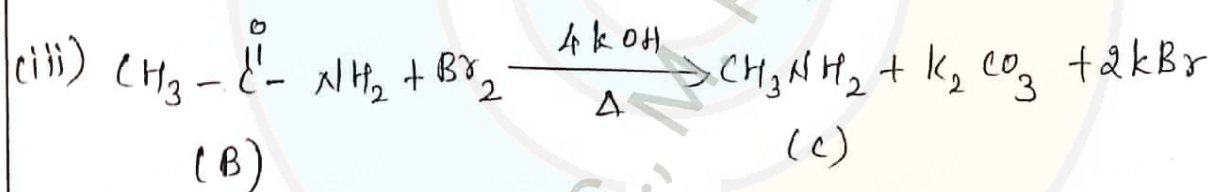
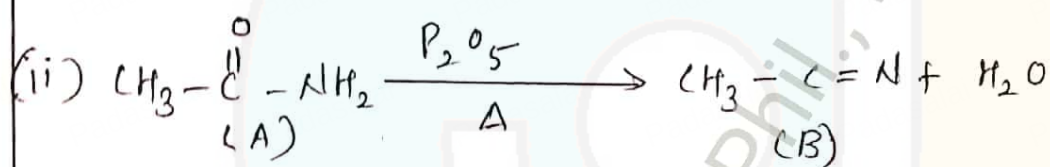


S.No	Compound	Name	Structure
1	A	methyl cyanide	$CH_3 - C \equiv N$
2	B	Acetic acid	$CH_3 - \overset{\overset{O}{\parallel}}{C} - OH$
3	c	Ammonium Acetate	$CH_3 - \overset{\overset{O}{\parallel}}{C} - \overset{\ominus}{O} \overset{\oplus}{NH_4}$
4	d	acetamide.	$CH_3 - \overset{\overset{O}{\parallel}}{C} - NH_2$

31. An Organic compound 'A' (C_2H_5ON) on heating with P_2O_5 gives 'B' (C_2H_3N). again compound 'B' partial hydrolysis with cold con. HCl gives compound 'A'. A reacts with Bromine in the presence of caustic alkali it forms compound 'C'. 'A' also reduced by $LiAlH_4$ give 'D'. Find out (A), (B), (C), and (D). Explain the reaction.

SOLUTION:

(i) Compound 'A' is Acetamide (CH_3CONH_2) identified from its molecular formula C_2H_5ON .

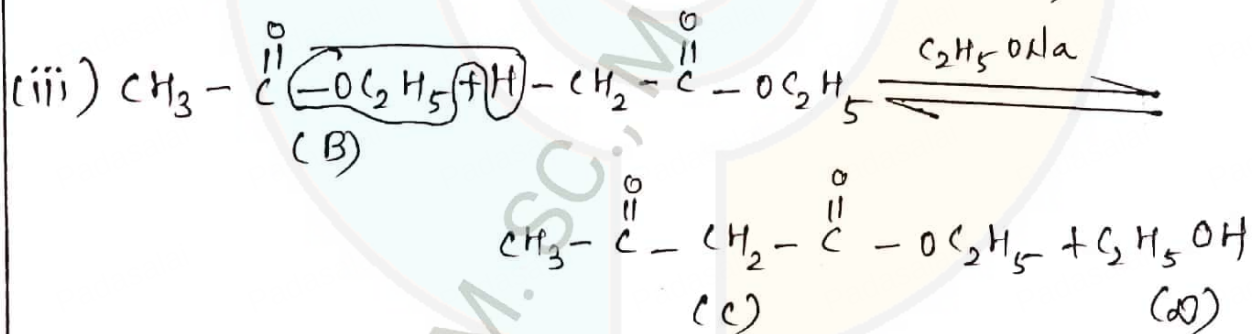
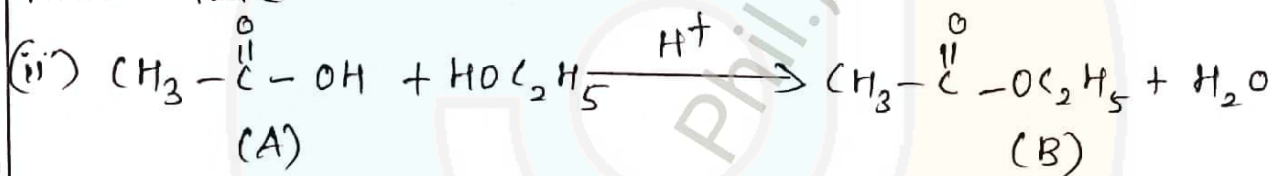


S.No	Compound	Name	Structure
1	A	Acetamide	$CH_3-\overset{\overset{O}{\parallel}}{C}-NH_2$
2	B	methyl cyanide (aceto nitrile)	$CH_3-C \equiv N$
3	C	methyl amine	CH_3-NH_2
4	D	Ethyl amine.	$CH_3CH_2NH_2$

- (38) An Organic compound (A) $C_2H_4O_2$ gives brisk effervescence with sodium bicarbonate. A on treated with ethyl alcohol in the presence of mineral acid gives fruity odour as 'B'. Compound 'B' further undergoes self condensation in the presence of a strong base, forms 'C' and 'D'. Identify A, B, C, D and explain the reactions?

SOLUTION:

(i) An organic compound (A) is acetic acid, (CH_3COOH) gives brisk effervescence with sodium bicarbonate.



S.No	Compound	Name	Structure
1	A	acetic acid	CH_3-COOH
2	B	Ethyl acetate	$CH_3-\overset{\overset{O}{\parallel}}{C}-OC_2H_5$
3	C	Ethyl aceto acetate	$CH_3-\overset{\overset{O}{\parallel}}{C}-CH_2-\overset{\overset{O}{\parallel}}{C}-OC_2H_5$
4	D	Ethyl alcohol.	$C_2H_5OH.$

ORGANIC NITROGEN

Compoos.

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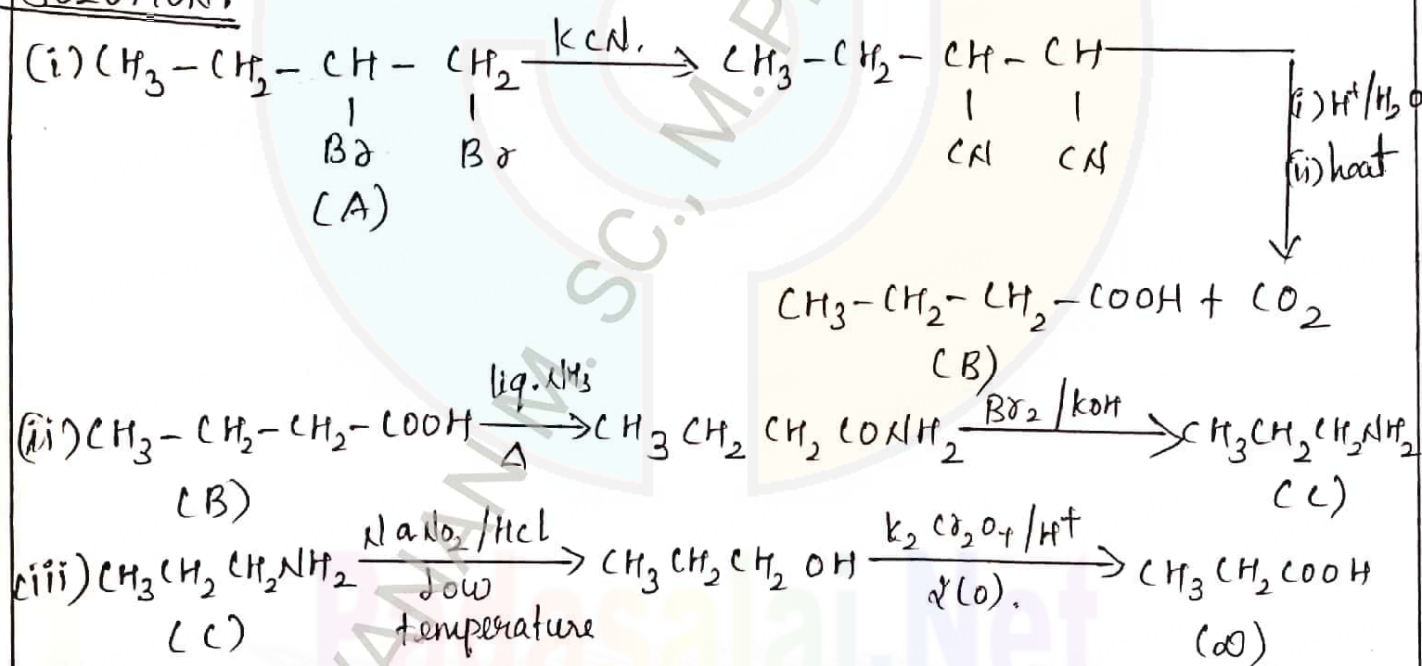
P. SARAVANAN M. SC., M. Phil., B. Ed.,

Padasalai.Net

ORGANIC NITROGEN COMPOUNDS

- ① A dibromo derivative (A) on treatment with KCN followed by acid hydrolysis and heating gives a monobasic acid (B) along with liberation of CO_2 . (B) on heating with liquid ammonia followed by treating with Br_2/KOH gives (C) which on treating with NaNO_2 and HCl at low temperature followed by oxidation gives a monobasic acid (D) having molecular mass 74. Identify (A), (B), (C) and (D). Explain the reaction?

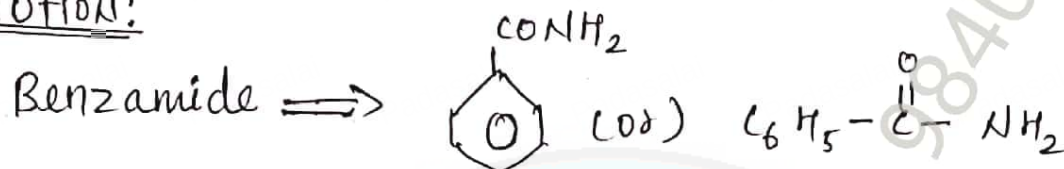
SOLUTION:



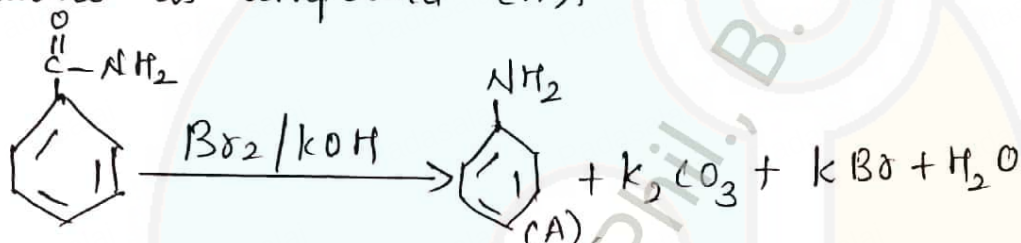
S. No	Compound	Name	Structure
1	A	1,2 - dibromo butane	$\text{CH}_3\text{CH}_2 - \underset{\text{Br}}{\text{CH}} - \underset{\text{Br}}{\text{CH}_2}$
2	B	1,2 - dicyano butane	$\text{CH}_3 - \text{CH}_2 - \underset{\text{CN}}{\text{CH}} - \text{CH}_2 - \text{CN}$
3	C	1 - amino propane	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$
4	D	propanoic acid	$\text{CH}_3 - \text{CH}_2 - \text{COOH}$

- ② When benzamide is treated with bromine and alkali gives compound (A). also when benzamide is reduced by LiAlH_4 , compound (B) is formed. Find (A) and (B). Write the equations.

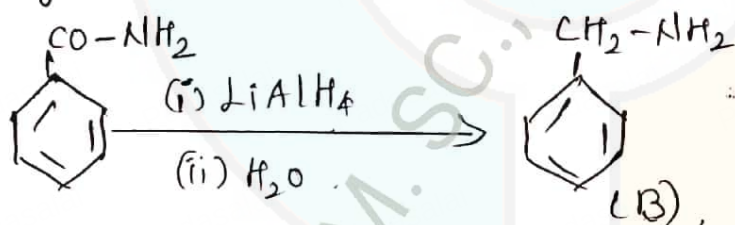
SOLUTION:

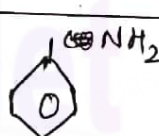
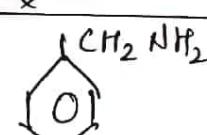


- (i) Benzamide is treated with Br_2/KOH gives aniline as compound (A).



- (ii) Benzamide is reduced by LiAlH_4 gives Benzyl amine as compound (B)



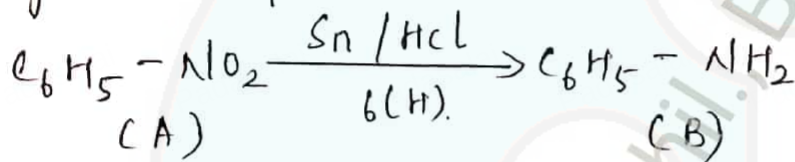
S.No	Compound	Name	Structure
1	A	Aniline	
2	B	Benzylamine	

- ③ Compound (A) is yellow coloured liquid and it is called oil of mirbane. (A) on reduction with tin and HCl gives (B). (B) answers carbylamine test. Identify (A) and (B).

Solution:

(i) Nitro benzene is compound (A) yellow coloured liquid and it is called oil of mirbane.

(ii) Compound (A) on reduction with tin/HCl gives compound (B).



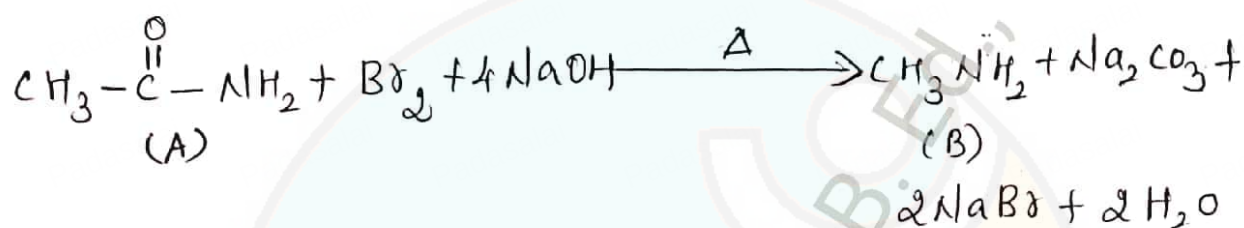
S.No	Compound	Name	Structure
1	A	Nitrobenzene	$\text{C}_6\text{H}_5 - \text{NO}_2$
2	B	Aniline	$\text{C}_6\text{H}_5 - \text{NH}_2$

- ④ An organic compound (A) of molecular formula $\text{C}_2\text{H}_5\text{NO}$ on treated with Br_2/NaOH to give compound (B) of molecular formula CH_5N . (A) is reduced by LiAlH_4 to give compound (C) of molecular formula $\text{C}_2\text{H}_7\text{N}$. Identify (A), (B) and (C).

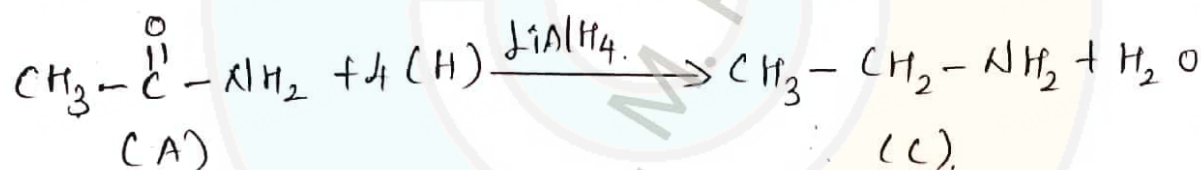
Solution:

(i) Compound (A) Acetamide ($\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{NH}_2$) is identified from its molecular formula $\text{C}_2\text{H}_5\text{NO}$.

(ii) Compound (A) reacts with bromine in the presence of caustic alkali to form a primary amine carrying one carbon less than the parent amide as compound (B).



(iii) (A) on reduction with LiAlH_4 to form ethylamine as compound (C).



S.No	Compound	Name	Structure.
1	A	Acetamide	$\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{NH}_2$
2	B	Methylamine	$\text{CH}_3 - \text{NH}_2$
3	C	Ethylamine	$\text{CH}_3 - \text{CH}_2 - \text{NH}_2$

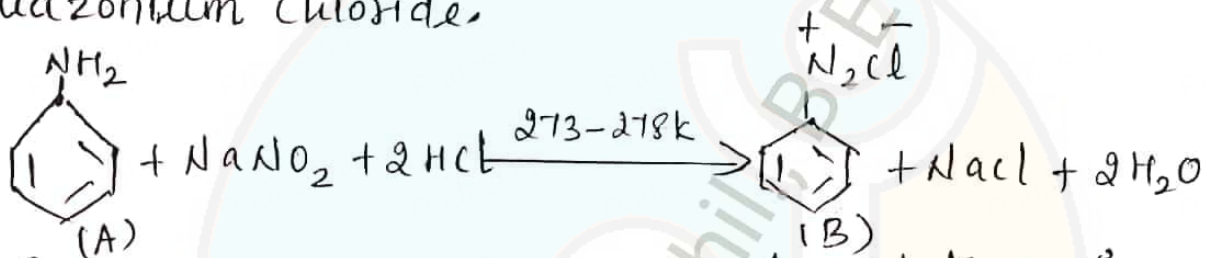
⑤ An aromatic primary amine (A) with molecular formula $\text{C}_6\text{H}_7\text{N}$ undergoes diazotisation to give (B). When the aqueous solution of (B) is boiled it gives (C). Identify (A), (B) and (C). Write the reaction?

SOLUTION:

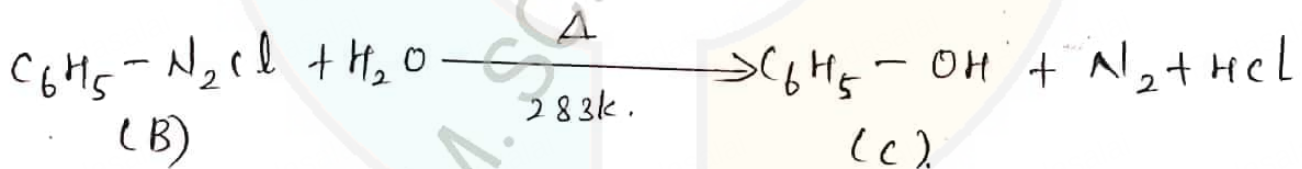
(i) An aromatic primary amine (A) aniline is identified from its molecular formula C_6H_7N .

(ii) Diazotisation:

Aniline reacts with nitrous acid at low temperature (273-278K) to give benzene diazonium chloride.



(iii) Benzene diazonium chloride solution is added slowly to a large volume of boiling water to get phenol.



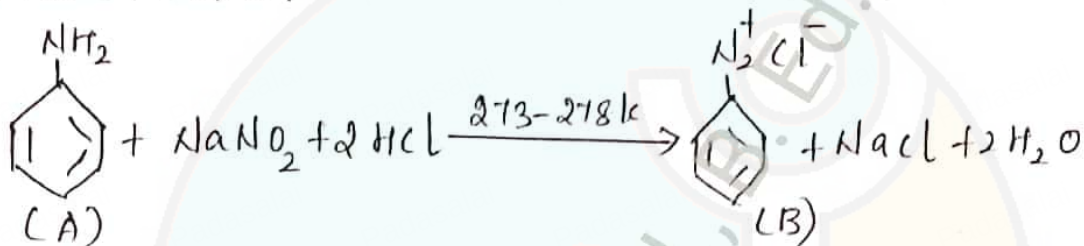
S.No	Compound	Name	Structure
1	A	Aniline	$C_6H_5 - NH_2$
2	B	Benzene diazonium chloride	$C_6H_5 - N_2Cl$
3	C	phenol.	$C_6H_5 - OH$

- ① An aromatic primary amine (A) with molecular formula C_6H_7N undergoes diazotisation to give (B). (B) when treated with hypophosphorous acid gives (C). Identify (A), (B) and (C).

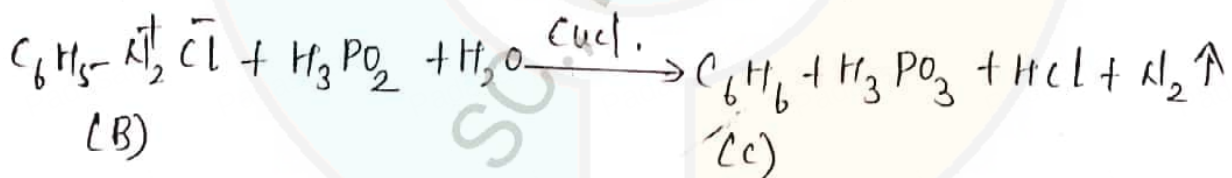
SOLUTION:

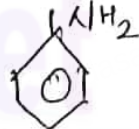
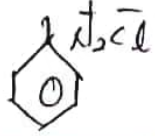
(i) An aromatic primary amine (A) is aniline.

(ii) Diazotization:



(iii) Benzene diazonium chloride reduced by hypophosphorous acid in the presence of CuCl gives benzene as compound (C).

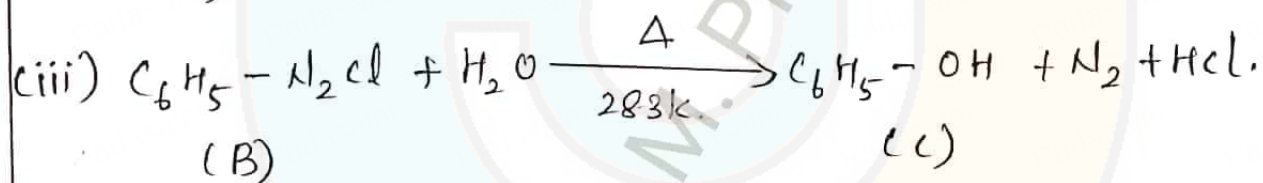
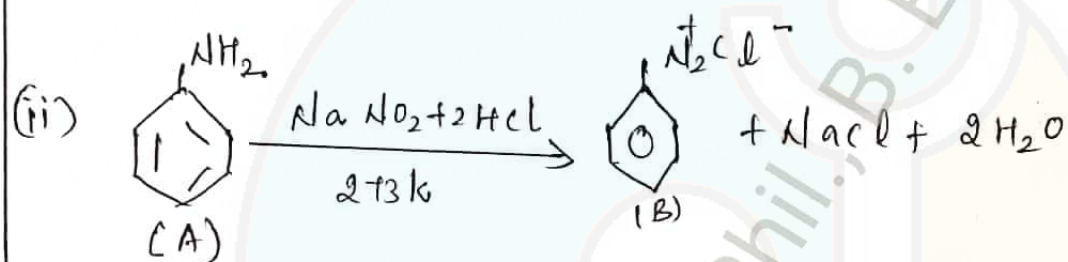


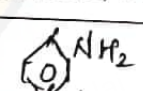
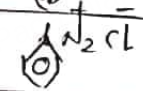
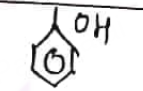
S.No	Compound	Name	Structure
1	A	Aniline	
2	B	Benzene diazonium chloride	
3	C	Benzene	

- ⑦ An organic compound (A) with molecular formula C_6H_7N gives (B) with HNO_2/HCl at $273K$. The aqueous solution of (B) on heating gives (C). when gives violet colour with neutral $FeCl_3$. Identify the compounds (A), (B) and (C).

SOLUTION:

(i) An organic compound (A) with molecular formula C_6H_7N is aniline ($C_6H_5-NH_2$).

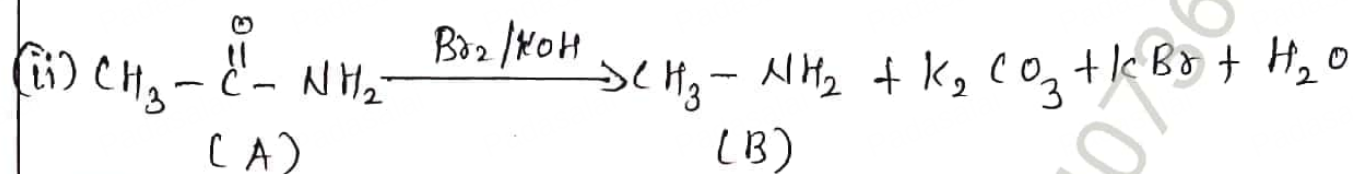


S.No	Compound	Name	STRUCTURE
1	A	Aniline	
2	B	Benzene diazonium chloride	
3	C	phenol.	

- ⑧ An organic compound (A) of molecular formula C_9H_5ON treated with bromine and KOH gives (B). of molecular formula CH_5N . Identify (A) and (B). write the equation involved.

SOLUTION:

(i) An organic Compound (A) of molecular formula C_2H_5ON identified $CH_3-\overset{\overset{O}{\parallel}}{C}-NH_2$



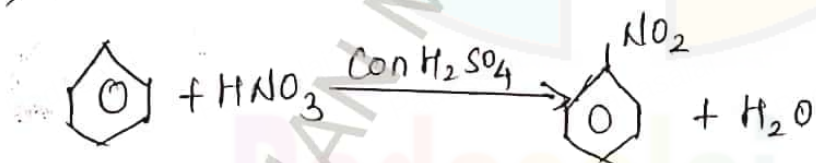
S.No	Compound	Name	Structure
1	A	Acetamide	$CH_3-\overset{\overset{O}{\parallel}}{C}-NH_2$
2	B	Methyl amine	CH_3-NH_2

⑨ An aromatic hydrocarbon (A) on nitration gives (B) which is known as oil of mirbane. (B) on warming with con. H_2SO_4 gives compound (C). Identify (A), (B) and (C).

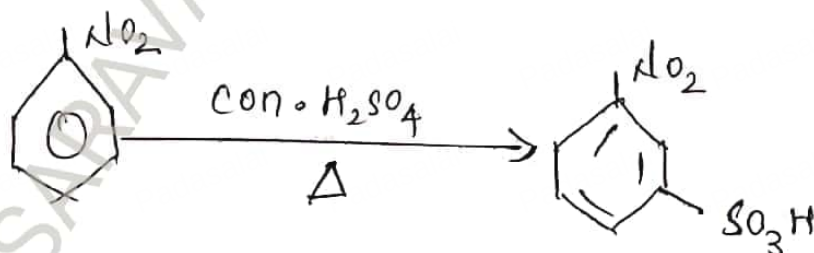
SOLUTION:

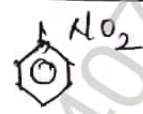
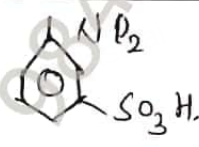
(i) An aromatic hydrocarbon (A) is Benzene.

(ii) Nitration of benzene.



(iii) sulphonation of nitrobenzene.



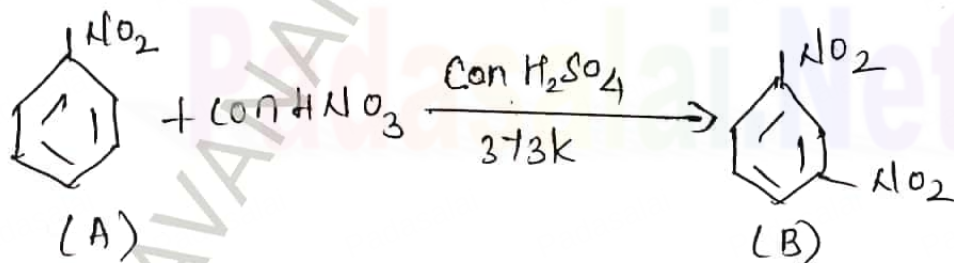
S.No	Compound	Name	Structure
1	A	Benzene	
2	B	Nitrobenzene	
3	C	3-nitrobenzene sulphonic acid	

- ⑬ Compound (A) is yellow colour liquid and it is called oil of mirbane. (A) on nitration at 373k gives (B), (B) on further reduced by $(\text{NH}_4)_2\text{S}_x$ gives compound (C). Identify (A), (B) and (C). Explain the reactions?

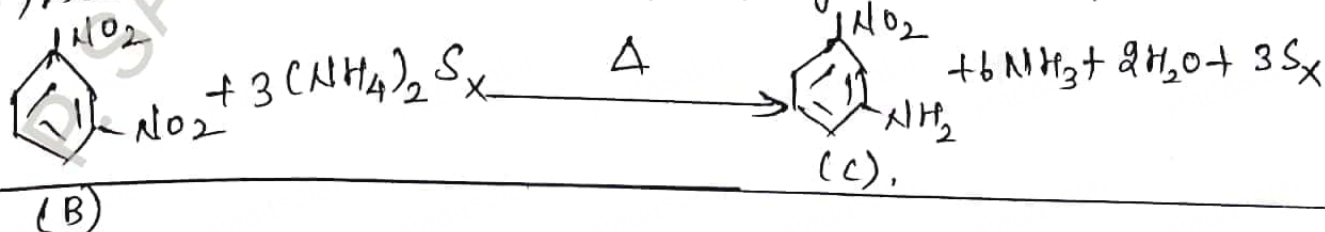
SOLUTION:

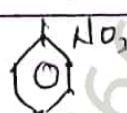
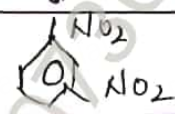
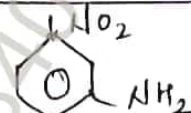
(i) Compound (A) Nitrobenzene is yellow coloured liquid and it is called oil of mirbane

(ii) Nitration of nitrobenzene



(iii) selective reduction of poly nitro compound.

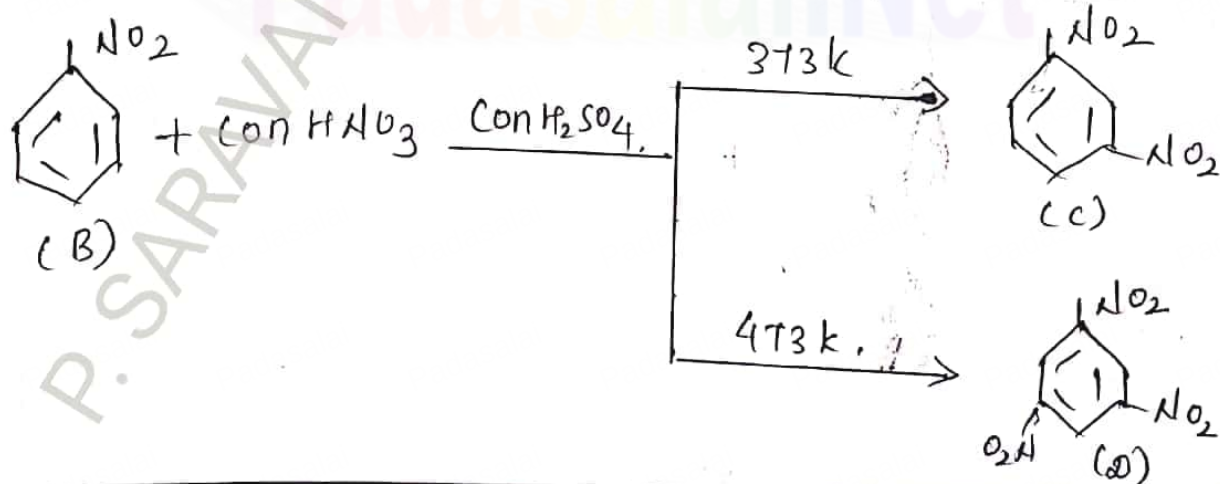
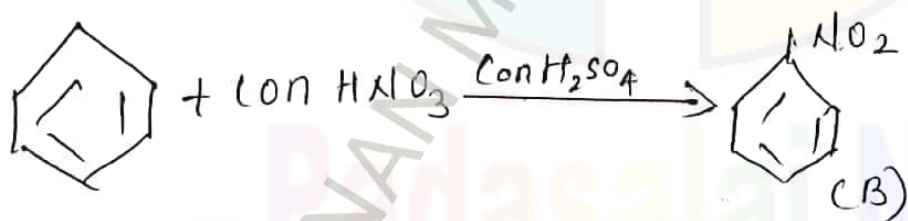


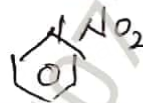
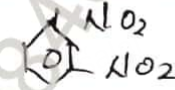
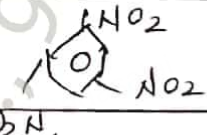
S.No	Compound	Name	Structure
1	A	nitro benzene	
2	B	1,3-dinitro benzene	
3	C	3-nitro aniline (m-nitro aniline)	

⑩ An aromatic hydrocarbon (A) on nitration gives (B), which is yellow coloured liquid, (B) on heated with nitrating mixture at 373k (100°C) and 473k (200°C) gives compound (C) and (D) respectively. Find out (A), (B), (C) and (D). and explain the reaction?

SOLUTION:

- (i) An aromatic hydrocarbon (A) is Benzene
(ii) Nitration of benzene

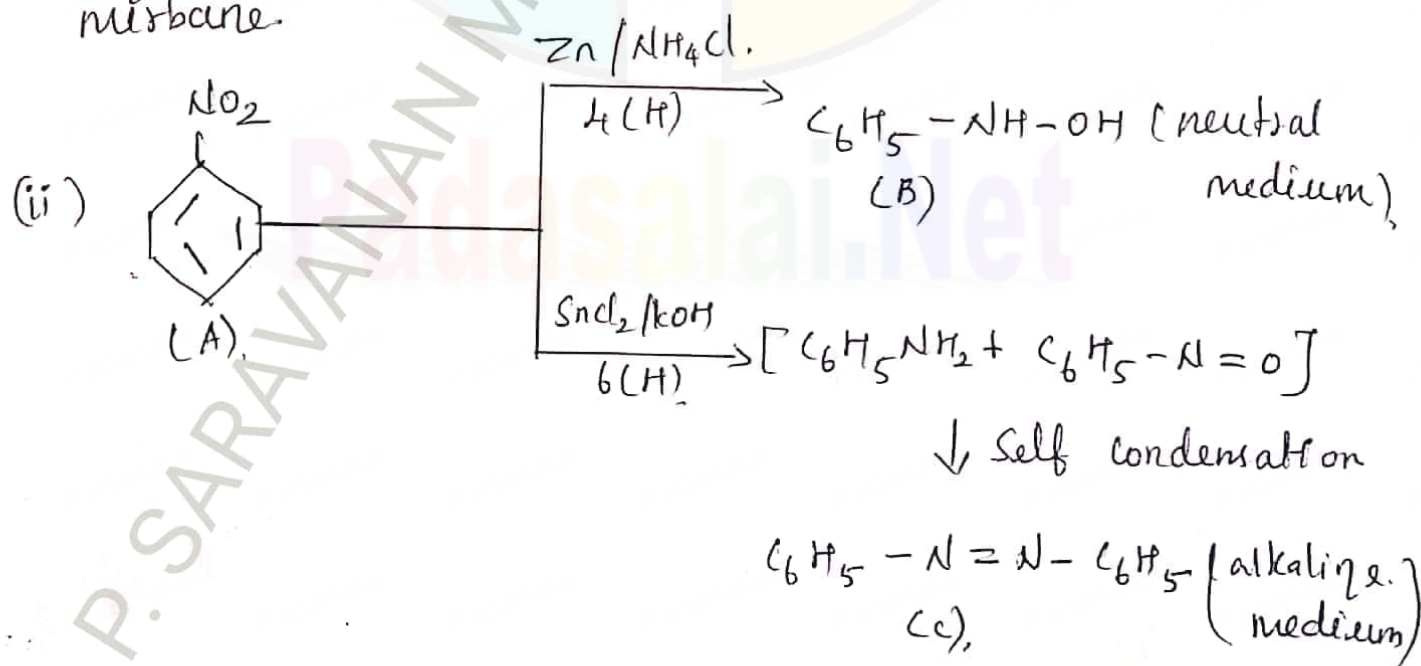


S.No	Compound	Name	STRUCTURE
1	A	Benzene	
2	B	nitro benzene	
3	C	1,3-dinitro benzene	
4	D	1,3,5-trinitro benzene (TNB)	

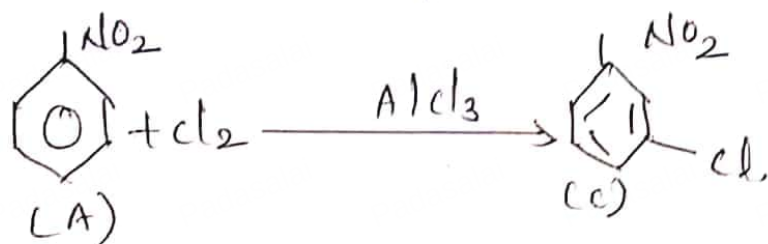
② Compound (A) is called oil of mirbane (A) reduced by $\text{Zn}/\text{NH}_4\text{Cl}$ and SnCl_2/KOH as per the pH medium gives compound (B) and (C). (A) further chlorinated in the presence of Lewis acid gives 1,2,4-trichlorobenzene. Identify (A), (B), (C) and (D). Explain the reaction in it?

SOLUTION:

(i) Compound (A) with nitrobenzene is called oil of mirbane.



(iii) chlorination of nitrobenzene

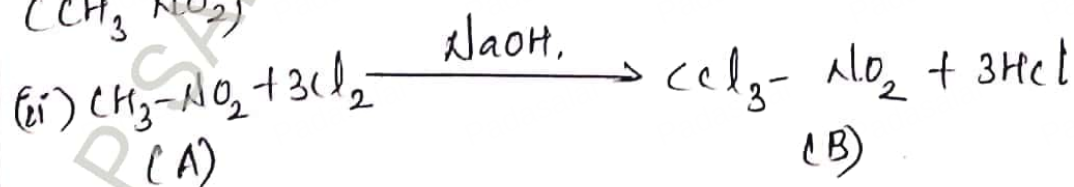


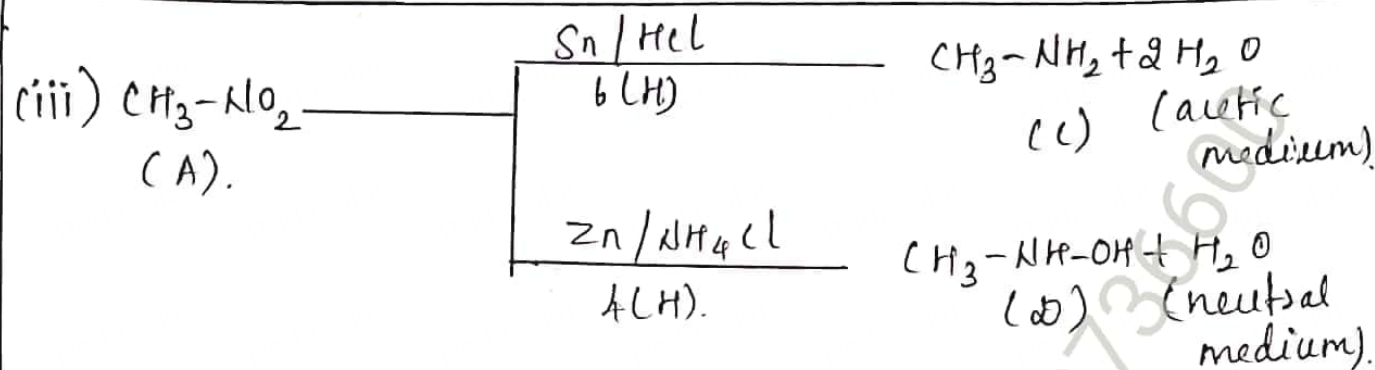
S.No	Compound	Name	Structure
1	A	Nitro benzene	
2	B	phenyl hydroxylamine	$C_6H_5 - NH - OH$
3	C	Azobenzene	$C_6H_5 - N = N - C_6H_5$
4	D	3-chloronitrobenzene.	

Q13 An aliphatic primary nitro compound (A) colourless pleasant smelling liquid is treated with chlorine in the presence of NaOH gives compound (B), which is used as an insecticide 'A' on reduced by Sn/HCl and Zn/NH_4Cl at different pH of the medium gives 'C' and 'D'. Identify (A), (B), (C) and (D). write the reactions?

SOLUTION:

(i) An aliphatic primary nitro compound (A) is Nitro methane is colourless pleasant smelling liquid (CH_3NO_2)





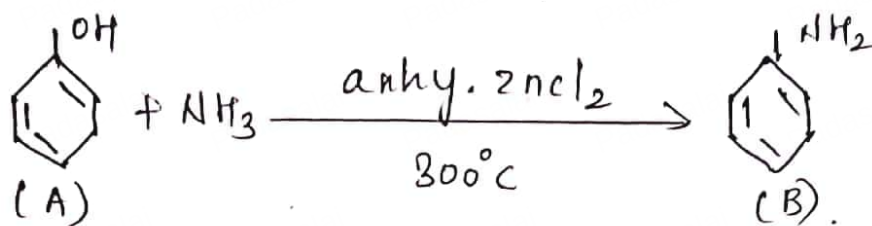
S.No	Compound	Name	Structure
1	A	nitro methane	$\text{CH}_3\text{-NO}_2$
2	B	chloro picric (trinitro methane)	$\text{CCl}_3\text{-NO}_2$
3	c	methyl amine	$\text{CH}_3\text{-NH}_2$
4	d	N-methyl hydroxylamine	$\text{CH}_3\text{-NHOH}$

14) Compound (A) with molecular formula $\text{C}_6\text{H}_6\text{O}$ gives violet colour with neutral FeCl_3 . (A) reacts with ammonia at 300°C in the presence of anhydrous ZnCl_2 give 'B' which answers (Carbylamine test) 'B' on treated with disulphide gives 'c'. 'c' on further boiling with con HCl gives compound 'd'. which has mustard oil smell. Identify (A), (B), (c) and (d). write the chemical reactions?

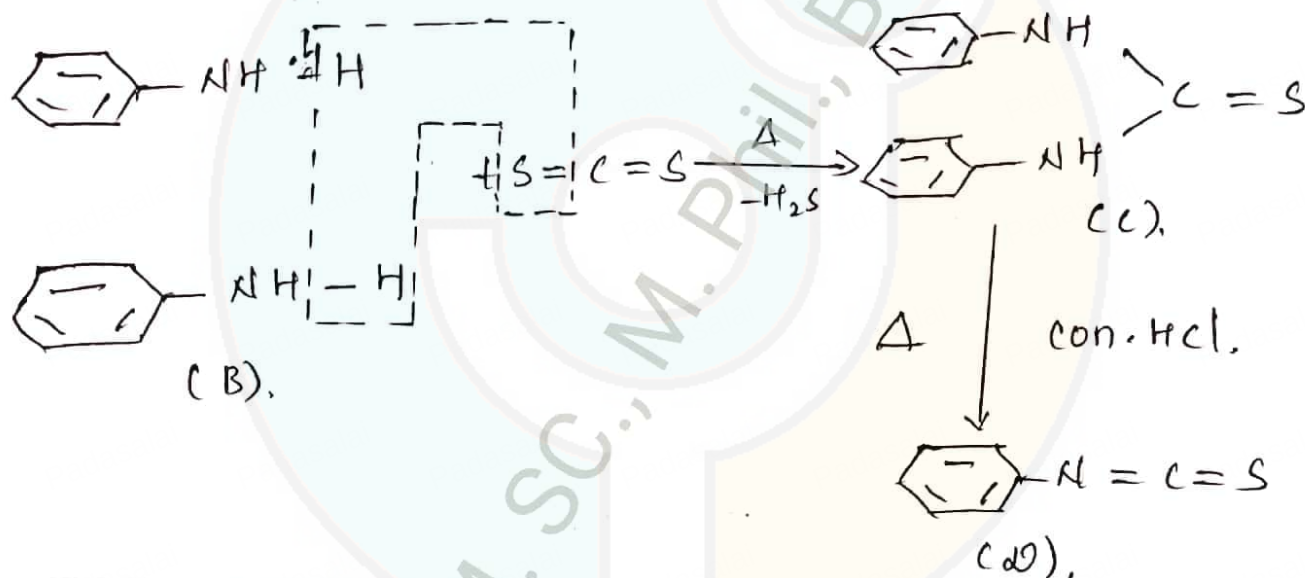
SOLUTION:

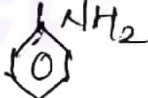
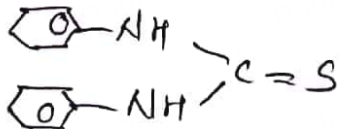
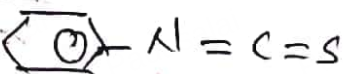
(i) Compound (A) with molecular formula $\text{C}_6\text{H}_6\text{O}$ is phenol ($\text{C}_6\text{H}_5\text{OH}$) is gives violet colour with neutral FeCl_3 .

(ii) phenol reacts with ammonia at 500°C in the presence of anhydrous ZnCl_2 to give aniline.



(iii) when aniline treated with S_2 , S-diphenylthio area is formed, which on boiling with strong HCl , phenyl isocyanate is formed.



S.No	Compound	Name	Structure
1	A	Phenol	
2	B	Aniline	
3	C	S-diphenyl thiourea	
4	D	(Phenyl mustard oil) phenyl isothiocyanate.	

- 15) An organic compound (A) with molecular formula (C_2H_5ON) , reacts with trifluoroperoxy acid gives compound (B), which is used as a fuel additive. On reduction of 'B' by H_2/Ni gives compound 'C'. 'C' on further reacts with chloroform and alcoholic KOH gives 'D' which has an unpleasant smell. Find (A), (B), (C) and (D). Explain the reactions?

SOLUTION:

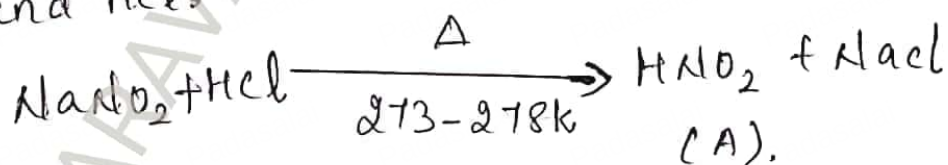
- (i) An organic compound (A) Acetaldoxime $(CH_3-CH=N-OH)$ is identified from molecular formula C_2H_5ON .
- (ii) Oxidation of acetaldoxime with trifluoroperoxy acetic acid gives nitro ethane.
- $$CH_3-CH=N-OH \xrightarrow[\text{[O]}]{CF_3COOH} CH_3-CH_2-NO_2$$
- (A) (B)
- (iii) Reduction of nitroethane by H_2/Ni gives ethanamine.
- $$CH_3CH_2-NO_2 \xrightarrow{3H_2/Ni} CH_3CH_2-NH_2 + 2H_2O$$
- (B) (C)
- (iv) Nitroethane reacts with chloroform and alcoholic KOH gives compound (C) as ethyl isocyanide.
- $$C_2H_5-NH_2 + CHCl_3 + 3KOH \longrightarrow C_2H_5-NC + 3KCl + 3H_2O$$
- (C) (D)

S.No	Compound	Name	Structure
1	A	Acetaldoxime	$\text{CH}_3 - \text{CH} = \text{N} - \text{OH}$
2	B	Nitroethane	$\text{CH}_3 - \text{CH}_2 - \text{NH}_2$
3	C	Ethylamine	$\text{CH}_3 - \text{CH}_2 - \text{NH}_2$
4	D	Ethyl isocyanide.	$\text{C}_2\text{H}_5 - \text{NC}$

- 16) Compound (A) can be prepared from, sodium nitrite and conc HCl at 273K. 'A' on treated with aryl secondary amine gives 'B' as yellow oily liquid which is insoluble in water. 'A' compound also further reacts with aryl tertiary amine at 273K gives compound (C). Identify (A), (B) and (C).

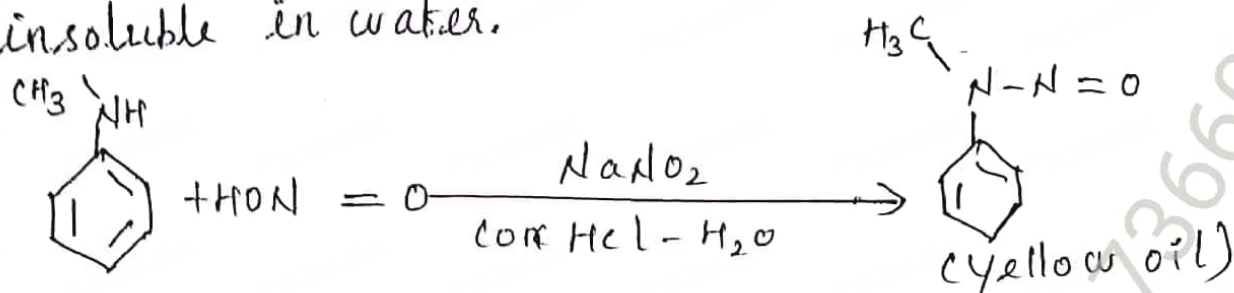
SOLUTION:

(i) Compound (A) prepared from NaNO_2 and HCl.

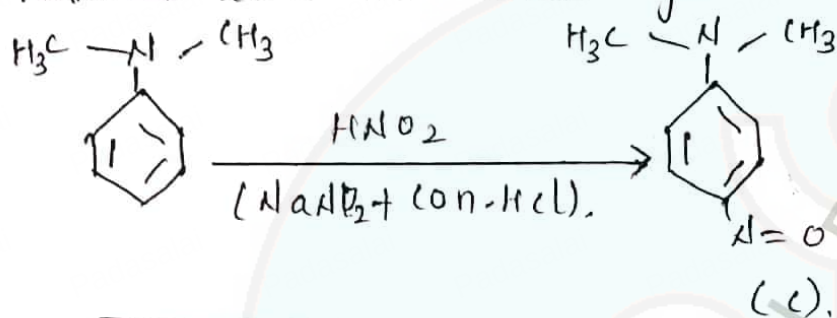


(ii) Aryl secondary amine reacts with nitrous acid gives N-nitrosoamine as yellow oily liquid which is

insoluble in water.



iii) Aromatic tertiary amine reacts with nitrous acid at 273K gives p-nitroso compound.

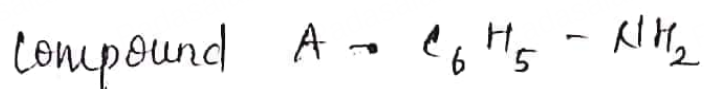


S.No	Compound	Name	Structure
1	A	Nitrous acid	HNO_2
2	B	N-nitrosomethyl phenyl amine	$ \begin{array}{c} \text{H}_3\text{C} \\ \\ \text{N} - \text{N} = \text{O} \\ \\ \text{C}_6\text{H}_5 \end{array} $
3	C	p-nitroso N, N-dimethyl aniline	$ \begin{array}{c} \text{H}_3\text{C} - \text{N} - \text{CH}_3 \\ \\ \text{C}_6\text{H}_4 \\ \\ \text{N} = \text{O} \end{array} $

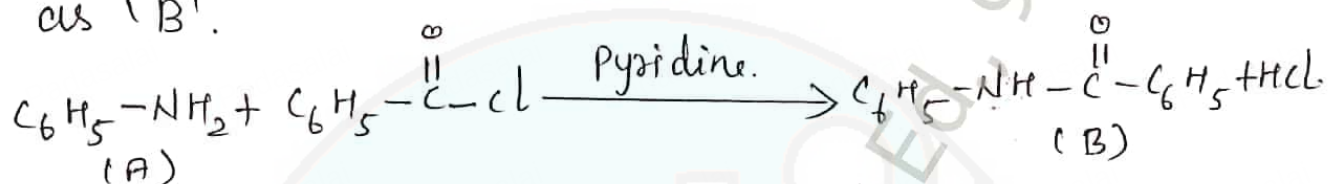
④ An aromatic primary amine (A) with molecular formula $\text{C}_6\text{H}_7\text{N}$ undergoes diazotisation 'A' reacts with Benzoyl chloride the presence of pyridine gives 'B'. 'A' also further reacts with Bromine water gives white precipitate as compound (C). Identify (A), (B) and (C). Explain the reactions?

SOLUTION:

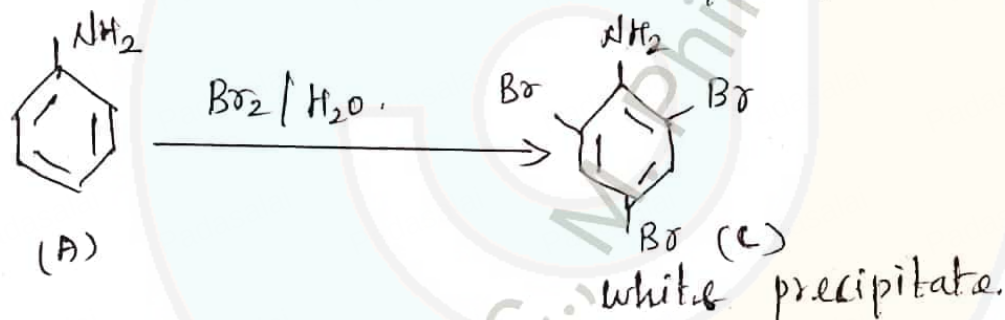
(i) An aromatic primary amine (A) Aniline identified from molecular formula C_6H_7N .



(ii) Aniline reacts with benzoyl chloride in the presence of pyridine gives N-phenyl benzamide as 'B'.



(iii) Aniline reacts with Br_2/H_2O to give 2,4,6-tribromo aniline a white precipitate.



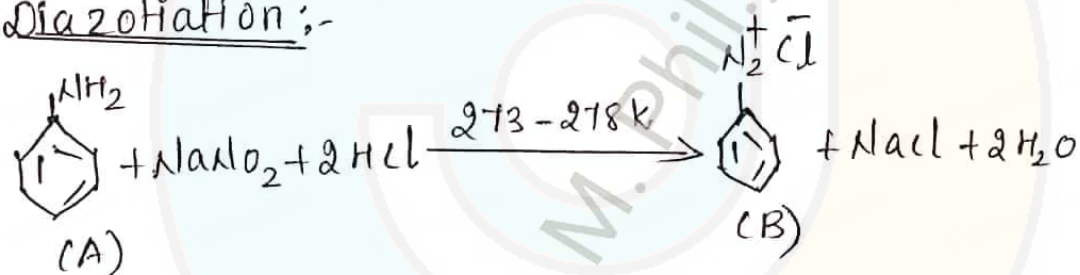
S.No	Compound	Name	Structure
1	A	Aniline	
2	B	N-phenyl benzamide	$C_6H_5 - NH - \overset{\overset{O}{\parallel}}{C} - C_6H_5$
3	C	2,4,6-tribromo aniline.	

- 18) An aromatic primary amine (A) with molecular formula C_6H_7N , undergoes diazotisation, gives (B). (B) reacts with fluoroboric acid, gives (C). Compound (C) further heated with aqueous sodium nitrate solution, and acetic acid gives compound (D) and (E). respectively. Identify (A), (B), (C) and (D), (E).

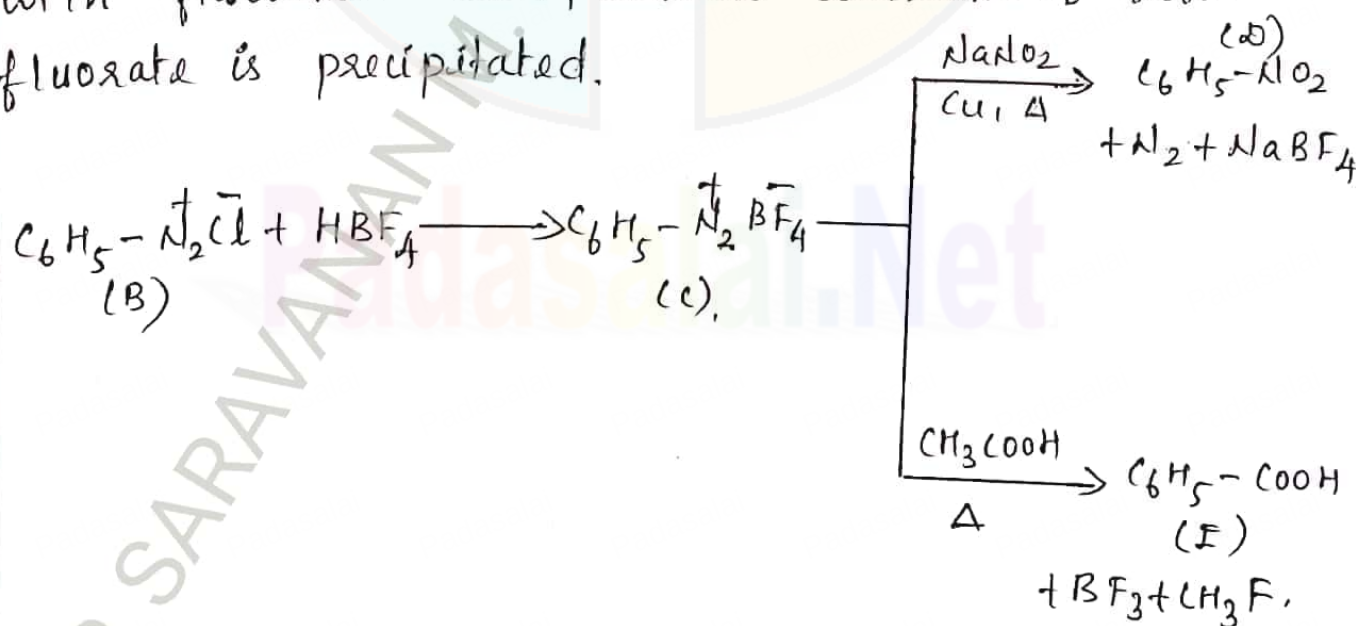
SOLUTION:

(i) An aromatic primary amine (A) aniline ($C_6H_5-NH_2$) identified from molecular formula C_6H_7N .

(ii) Diazotisation:-



(iii) when benzene diazonium chloride is treated with fluoroboric acid, benzene diazonium tetrafluoroborate is precipitated.



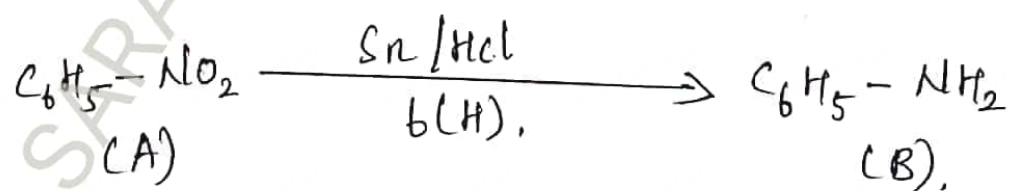
S.No	Compound	Name	Structure
1	A	Aniline	$C_6H_5-NH_2$
2	B	Benzene diazonium chloride	$C_6H_5-N_2^+Cl^-$
3	C	Diazonium tetrafluoroborate	$C_6H_5-N_2^+BF_4^-$
4	D	Nitro benzene	$C_6H_5-NO_2$
5	E	Benzoic acid.	C_6H_5-COOH
6	—	—	—

- (19) An aromatic nitro compound (B) on reduction with Sn/HCl gives compound (B) C_6H_7N . Compound (B) on treatment with Benzoyl chloride in the presence of pyridine to give (C). Compound (B) on treatment with CH_3Br to give compound (D) which further reacts with $NaNO_2/HCl$ to give compound (E) with yellow oil liquid. Identify (A) to (E) and write the reactions?

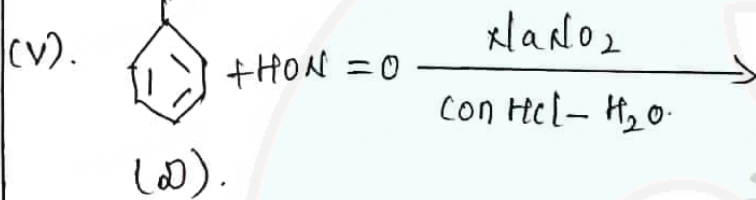
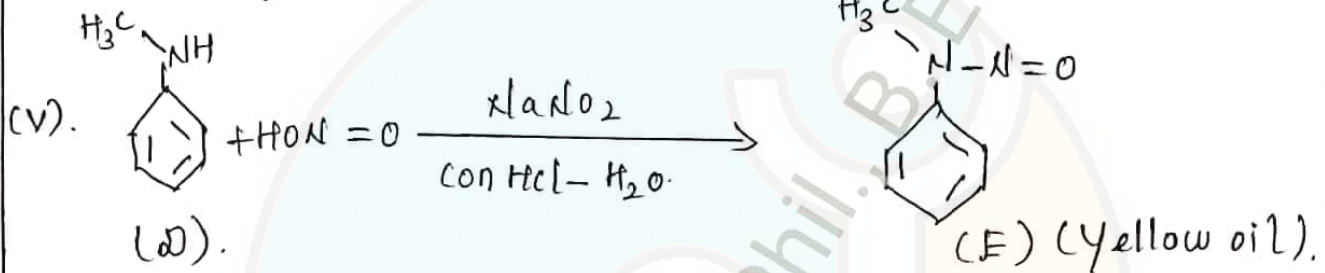
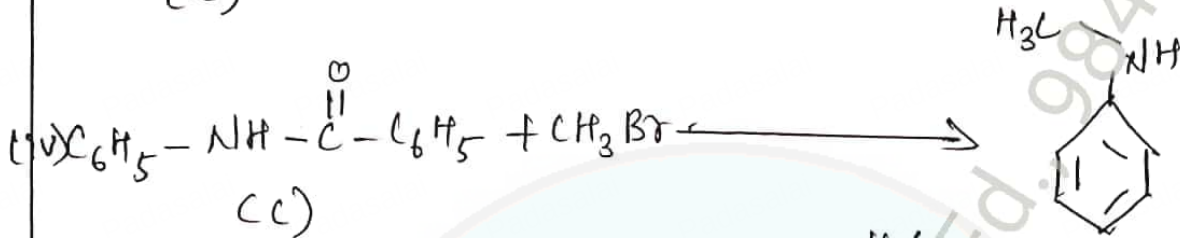
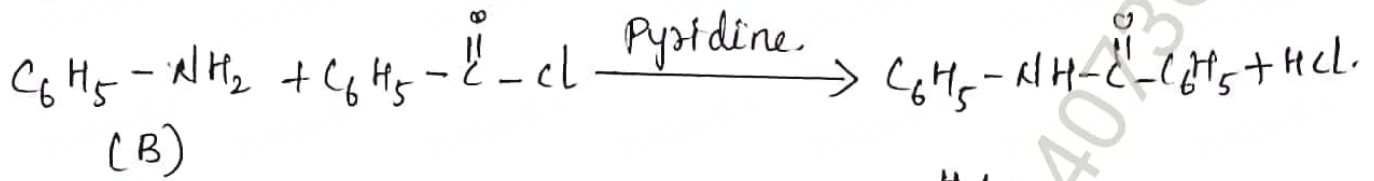
SOLUTION

(i) An aromatic nitro compound (A) is nitro benzene ($C_6H_5-NO_2$)

(ii) Nitrobenzene on reduction with Sn/HCl gives aniline as compound (B)



(iii) Aniline reacts with benzoyl chloride in the presence of pyridine give N-phenyl benzamide.



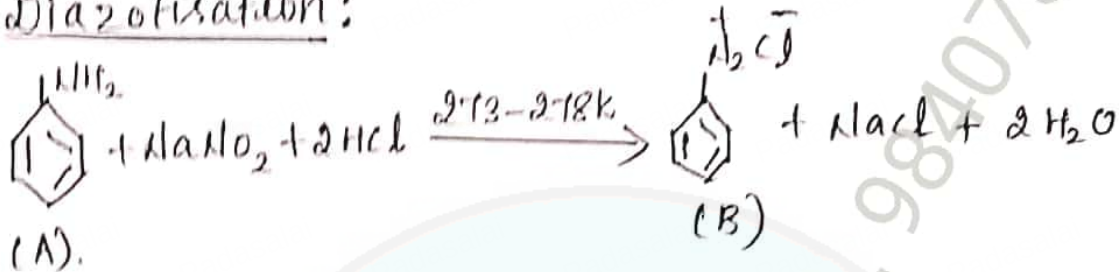
S.No	Compound	Name	Structure
1	A	Nitro benzene	
2	B	Aniline	
3	C	N-phenyl benzamide	$\text{C}_6\text{H}_5-\text{NH}-\overset{\text{O}}{\parallel}\text{C}-\text{C}_6\text{H}_5$
4	D	N-methyl aniline	
5	E	N-Nitroso methyl phenyl amine	

20) An aromatic primary amine (A) with molecular formula $\text{C}_6\text{H}_7\text{N}$, undergoes diazotization gives (B). (B) warmed with KI, gives 'C'. "B" also treated with benzene in the presence of sodium hydroxide to gives "D". Identify (A), (B), and (C). write the reactions?

Solution:

(i) An aromatic primary amine (A) with molecular formula C_6H_7N is identified as aniline ($C_6H_5NH_2$)

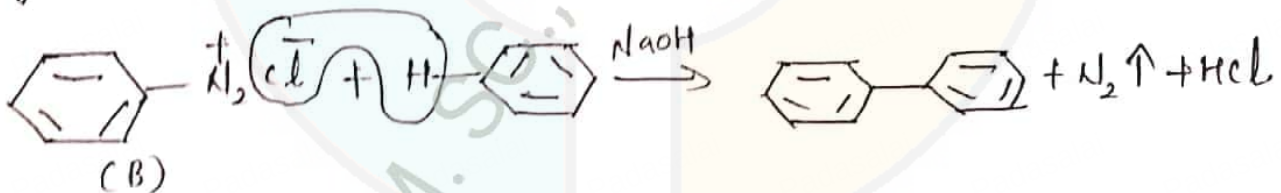
(ii) Diazotisation:



(iii) Aqueous solution of benzene diazonium chloride warmed with KI to form iodobenzene



(iv) Benzene diazonium chloride reacts with benzene in the presence of sodium hydroxide to give biphenyl.



S.No	Compound	Name	Structure
1	A	Aniline	$C_6H_5-NH_2$
2	B	Benzene diazonium chloride	$C_6H_5-N_2^+\text{Cl}^-$
3	C	Iodobenzene	C_6H_5-I
4	D	Biphenyl.	