

CHEMISTRY - SOLUTION
SECTION 'A'

Ans :- 1 Choose the correct option :-

1. 3
2. 3
3. 1
4. 3
5. 2
6. 1

Ans :- 2 Fill in the blanks -

1. 38
2. Reduce
3. Formalin
4. Benzene
5. +2
6. Photo chemical reaction

Ans :- 3 Write / True or False :-

1. True
2. False
3. False
4. True
5. True
6. False

Ans :- 4 Match the column :-

1-d, 2-a, 3-b, 4-e, 5-c

Ans :- 5 Write answer in on word / sentence.

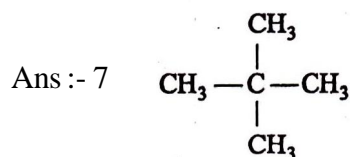
1. Un-saturated aromatic carboxylic acid (Cinnamic acid)
2. Benzoin condensation
3. Basic
4. $\text{Conc. HNO}_3 + \text{Conc. H}_2\text{SO}_4$
5. Ten

SOLUTION SECTION 'B'

Ans :- 6 If a transition metal contain unpaired electron, it shows paramagnetism and forms "coloured compound. In Cu^+ d-orbital is partially filled ($3d^9$) thus Cu^+ is colourless and "diamagnetic while Cu^{+2} is coloured and paramagnetic.

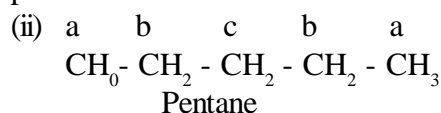
OR

Mn^{+2} has stable electronic configuration $[\text{Ar}]4s^03d^5$ and they do not easily change to Mn^{+3} , Fe^{+2} $[\text{Ar}] 4s^03d^6$ on oxidation forms Fe^{+3} $[\text{Ar}] 4s^03d^5$ a more stable configuration.

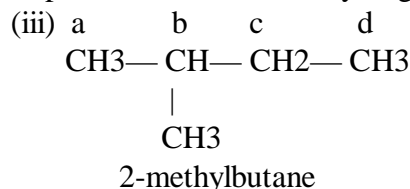


2, 2-dimethylpropane

All the hydrogen are same i.e., 1° . Therefore, replacement of only one of them will give the same product.



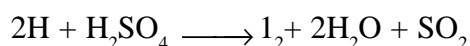
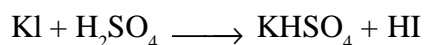
Replacement of a, b and c hydrogen atoms give three isomeric monochlorides.



Replacement of a, b, c and d hydrogen atoms give four isomeric monochlorides.

OR

H_2SO_4 is an oxidizing agent. It oxidizes HI produce during the reaction to I_2 and thus prevents the reaction between alcohol and HI to form an alkyl iodide.



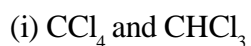
To remove this difficulty a non-oxidizing agent such as H_3PO_4 is used in place of H_2SO_4 .

Ans :- 8 No copper sulphate solution cannot be stored in zinc container because value of standard electrode potential of zinc is less than of copper. Thus, zinc is a stronger reducing agent than copper.

OR

System in which chemical energy is converted to electrical energy by oxidation reduction is known as electrochemical cell or voltaic cell.

Ans :- 9 Example of non - ideal solution showing positive deviation.



OR

Molarity : Molarity is defined as number of gram moles of solute dissolved in a litre of solution. It is denoted by M.

$$\text{Molarity (M)} = \frac{\text{Mass of solute in gram per litre}}{\text{Molecular mass of solute}}$$

Molarity : molality is defined as number of moles of solute present in a kilogram (1000 gram) of solvent. It is denoted by m.

$$\text{Molarity (m)} = \frac{\text{Mass of solute in kg of solvent}}{\text{Gram molecular mass of solute}}$$

Ans :- 10 (i) Total rate = $\frac{1}{2} + \frac{3}{2} = 2$ (Second order)

(ii) Total rate = $\frac{3}{2} + (-1) = \frac{1}{2}$ (Half order)

OR

Some chemical reactions complete in one or more steps. Rate of reaction is determined by the slowest step which is known as rate determining step.

Ans :- 11 $\log_{10} \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$

OR

System in which chemical energy is converted to electrical energy by oxidation reduction is known as electrochemical cell or voltaic cell.

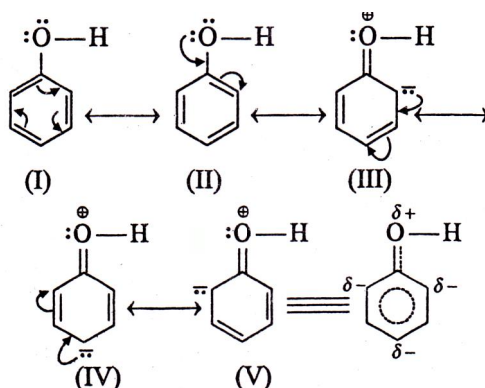
Ans :- 12 Zinc does not show oxidation state higher than +2. According to its electronic configuration, its d-orbitals are completely filled therefore no removal of electron takes place from it. Hence, only the ns orbital which has lower state of energy the d-orbital has to take part in chemical reaction. Hence, it loses 2 electrons from the s-orbital and that is why its oxidation state is +2

OR

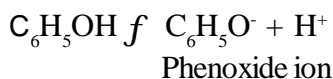
Most of the transition elements form interstitial compounds at high temperature with atoms of non-metallic elements like: H, B, C, N, Si etc. Small atoms of these non-metallic elements fit in the interstitial voids of crystal lattice of transition elements. These are called interstitial compounds.

SOLUTION SECTION 'C'

Ans :- 13 Explanation of acidic nature of phenol : One possible explanation why phenols are stronger acids as compared to alcohols is that phenols exist as a resonance hybrid.



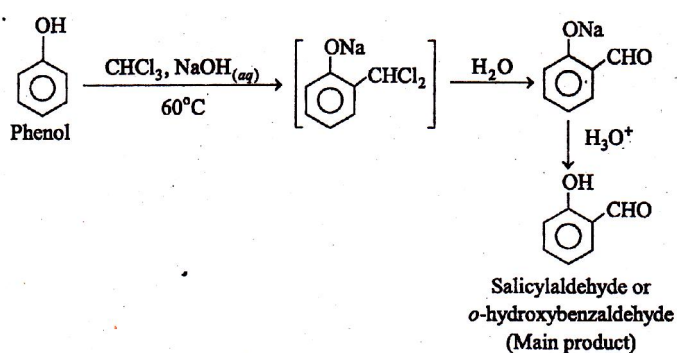
Due to resonance, the oxygen atom gets a positive charge and attracts the electron pair of the O—H bond and thus facilitates the release of a proton. The phenoxide ion formed after the release of a proton is also stabilized by resonance.



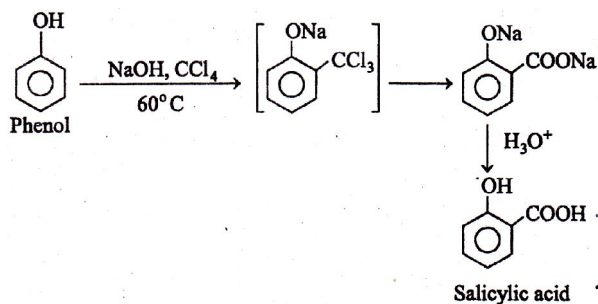
In alcohols, no resonance is possible hence the hydrogen atom is more firmly linked to the oxygen.

OR

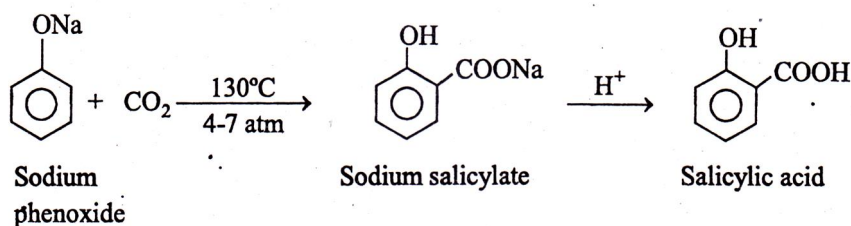
(i) **Reimer-Tiemann reaction** : When phenol is treated with chloroform in presence of aqueous sodium hydroxide at 60°C , o-hydroxy benzaldehyde (Salicylaldehyde) and p-hydroxy benzaldehyde are formed. The ortho-isomer is the major product. This reaction is called **Reimer-Tiemann reaction**.



If carbon tetrachloride is used in place of chloroform, salicylic acid is obtained as the main product.

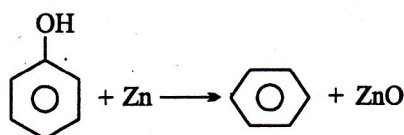


(ii) Kolbe-Schmidt's or Kolbe reaction : When sodium salt of a phenol is heated with CO_2 at 130°C . (403K) and 4-7 atm pressure, sodium salicylate is formed. This on acidification gives salicylic acid.

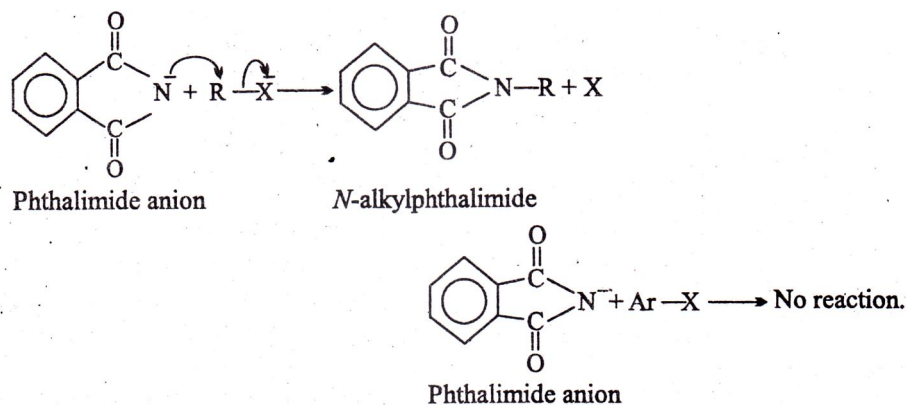


At high temperature p-derivative is formed.

(iii) Phenol is heated with Zn powder : Phenol is heated with Zn powder to form benzene.

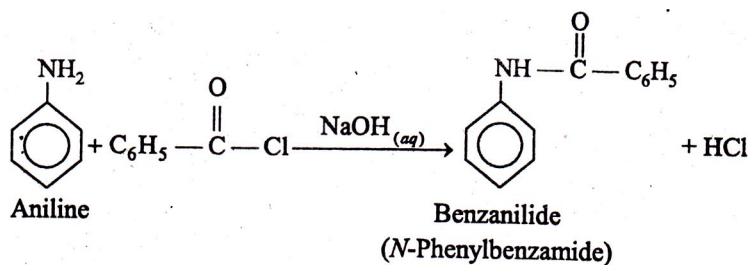


Ans :- 14 Gabriel phthalimide reaction occurs through the nucleophilic attack by the phthalimide anion on the organic halogen compound.



Since, aryl halide do not undergo nucleophilic substitution reactions easily aromatic primary amines cannot be prepared by Gabriel phthalimide.

OR



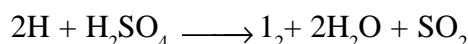
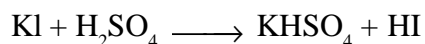
Ans :- 15

S. No.	DNA	RNA
1.	Occurs mainly in the nucleus of the cell .	Occurs in the cytoplasm of the cell .
2.	It contains the sugar deoxyribose .	It contains the sugar ribose .
3.	Does not contain nitrogenous base ,uracil .	Does not contain nitrogenous base thymine .
4.	It has a double strand helix .	It has double as well as single strandhelix .
5.	It is responsible for the transmission of heredity character .	It helps in protein biosynthesis .
6.	Alkaline hydrolysis is quite slow .	Alkaline hydrolysis takes place readily .
7.	Ratio A / T = 1 and G / C = 1 .	Such ratio is not present .

OR

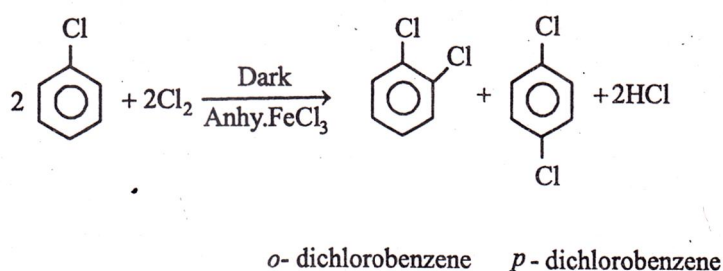
S. No.	Globular protein	Fibrous protein
1.	They have coiled ball like structure .	These molecule have long threads like structure .
2.	They have three - dimensional structure .	They have sheet like structure .
3.	They are soluble in water and aq . solution of salt and base .	These are insoluble in water .
4.	These proteins are inac ve towardsttemperature and pH value .	Fibrous protein are ac ve towardsttemperature and pH value .

Ans :- 16 H_2SO_4 is an oxidizing agent. It oxidizes HI produce during the reaction to I_2 and thus prevents the reaction between alcohol and HI to form an alkyl iodide.

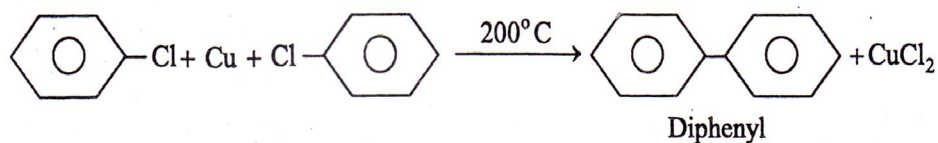


OR

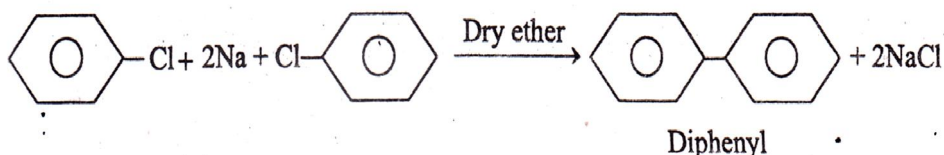
When chlorobenzene reacts with Cl_2 in the presence of FeCl_3 in dark, o-dichlorobenzene and p-dichlorobenzene is obtained.



Fittig reaction : Wrien chlorobenzene is heated at 200°C with Cu powder in a sealed tube Disphenyl is formed.



When two molecules of my! halide reacts with sodium metal in presence of dry ether, then diphenyl is formed. This reaction is known as Fittig reaction.



SECTION 'D'

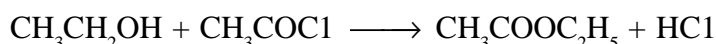
Ans :- 17

S.No.	Properties	Aldehyde (- CHO)	Ketone (> C = O)
1.	Schiff's reagent	Gives pink colour .	No colour .
2.	Reaction with NaOH	Gives reddish brown colour (except HCHO) .	No reaction .
3.	Reaction with Fehling's solution	Gives reddish brown ppt . of Cu ₂ O .	No ppt . is formed .
4.	Reaction with C ₂ H ₅ OH in presence of dry HCl	Forms acetyl compound . ?	Forms ketals .
5.	Reaction with Tollen's reagent	Gives silver mirror .	No reaction .
6.	Physical state	Liquid B.P. 21 ° C .	Colourless liquid B.P. 56 ° C
7.	Pyridine + Sodium nitroprusside	Blue colour .	No effect .
8.	Solid m - dinitrobenzene + NaOH solution	No reaction .	Violet colour which disappears on standing .
9.	With Mg - Hg / H ₂ O	No reaction .	Gives Pinacol .
10.	On reduction ?	Gives primary alcohol .	Gives secondary alcohol
11.	With chloroform	No reaction .	Gives chloroform .

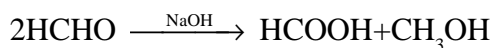
OR

(i) Acetylation : The introduction of an acetyl functional group into an organic compound is known as acetylation. It is usually carried out in the presence of a base such as pyridine, dimethylaniline, etc. This process involves the substitution of an acetyl group for an active hydrogen atom. Acetyl chloride and acetic anhydride are commonly used as acetylating agents.

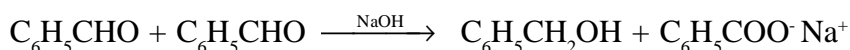
For example, acetylation of ethanol produces ethyl acetate. .



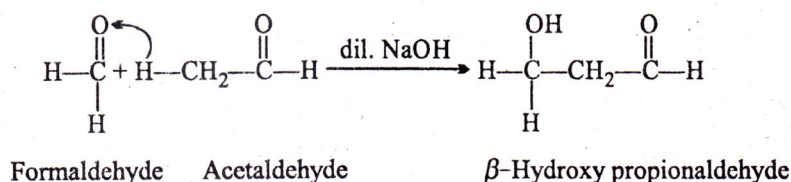
(ii) Cannizzaro reaction : Aldehydes which do not contain α -hydrogen like HCHO, $\text{C}_6\text{H}_5\text{CHO}$ react with conc. NaOH solution to form methyl alcohol and formic acid. This reaction is called Cannizzaro reaction. .



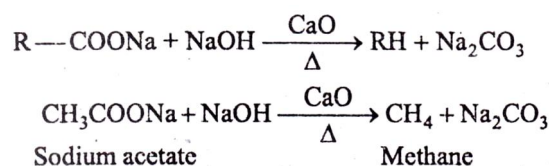
Formic acid Methyl alcohol



(iii) Cross-aldol condensation : When aldol condensation is carried out between different aldehydes or two different ketones or an aldehyde and a ketone, then the reaction is called a Cross-aldol condensation. If both the reactants contain α -hydrogens, four compounds are obtained as products.



Decarboxylation : Decarboxylation refers to the reaction in which carboxylic acids lose carbon dioxide to form hydrocarbons when their sodium salts are heated with soda-Lime.



Decarboxylation also takes place when aqueous solutions of alkali metal salts of carboxylic acids are electrolysed. This electrolytic process is known as Kolbe's electrolysis.

Ans :- 18 Differences among Primary, Secondary and Tertiary amines :

S.No	Test	Primary amines	Secondary amines	Tertiary amines
1	Action of HNO_2	Evolution of H_2 gas and alcohol is formed.	Gives nitrosoamine which give Libermann test.No action.	In cold gives nitrite and on heating gives amine oxide. No action.
2.	Carbyl- amine test	Gives disagreeable smell-of isocyanide.	No action.	No action.
3.	Mustard oil reaction	Gives alkyl isocyanate	Gives dithiocarbonic acid.	No action.
4.	Reaction with acid chloride	Acetyl derivative is formed.	Acetyl-derivative is formed	No reaction.
5.	Reaction with alkylhalide	Gives s-amines.	Gives t-amines.	Gives quaternary ammonium halide.
6.	Hinsberg test (Reaction with	Gives monoalkyl sulphonamides soluble in KOH.	Gives dialkyl sulphonamides insoluble in KOH.	No reaction.

OR

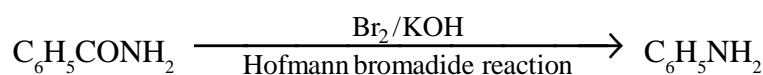
Structures of compounds 'B' and 'C':

(i) Since, 'C' is formed from 'B' on treatment with $\text{Br}_2 + \text{KOH}$ (i.e., Hofmann bromamide reaction), 'B' must be an amide and 'C' must be an amine.

The only amine having the molecular formula $\text{C}_6\text{H}_5\text{NH}_2$ benzene amine or aniline.

(ii) Since, 'C' is aniline, the amide from which it is formed must be benzamide ($\text{C}_6\text{H}_5\text{CONH}_2$). Thus, compound 'B' is benzamide.

The chemical equation showing the conversion of 'B' to 'C' is,



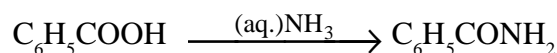
Benzamide (B)

(M.F. = $\text{C}_7\text{H}_7\text{NO}$)

Benzeneamine

(M.F. = $\text{C}_6\text{H}_7\text{N}$)

Structure of compound 'A': Since, 'A' on treatment with aqueous ammonia and heating forms benzamide 'A' must be benzoic acid.



Benzoic acid (A)

Benzamide (B)

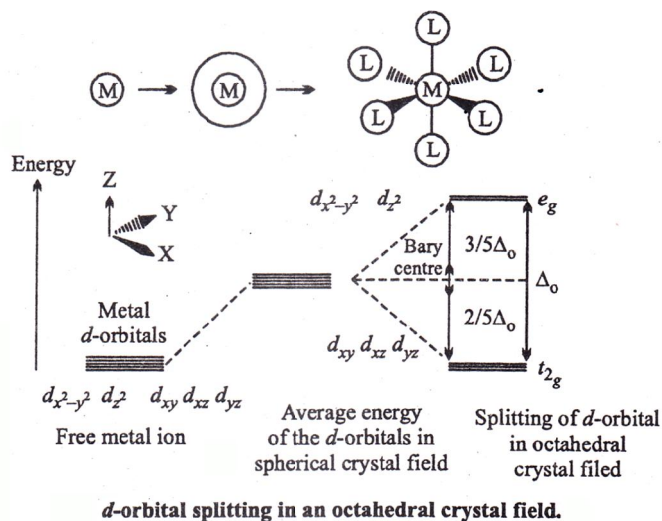
Ans :- 19 CFSE can be calculated as:

$$\text{CFSE} = [-0.4x + 0.6y] \Delta_0$$

Where, Δ_0 = CFSE in octahedral complex

x = Number of electrons in t_{2g} orbitals

y = Number of unpaired electrons in e_g orbitals.



OR

Victor-Meyer's method : (i) The given alcohol is converted into an iodide by concentrated HI or red phosphorus and iodine.

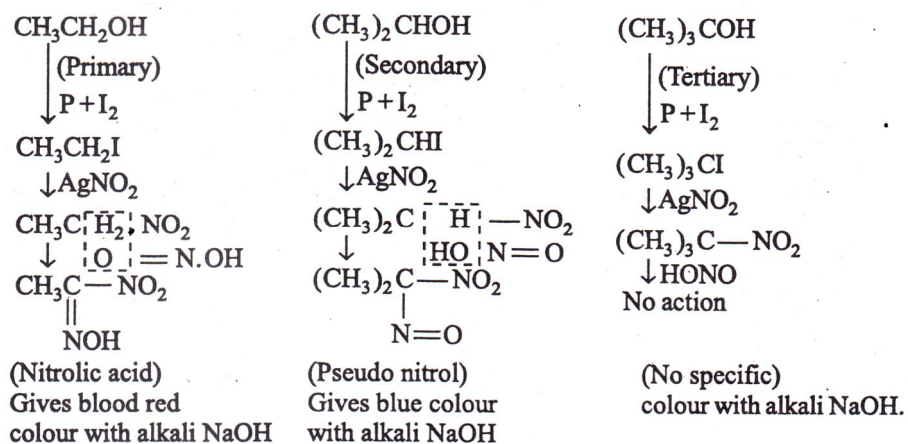
(ii) The iodide is treated with silver nitrite to form nitroalkane.

(iii) Nitroalkane is finally treated with nitrous acid ($\text{NaNO}_2 + \text{H}_2\text{SO}_4$) and made alkaline with KOH.

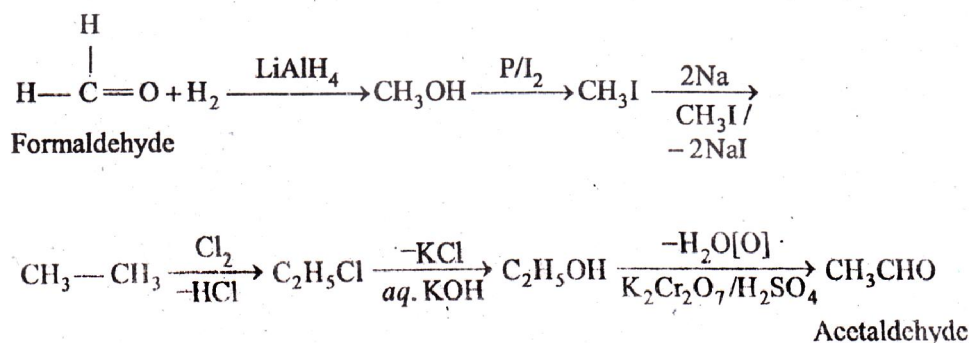
If a blood red colour is obtained, the original alcohol is primary

If a blue colour is obtained, the alcohol is secondary

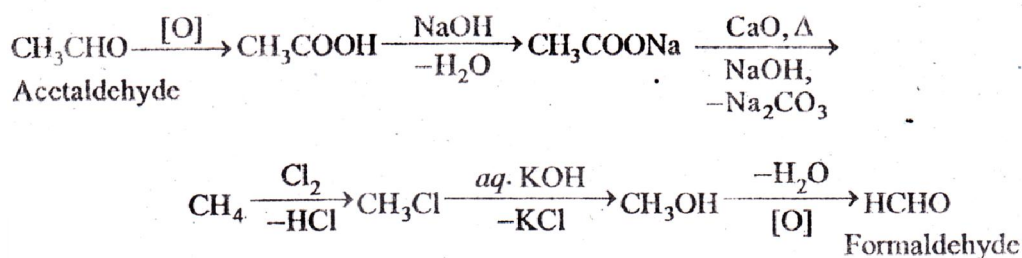
If no colour is produced, the alcohol is tertiary.



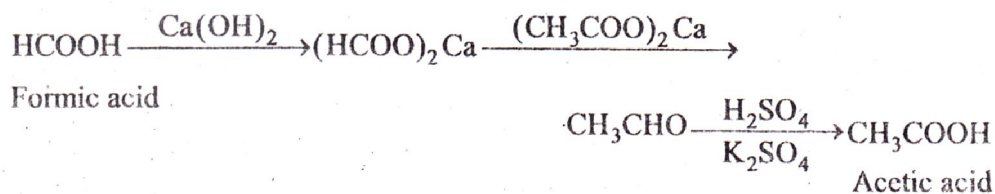
Ans :- 20 (i) Acetaldehyde from formaldehyde:



(ii) Formaldehyde from acetaldehyde :



(iii) Acetic acid from formic acid :



OR

S.No.	S _N 1 reaction	S _N 2 reaction
1.	It is a unimolecular reaction.	It is a bimolecular reaction.
2.	In this method, reaction takes place in two steps.	In this method, reaction takes place in one step.
3.	It follows a 1st order kinetic mechanism.	It follows the 2nd order kinetic mechanism.
4.	Rate of reaction depends on the concentration of alkyl halide only.	Rate of reaction depends upon the concentration of alkyl halide on nucleophile both.
5.	Being ionic, reaction takes place readily.	Reaction takes place with moderate rate.
6.	The order of reactivity for different alkyl halide is : tert. > sec. > pri. > CH ₃ -X.	The order of reactivity for different alkyl halide is : CH ₃ -X > pri. > sec. > tert..
