# SECTION - B

## QUESTION. 2:

### Part (i):

### IONIZATION ENERGY:

"The minimum amount of energy required to liberate valence electrons from the outermost shell of an atom is called ionization energy".

Ionization energy of P and S:

⇒ The electronic configuration of Phosphorous (P) is

$[Ne], 3s^2, 3p_x^1, 3p_y^1, 3p_z^1$

As p-orbitals are half-filled, they are more stable

⇒ Now, the electronic configuration of Sulphur (S) is,

$[Ne], 3s^2, 3p_x^2, 3p_y^1, 3p_z^1$

As p-orbitals of Sulphur are partially-filled, it is unstable.

Therefore, Sulphur is less stable and Phosphorous is more stable compared to eachother. So the ionization energy of Phosphorous is greater than that of Sulphur.



# Part (ii):

## TYPICAL TRANSITION METALS:

"The transition metals in the d-block of the periodic table are called typical transition metals".

The valence electron of typical transition metals reside in d-subshell of valence shell. They have varying oxidation states. They are divided into 10 groups.

Example:

Zinc (Zn) and Vanadium (V) are examples of typical transition metals.

## NON-TYPICAL TRANSITION METAL:

"The transition metals in the f-block of the periodic table are called non-typical transition metals."

The valence electron of non-typical transition metals reside in f-subshell of valence shell.

Example:

Lanthanides series and Actinides series are examples of non-typical transition metals. Each series has 14 elements.



## Part (x):

## ENZYME:

"Enzymes are biological catalysts which take part in a reaction without getting consumed."

Enzymes speed up the rate of the reaction.

### Effect of PH:

Some of the enzymes have their own basic and acidic levels. The optimum PH for enzymes is 7-8. When the PH exceeds or reduces than the optimum condition, enzymes do not perform their function properly.

Effect of temperature:

Every body does its metabolism on a specific temperature range. When the range is disturbed, the metabolism of the body will not work properly. Enzymes have also their optimum temperature, when disturbed from that, they do not perform their function properly.

## Part (vii)

### LUCAS REAGENT:

"The mixture of concentrated HCl and anhydrous Zinc Chloride ($ZnCl_2$) is called Lucas reagent."



### LUCAS TEST:

It is a test in which lucas reagent is used to distinguish between various types of alcohols.

### TERTIARY ALCOHOLS:

When lucas reagent reacts with tertiary alcohols, cloudiness appears immediately.

### SECONDARY ALCOHOLS:

The lucas reagent reacts with secondary alcohols. Cloudiness appears immediately after 10-15 minutes.

### PRIMARY ALCOHOLS:

The lucas reagent cannot help to react with primary alcohol.

# Part (xi)

## PVC:

PVC is a light-weight substance. It is commonly used by people. It is usually safe from erosion and rust.

## USES:

(i) The pipelines used domestically for gas and water supply are made up of PVC.

(ii) The window frames are made up of PVC.

(iii) PVCs are used as insulators wherever needed.



PVCs are used in storing blood in blood bags in blood banks.

# Part (iv)

## METAMERISM:

The functional group in which the arrangement of carbon atoms around the molecule is different. Two metamers have functional group and they can exist seperately.

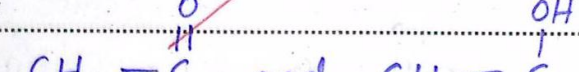
Example:

$C_2H_5-O-C_2H_5$ and $C_3H_7-O-CH_3$ are metamers.

## TAUTOMERISM:

In tautomerism, two isomers are different from eachother by the position of protons Tautomers have different functional groups. In tautomerism the two tautomers differ from eachother by relative position of a hydrogen atom.

Example:



$CH_2-\overset{O}{\overset{\|}{C}}$ and $CH=\overset{OH}{\overset{|}{C}}$

are tautomers.

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## Part (xii)

## PHOTOCHEMICAL SMOG:

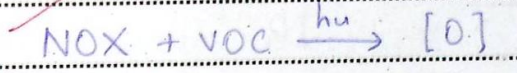
The smog which is formed due to air pollution in eachother.



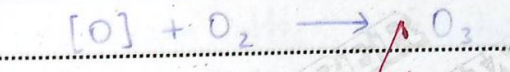
## FORMATION:

The initial process NOX and VOC react in the presence of UV light and atomic nascent oxygen. Oxygen molecule react to form $O_3$

## REACTION:



$NOX + VOC \xrightarrow{h\nu} [O]$



$[O] + O_2 \longrightarrow O_3$

So with the formation of oxygen in the atmosphere results in photochemical smog.

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# Part (xiii)

## QUATITATIVE ANALYSIS:

IR spectroscopy can be used to find quantitative analysis of molecules.

## CONFIGURATION:

IR spectroscopy can be used for the configuration of molecules.

## CONJUGATION:

IR spectroscopy can be used for the conjugation of molecules.



## STRUCTURAL ANALYSIS:

Scientists use IR spectroscopy for the deep study of the structure of different molecules.

# Part (iii)

First of all, it was considered that organic compounds were derived from the vital force in the living organisms known as Vital Force Theory (VFT)

## WOHLER'S WORK:

Wohler rejected the Vital Force Theory by synthesizing urea from heating ammonia cyanate in laboratory.

$NH_4CNO \xrightarrow{\Delta} NH_2CONH_2$

## IMPORTANCE:

Its importance is that it proved and paved the way that organic compounds are able to be obtained in the laboratory.

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# Part (viii)

## TOLLEN'S TEST:

It is a test which is used for detection of aldehyde. The reagent used is ammonial silver nitrate. Silver mirroring is done at the end, Ag atoms are deposited at the tube causing silver mirror.



## Reaction:

$R-CHO + [2Ag(NH_3)_2]OH^- \rightarrow RCOONH_4 + 2Ag + H_2O$

## FEHLING'S SOLUTION:

In this $Cu^{+2}$ cupric ion solution is used in tetrate solution for aldehyde test

## Reaction:

$RCHO + Cu^{+2} + 5OH^- \rightarrow RCOO^- + Cu_2O$

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# SECTION - C

## QUESTION. 4:

### ALKENES:

"Unsaturated hydrocarbons that have at least one C-C double bond are called alkenes".

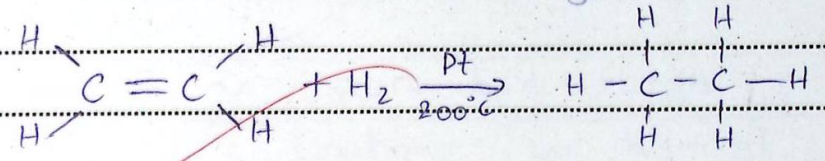
### CHEMICAL REACTIONS:

Some important chemical reactions of alkenes are given as:



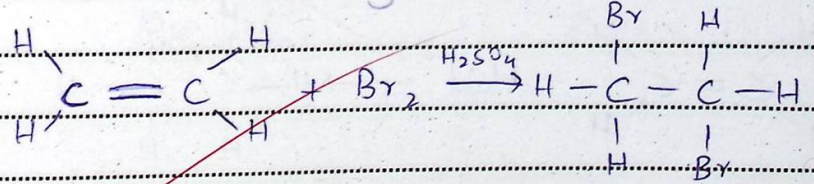
### Hydrogenation:

The addition of hydrogen atom to C-C double bond is called hydrogenation. In this reaction we use platinum at 200°C as catalyst



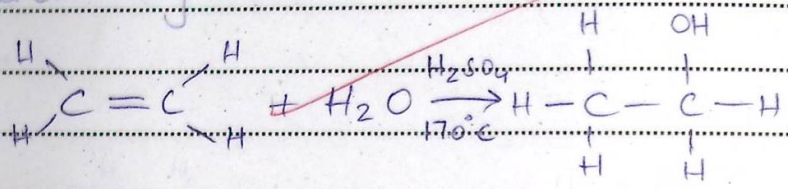

### HALOGENATION:

The addition of a halogen to C-C double bond is called halogenation.



## Hydration:

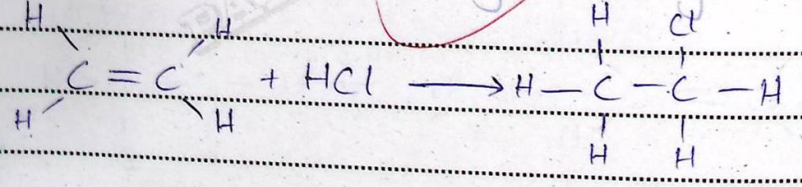
The addition of water to C-C double bond is called hydration




After hydration, an alcohol is formed as product.

## Hydrohalogenation:

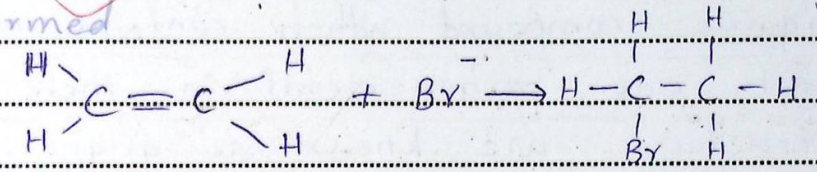
The addition of hydrogen halide to C-C double bond is called hydrohalogenation



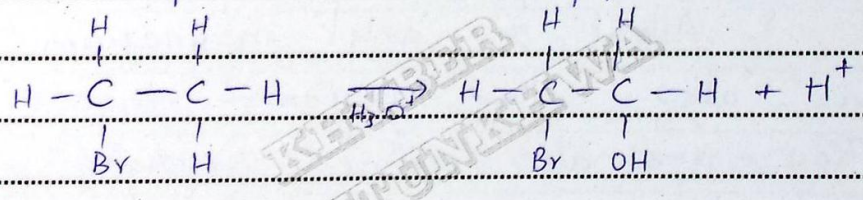



## Halohydration:

In the beginning, first halogen atom is added to alkene so that cyclonium ion and upon $H_2O^+$ workup, product is formed




Upon $H_3O^+$ workup,




At the end, Bromoethanol is formed as product.

# QUESTION. 5:

## GRIGNARD REAGENT:

The organic compound which contains at least one carbon-metal in their structure are known as grignard reagent.

Alkyl or aryl magnesium are also called grignard reagent. They are also named grignard reagent.

## GENERAL FORMULA:

The general formula for grignard reagents is R-MgX where R is alkyl or



aryl group, Mg is magnesium and X is a halide.

## EXAMPLES:

$CH_2MgI$ and $C_2H_5MgCl$ are examples of grignard reagent.

## PREPARATION:

Grignard reagent can be prepared by reacting alkyl halide or aryl halide with magnesium (Mg) in diethyl ether as medium

$$R-X + Mg \xrightarrow[\text{ether}]{\text{diethyl}} R-MgX$$

## REACTION OF ALDEHYDE:

Grignard reagent reacts with aldehyde to give addition product which are water or acid hydrolysis.

$$R\text{-}MgX + H\text{-}\underset{\underset{O}{\|}}{C}\text{-}H \longrightarrow R\text{-}\underset{\underset{OMgX}{|}}{C}\text{-}H$$

$$R\text{-}\underset{\underset{R}{|}}{\overset{\overset{OMgX}{|}}{C}}\text{-}H + H^{+}\text{-}OH^{-} \longrightarrow R\text{-}\underset{\underset{R}{|}}{\overset{\overset{OH}{|}}{C}}\text{-}H + Mg\begin{matrix}X\\ \diagdown\\ \diagup\\ OH\end{matrix}$$

## REACTION OF KETONES:

Grignard reagent reacts with ketone to give an addition product which on acid hydrolysis gives tertiary alcohols

$$R\text{-}MgX + R\text{-}\underset{\underset{O}{\|}}{C}\text{-}R \longrightarrow R\text{-}\underset{\underset{R}{|}}{\overset{\overset{OMgX}{|}}{C}}\text{-}R$$

$$R\text{-}\underset{\underset{R}{|}}{\overset{\overset{OMgX}{|}}{C}}\text{-}R + H^{+}\text{-}OH^{-} \longrightarrow R\text{-}\underset{\underset{R}{|}}{\overset{\overset{OH}{|}}{C}}\text{-}R + Mg\begin{matrix}X\\ \diagdown\\ \diagup\\ OH\end{matrix}$$

## REACTION OF $CO_2$:

Grignard reagent reacts with carbon dioxide as follows:

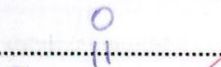
$$O\overset{\delta+}{=}C\overset{\delta-}{=}O\overset{\delta-}{} + R\text{-}MgX \longrightarrow O=\underset{\underset{R}{|}}{\overset{\overset{OMgX}{|}}{C}}$$

$$O=\underset{\underset{R}{|}}{\overset{\overset{OMgX}{|}}{C}} + H^{+}\text{-}OH^{-} \longrightarrow O=\underset{\underset{R}{|}}{\overset{\overset{OH}{|}}{C}} + Mg\begin{matrix}X\\ \diagdown\\ \diagup\\ OH\end{matrix}$$

# QUESTION. 6:

## STRUCTURE OF ALDEHYDE:

The structure of aldehydes is:

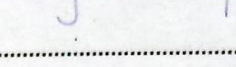


Aldehydes consist of functional group carbonyl compound. (–C–) Both oxygen and carbon are $sp_2$ hybridized. Oxygen has a lone pair of electrons. In aldehyde, one alkyl group and hydrogen atom is attached to carbonyl carbon. Bond angles are close to 120° and structure is trigonal planar.



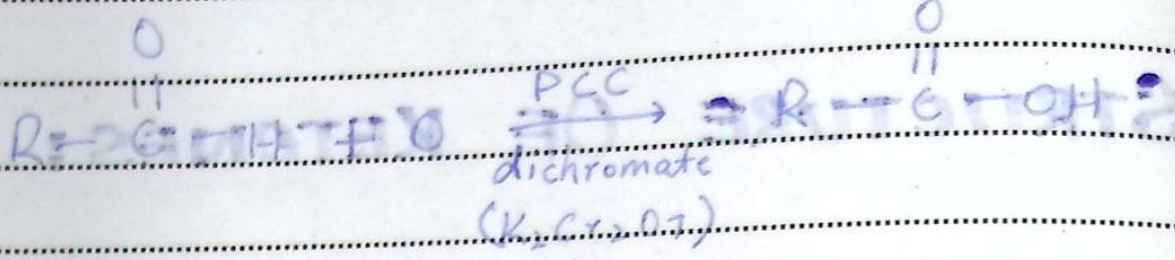
## STRUCTURE OF KETONES:

Unlike aldehydes, ketones have two alkyl groups are attached to carbonyl carbon on both sides. Both oxygen and carbon are $sp_2$ hybridized. The structure is trigonal planar.



## Oxidation of aldehydes:

Aldehydes can be oxidized by reacting with oxygen in the presence of PCC, dichromate and chromate to form carboxylic acids.




# Oxidation of Ketones:

Ketones can also be oxidized with oxygen in the presence of PCC, chromate, or dichromate to give carbonylic acids.