# Section B

## Short Question

## Question No 02

### iv

## Answer:

### Metamerism:

In metamerism, the two metamers



have the same functional group.

2. In metamerisms, the two metomers differ from each other by the number of carbon atom at either side of functional group

The two metamors exist separetly.

**Example:**

$CH_3 - CH_2 - O - CH_2 - CH_3$

Diethyle ether

$CH_3 - CH_2 - CH_2 - O - CH_3$.

methyle-n-propyl ether.

### Tautomerism:

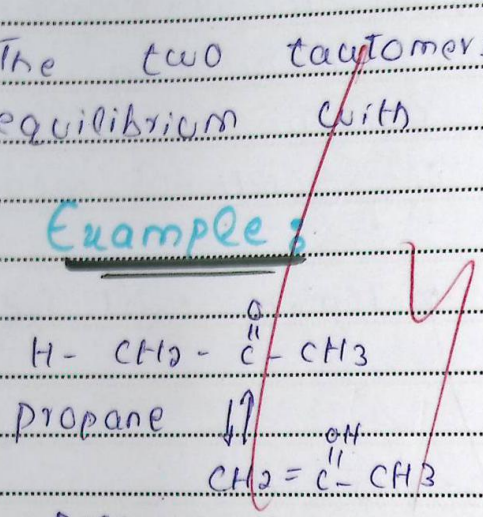
In tautomerism, the two tautomers have different functional group.

In tautomerism, the two tautomerism

differ from each by position of a hydrogen atom.

The two tautomers exist in equilibrium with each other.

Example:




## Question No 02

## (Vii)

Answer:



## Lucas Test:

When an Unknown is treated with lucus reagent, the corresponding alkyl halide/chlorde is formed. This is done by in alcohol to diuberentiate among primary, secondary and tertiary alcohol. it is based on the diuberences in reactivity of three classes of alcohol with hydrogen halide via S-1 reactions.

$$R-OH + HCl \longrightarrow R-Cl + H_2O$$

## Test for identification of alcohol:

## Tertiary alcohol: Tertiary

alcohol immediately form an insoluble layer of tertiary alkyle chloride.

## Secondary alcohol:

Secondary alcohol form an insoluble layer of secondary alkyl chloride in 5-10 min.

## Primary alcohol:

Primary alcohol form an insoluble primary alkyl chloride on heating.

## (Question NO 02)

## (V)

Answers:



# Suppicient Condition for geometrical Isomerisms:

A molecule can show geometrical (cis-trans) isomerism if:

1. There is restricted rotation, typically due to a C=C double bond.
2. Each carbon of the double bond has two diiverent groups attached to it.

## Cis isomers:

Same groups on the same side of the double bond.

**Trans isomer:-**

Same group on opposite side.

**Example:-** But-2-ene → cis-but-2-ene and trans-but-2-ene.

## Question NO 02

### (VI)

**Answers:**

In the SN1 mechanism (Substitution Nucleophilic Unmolecular):

1. The leaving group departs, forming a carbonate intermediate.
2. The te nucleophilic attacks to carbonate:



- Tertiary alkyl halides form highly stable carbonate due to
- Inductive effect of surrounding alkyle groups.
- hyperconjugation stabilizing the positive charge.

There fore, they prefer the SN1 mechanisms, which proceeds via this carbocation formation.

## Question NO 02

### XI

**Answers:**

**Uses of PVC:**

PVC or polyvinyl chloride is a type of plastic used in numerous industries. It is durable inexpensive and resistant to heat, water and chemicals.

1/ PVC plastic is manipulated a leature like material called rexine.

2/ PVC are used for pips. These pips are strong light weight and corr- reactive, rotor rust, and are a dependent and accordable material.

3/ PVC plastic is used by a ~~for~~ insulating material on electrical wires.

4/ PVC plastic is used to manufacture bottles.



other uses of PVC include medical tubing, PVC window frames, resilient flooring, vinyle paneling, carpet backing etc.

## Questions No 02

### (VIII)

**Answer:**

**Tollen's Test:**

Uses ammoniacal Silver nitrate ($AgNO_3$)

Aldehyde reduce $Ag^+$ to metallic Ag → Silver mirror forms.

$RCHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow RCOO^- + 2Ag(s) + 4NH_3 + 2H_2O$

## Fehling's Test:

Uses alkaline $Cu^{2+}$ solution (Fehling A + Fehling B).

Aldehydes reduce $Cu^{2+}$ to $Cu_2O$.

→ forms brick-red precipitate.

$RCHO + 2Cu^{2+} + 5OH^- \rightarrow RCOO^- + Cu_2O(s) + 3H_2O$

**Importance:** Both tests help distinguish aldehydes from ketones, as ketones generally do not react.

## Question NO 02

## (XII)

**Answers:**

## Photochemical Smog:

Photochemical smog is a type



of air pollution formed when sunlight reacts with nitrogen oxides (NOx) and hydrocarbons (VOCs) in the atmosphere.

→ This reaction produce secondary pollutants like:

- Ozone ($O_3$)
- Peroxyacetylnitrate (PAN)
- Formaldehyde and other oxidants.

## Formation:

$NO_2 + \text{Sunlight} \rightarrow NO + O$; $O + O_2 \rightarrow O_3$

## Question NO 02

## (X)

**Answer:** **Effect of PH:**

Enzymes work best at a

Specific optimum PH.

Deviation from this PH can alter the charge of amino acid, especially at the active site.

Extreme PH (too acidic or too basic) can denaturation, changing the enzymes shape or stooping its activity.

## Effect of temperature:

Enzyme activity increases with temperature due to higher molecular movement, reaching a maximum at optimum temperature (usually 37°C in human).

Above optimum, enzymes begin to losing their structure and function.



## Question no 02

## I

## Answer:

## Ionization energy:

The minimum amount of energy which is required to remove the valence electron from an isolated gaseous atom to form an ion is called ionization energy:

Ionization energy is also called ionization potential.

e.g $Na \rightarrow Na^{\oplus} + 1e^{\ominus} + 496\ kg\ (mol)$

**Reasons :-**

This is because in sulphure the outer electrons are present in partialy filled "p" orbital which is less stable compare half filled "p" orbital phosphorous, which is more stable. Therefore, sulphure has low I.E.

## Question No 02

(II)

**Answer :-**

## Non-typical Transition Elements :

" Elements which do not possess all the properties of transition elements are called non-typical elements. " Elements of IIB and IIIB groups are non-typical transition element.

**E.g :-**

Zn, Cd, Hg etc.

## Typical transition Elements :

Elements which possess all the characteristic properties of transition elements are called typical transition elements". Elements of IB, IVB, VB, VIB, VIIB and VIIIB sub-groups are the example of typical transition elements.

**E.g :-**

Fe, mn, Cr, etc.

# Section C

## Question No 03

### Answer:

### Solubility of the Hydroxide:

Group-II metal hydroxide become more soluble in water as we go down the column.

Magnesium hydroxide appears to be insoluble in water. However, if it is shaken in water and filtered, the solution is slightly basic (PH = 9-0). This indicate hydroxide ions. Therefore have been produced a very slight dissolving. This is because some magnesium hydroxide has dissolved.



Magnesium hydroxide is used in medicine (in suspension as milk of magnesia) to neutralize excess acid stomach and to treat constipation):

$$Mg(OH)_{2(aq)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + 2H_2O_{(l)}$$

Calcium hydroxide is classed as partially soluble in water, A suspension of calcium in water will appear more alkaline (PH 11) than magnesium hydroxide as it is more soluble so there will be more hydroxide

ion presents in solution.

$Ca(OH)_{2(aq)} + CO_{2(g)} \longrightarrow CaCO_{3(s)} \downarrow + H_2O$

3, Barium hydroxide is soluble enough to produce a solution with a concentration 0.1 mol $dm^{-3}$ room temperature.

$Ba(OH)_2 \xrightarrow{H_2O} Ba^{2+}_{(aq)} + 2OH_{(aq)}$

## Solubility of The Sulphates:

Group-IIA Sulphates become less soluble as we move down the group $BaSO_4$ is the least soluble.

4 This is simple trend is true if hydrated beryllium Sulphate is considered but not



anhydrous beryllin Sulphate. The anhydrous is $BeSO_4$ as insoluble whereas the hydrated form, $BeSO_4 4H_2O$ is soluble with a solubility of about 39g of $BeSO_4$ per 100g of water at room temperature.

→ Two common examples illustrate this trend:

1, A familiar reaction is that between magnesium and dilute Sulphuric acid. Notice that a solution and not a precipitate, is formed, showing that magnesium Sulphate is formed.

2, Barium Sulphate as Substance exists as a white precipatete indicates that barium Sulphate is insoluble. In fact, 1 liter of water dissolves about 2mg of barium Sulphate at

room temp.

## Solubility of the Carbonate:

The carbonates becomes less Soluble down the group. All the group 2 carbonate are very Sparingly soluble. The trend to lower solubility is, however broken at the bottom of the group: barium carbonate is slightly more Soluble than Strontium Sulphate.

## Question 250 04)

## Answers:



## Important chemical Reactions of Alkanes:

### 1) Addition of hydrogen (Hydrogenation):

Alkanes react with hydrogen in the presence of catalyst Such as nickals, platinum and palladium at a temp of 200 - 250° under 1-1-5 external and form alkanes. This is called catalytic hydrogenation.

$$CH_2 = CH_2 + H_2 \xrightarrow[\text{pressure 1-1.5 atm}]{Ni(H_2O), 250^\circ C} CH_3 - CH_3$$

(Ethene) (Ethane)

Hydrogenation is an exothermic process.

Hydrogenation process is industrially used for the conversion of vegetable oil into vegetable ghee.

vegetable oil $\xrightarrow[Ni]{N_2,\ 250C-300C}$ vegetable ghee

## 2) Hydrohalogenation (Addition of halogen Acids):

Alkanes react with halogen acids (HCl, HBr, HI) and form alkyle react with Sulphuric acid to produce alkyl hydrogen sulphate which is on hydrolysis produce alcohol at 100C

$CH_2 = CH_2 + H^+ - OSO_2H \longrightarrow CH_3-CH_2-OSO_3H$ (Ethyle hydrogen Sulphate)

$CH_3-CH_2-O-SO_2H + H^+ - OH \longrightarrow CH_2-CH_2-OH + H_2SO_4$



## (4) Halogenation (Addition of Halogens:)

Reactivity order of halogens is $F_2 > Cl_2 > Br_2 > I_2$. Chlorine and bromine add readily to alkane in the presence of carbon tetrachloride as a solvent - producing vicinal dihaloalkanes. When two halogen atom are attached to the adjacent carbons, such compound are called vicinal dihaloalkanes. Such compound are called [minal dihaloalkanes.

$CH_2 = CH_2 + Cl_2 \longrightarrow \underset{Cl}{CH_2} - \underset{Cl}{CH_2}$

## 5) Halohydration (Addition of Hypohalous Acid)

Hypohelous acid = HOX, hypochlorous acid = HOCl

Alkenes react with aqueous solution of hypohalous acid and form halohydrines.

$CH_2 = CH_2 + Cl - OH \longrightarrow CH_2(OH) - CH_2(Cl)$

(Ethylene chlorohydrine
1-chloro-2-hydroxyethane)

$CH_3 - CH = CH_2 + Cl - OH \longrightarrow CH_3 - CH(OH) - CH_2(Cl)$

(1-chloro 2-hydroxy propane)

## 6) Epoxidation:

Cyclic compounds in which hetero atom in the three membered ring is Oxygen are



called exporides. when alkene are mixed with oxygen or air and passed over silver catalyst at high temperature (300°C) and pressure, an oxygen atom is added to the double bond, and epoxides are formed.

$CH_2 = CH_2 + CH_3COOOH \longrightarrow CH_2(O)CH_2 + CH_3COOH$

ethene peracetic acid ethylene oxide acetic acid

$CH_2 = CH_2 + O_2 \xrightarrow[300°C]{Ag} H_2C(O)CH_2$

Ethylene oxide (oxirane)

$CH_2 = CH - CH_2 + \frac{1}{2}O_2 \longrightarrow CH_2(O)CH - CH_2$

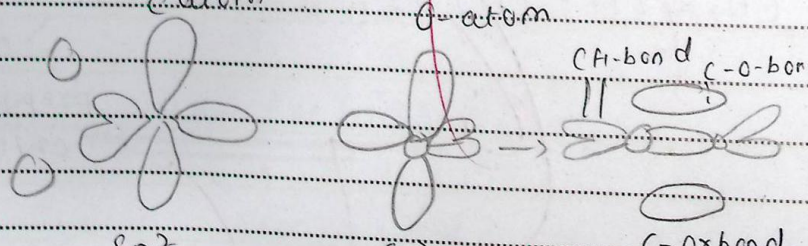
propylene (oxide)

## Question NO 06) 3>

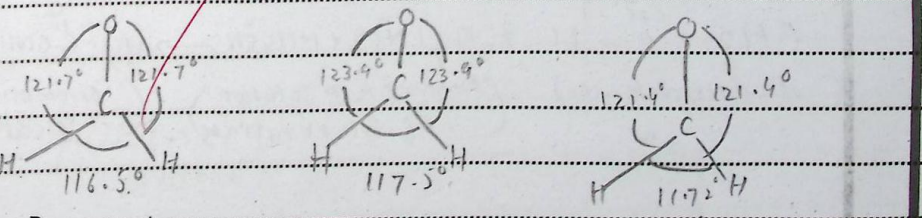
## Answers:

### Structure:

The Carbon and oxygen in the Carbonyle groups, present in aldehyde and ketones, are linked by a single bond and pi bond. Both carbon as well as oxygen of pi bond are formed by linear $Sp^2$- $sp^2$ and sidewise overlap of two unshared electron




The three atom attached to Carbonyl carbon its in a place and are arranged in triangle planer manner. The bond angles around carbonyle carbon are approximately 120°c. Slight derivation is observed depending upon nature of atom or groups attached to carbon in various aldehyde and ketone. The bond angles in some of the known aldehyde and ketone are.




Formaldehyde. Acetaldehyde Acetone

# Oxidation of Aldehydes:

Oxidation of an aldehyde produce carboxylic acid. The oxidizing agents used are $KMnO_4$, $K_2Cr_2O_7$, $Ag_2O$ and $Na_2Cr_2O_7$.

$$CH_3-\overset{O}{\overset{\|}{C}}-H + [O] \xrightarrow[H_2SO_4]{KMnO_4} CH_3-\overset{O}{\overset{\|}{C}}-OH$$

(Ethanol) (Ethanoic acid)

## i) Oxidation by Tollen's Reagent:

Since aldehyde can be oxidized by mild tollen's reagents, the Silver ions present in tollen's reagent are reduced of test tube to form silver mirror. Therefore it is also known as Silver mirror test.

$$CH_3-\overset{O}{\overset{\|}{C}}-H + Ag^+NO_3 + NH_4OH \longrightarrow CH_3-\overset{O}{\overset{\|}{C}}-ONH_4 + Ag + H_2O$$

(Acetaldehyde) (Ammonium solution of silver nitrate) (Ammonium Acetate)



## ii) Oxidation by Fehling's Solution:

When aldehyde is treated with Fehling's solution the deep blue colour of cupric ion is reduced to red precipite of cuprous oxide.

$$CH_3-\overset{O}{\overset{\|}{C}}-H + 2Cu(OH)_2 + NaOH \longrightarrow CH_3-\overset{O}{\overset{\|}{C}}-ONa + Cu_2O + 3H_2O$$

(Ethanol) (Fehling Solution) (Sodium acetate) (Red ppt)

$$\begin{array}{l} H-C=O \\ H-C=O \\ HO-C-H \\ H-C-OH \\ H-C-OH \\ CH_2OH \end{array} + 2Cu(OH)_2 + NaOH \rightarrow \begin{array}{l} NaO-C=O \\ H-C-OH \\ HO-C-H \\ H-C-OH \\ H-C-OH \\ H \end{array} + Cu_2O + 3H_2O$$

(Glucose / aldose) (Red ppt.)

# Oxidation of ketone:

In aldehyde oxidation involve hydrogen atom that is directly attached to carbonyle carbon but in case of ketones no such hydrogen exist ketones having α- hydrogen can be oxidized in the presence of strong oxidizing agents such as $K_2Cr_2O_7/H_2SO_4$ $KMnO_4/H_2SO_4$ and ions.

$$CH_2-\overset{O}{\overset{\|}{C}}-CH_3-4[O] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} CH_3-\overset{O}{\overset{\|}{C}}-CH+CO_2+H_2O$$

In case of unsymmetrical ketones, the carbonyle group remain with smaller alkyle group. as oxidation takes place at this site.

$$CH_2-CH_2-\overset{O}{\overset{\|}{C}}-CH_2+7[O] \longrightarrow CH_2-\overset{O}{\overset{\|}{C}}-CH+CO_2+H_2O$$