SECTION-B

QUESTION-2

Attempt any 10 parts - - - - -

PART-1

Write any four uses of - - - - ?

POLYVINYL CHLORIDE:

Polyvinyl chloride (PVC) is a polymer made of vinyl chloride monomers.

USES:

Following are the uses of PVC.

1) **REXINE:**

PVC is modified

to a leather like material called rexine which is used for manufacture of a large number of compounds.

2) **Electrical Insulation:**

It is used as an insulating material on electrical wires.

3) **Pipes:**

PVC is used to make corrosion-resistant and durable pipes.

4) **Window Framing:**

PVC is also used in window framing.

Part - 2

What are the important - - - ?

Applications of IR Spectroscopy:

Following are few important applications of IR spectroscopy.

1) **Identity of Substance:** IR spectroscopy can be used to establish the identity of a substance by comparing the IR spectrum of fingerprint region of an unknown compound with that of a known one.

2) **Functional Group:** IR spectroscopy can be used to determine which functional groups are present in a molecule. Each functional group will show a separate spike in the IR spectrum, indicating the presence of a specific functional group.

3) **Impurities:** IR spectroscopy can be used to determine whether or not impurities are present in a sample. The presence of abnormal spikes in IR spectrum of a sample confirms the presence of impurities.

4) **Progress of Reaction:** It can be

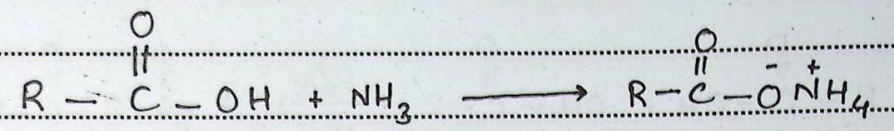
used to determine the progress of a chemical reaction. By comparing the IR spectrum of a sample at regular intervals of time, the changing of IR spectrum shows that the reaction is proceeding.

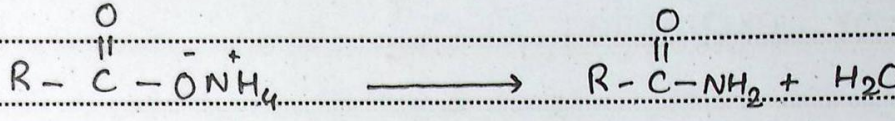
Part - 3

How carboxylic acids can be.....?

Conversion To Acid Amides:

Carboxylic acids can be converted to acid amides by reacting them with ammonia. The general reaction proceeds as follows.





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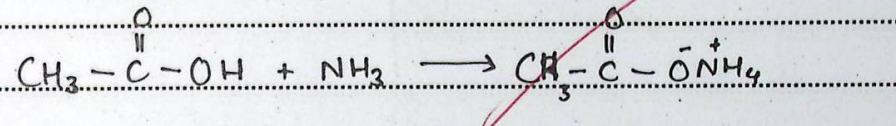
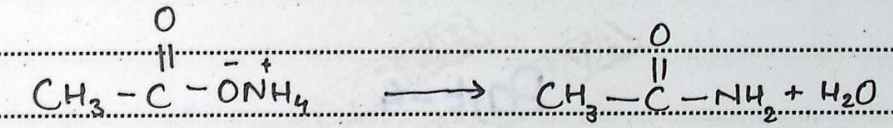
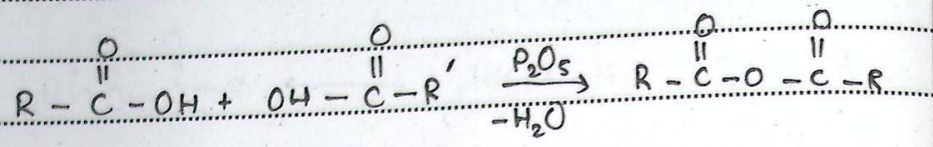




Conversion To Acid Anhydrides:

Carboxylic acids are converted to anhydrides by dehydration in presence of P_2O_5.



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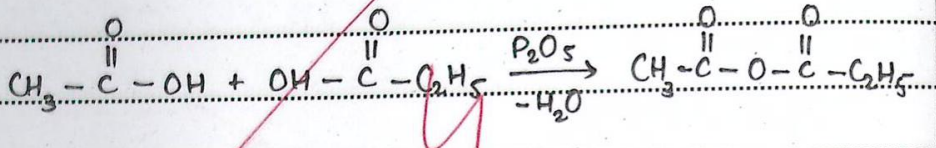


Part-4

What is Lucas - - - - - ?

LUCAS TEST:

Lucas test is a chemical test used to distinguish between primary, secondary and tertiary alcohols. Lucas reagent is

used for this purpose.

LUCAS REAGENT:

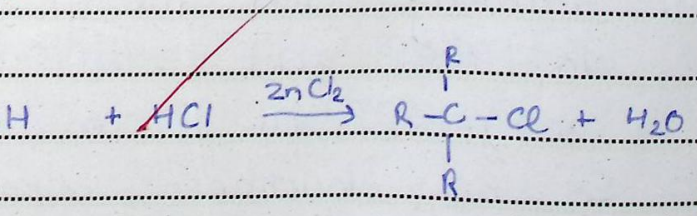
$ZnCl_2$ with conc. HCl is termed as Lucas reagent.

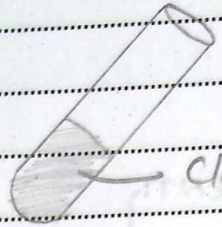
PROCEDURE:

Lucas reagent is reacted with alcohols. The time taken for cloudiness to appear in test tube tells us the type of alcohol.

Tertiary Alcohols:

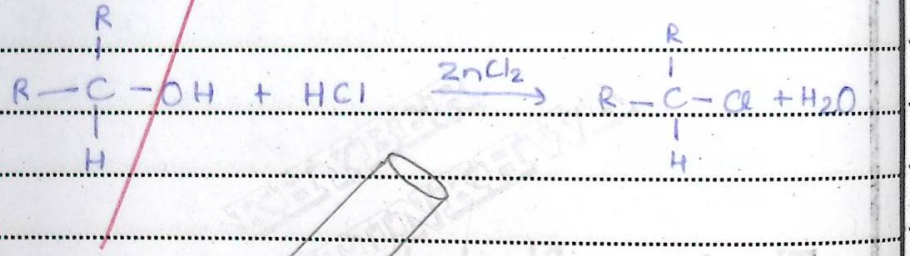
Tertiary alcohols react immediatly with Lucas reagent and cloudiness appears within seconds.

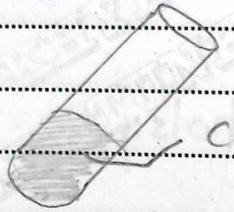




Secondary Alcohols:-

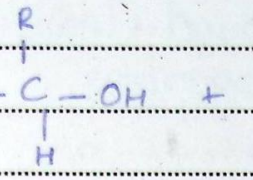
Secondary alcohols take about 10-15 minutes for formation of cloudiness.

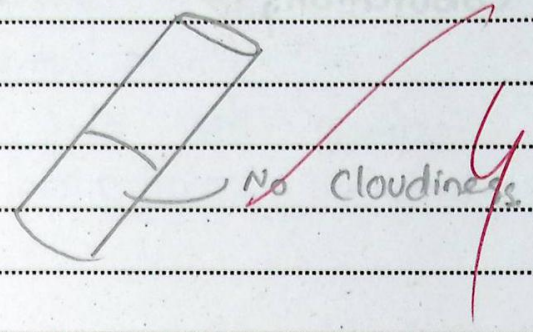




Primary Alcohols:-

Primary and methyl alcohol do not react with Lucas reagent at room temp. So no cloudiness appears.





Part - 5

What is photochemical - - - ?

PHOTOCHEMICAL SMOG:-

The word 'smog' is formed from the combination of 'smoke' and 'fog'.

Photochemical smog refers to the presence of

ozone (O_3) at ground level, which is harmful for living organisms.

Sky Coburation:

Photochemical smog gives the sky a hazy-brown coburation.

FORMATION OF PHOTOCHEMICAL SMOG:

It is formed by the reaction of NO_x with VOCs in presence of sunlight. The reaction goes as follows.

$$NO + VOC \longrightarrow NO_2$$

$$NO_2 \longrightarrow NO + O$$

Atomic oxygen combines with O_2 to form O_3.

$$O + O_2 \longrightarrow O_3$$

$$NO_2 + VOC \longrightarrow PAN$$

NO_2 reacts with VOC to form peroxyacetyl nitrate. The general reaction is,

$$NO + VOC + O_2 \longrightarrow NO_2 + PAN + O_3$$

Part-6

What is the effect of pH - - - ?

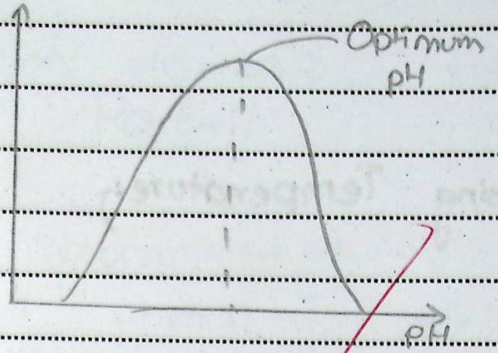
EFFECT OF pH on Enzyme Activity:

The pH

of medium where enzyme acts has considerable effect on enzyme activity. Enzymes work best at a specific pH. Each enzyme has its own range of pH at which it work best called optimum pH.

Change in pH:

The change in pH affects the basic or acidic groups present on enzyme, thus changing its structure and as a consequence, altering the rate of activity of enzyme. A large change in pH renders the enzyme inactive.



Pepsin works best at 2pH, trypsin in 8-9 pH.

EFFECT OF TEMPERATURE:

Temperature has a prominent effect on the rate of enzyme activity.

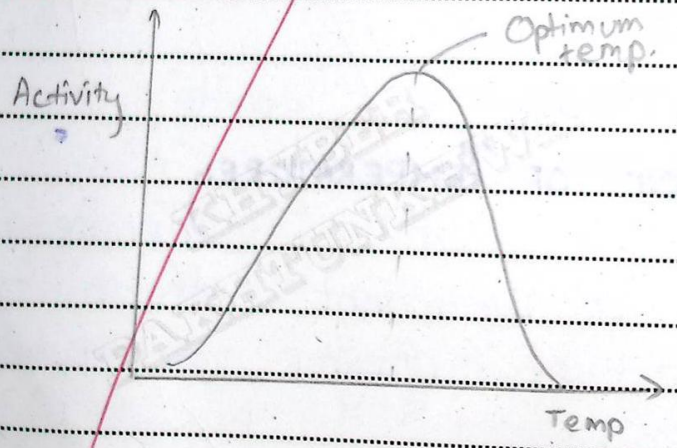
Lowering Temperature:

By lowering temp, the rate of activity is decreased because there are less collisions

between substrate and enzyme.

Increasing Temperature:

By increasing temperature, the rate of activity increases. But decreases afterwards. This is because the enzyme denatures at high temperatures.



Human enzymes work best at about 37°C.

Part-7

What is Wohler's work ....?

WOHLER'S WORK:

Background:

Vital force theory, put forward by Berzillius, stated that organic compounds can be made by living organism only due to presence of a vital force.

WOHLER'S WORK:

Fredrick Wohler disproved the vital force theory by synthesizing urea, an organic compounds, from ammonium carbamide, an inorganic compound.

The reaction is as follows:

$$NH_4COONH_2 \xrightarrow{\Delta} H_2NCONH_2$$

The formation of urea (H_2NCONH_2) from an inorganic source is termed as Wöhler's work.

IMPORTANCE:

Wöhler's work holds great importance in organic chemistry.

1) Eliminated the Old Concept:

Initially, it was thought that organic compounds could be made only by living organisms. By preparing

urea in laboratory. So, scientists got proof that organic compounds can be synthesized.

2) Synthesis of Organic Compounds:

It opened doors and avenues to organic chemistry and synthesis of new organic compounds started taking place.

Part-8

What is ionization energy . . . . ?

IONIZATION ENERGY:

The minimum amount of energy required to

remove a valence electron from a gaseous atom to form a gaseous cation is called ionization energy.

For example,

$$Mg_{(g)} \longrightarrow Mg^{+}_{(g)} + e^{-} \quad \Delta H = 737\,kJ/mol$$

Why Ionization Energy of Phosphorous Is Higher than Sulphur:

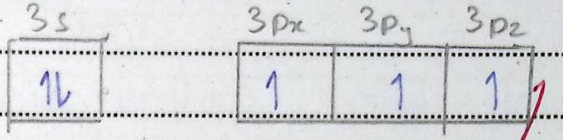
Ionization energy increases in a period from left to right due to increasing attraction b/w nucleus and valence electron. But sulphur has lower I.E than phosphorus. This is because of their

electronic configuration.

Phosphorus Configuration:

The valence electronic configuration of phosphorus is,

$$P = [Ne]\ 3s^2, 3p^3$$

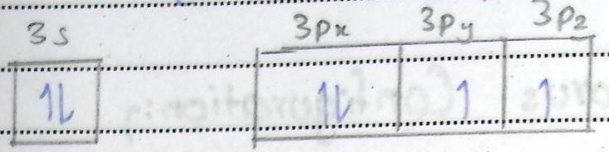


By looking at their orbitals, we see that 3p orbitals are half-filled, which are more stable than partially filled orbitals.

Sulphur Configuration:

The valence electronic configuration of sulphur is,

S = [Ne] $3s^2$, $3p^4$



One of 3p orbital is fully filled while others are half-filled, indicating that 3p is partially filled. It is less stable than half-filled configuration.

REASON:

The I.E of sulphur is less than phosphorus because its e^- configuration is unstable as compared to that of phosphorus. So it ionizes easily.

Part-9

What is meant by .....?

METAMERISM:

Definition:

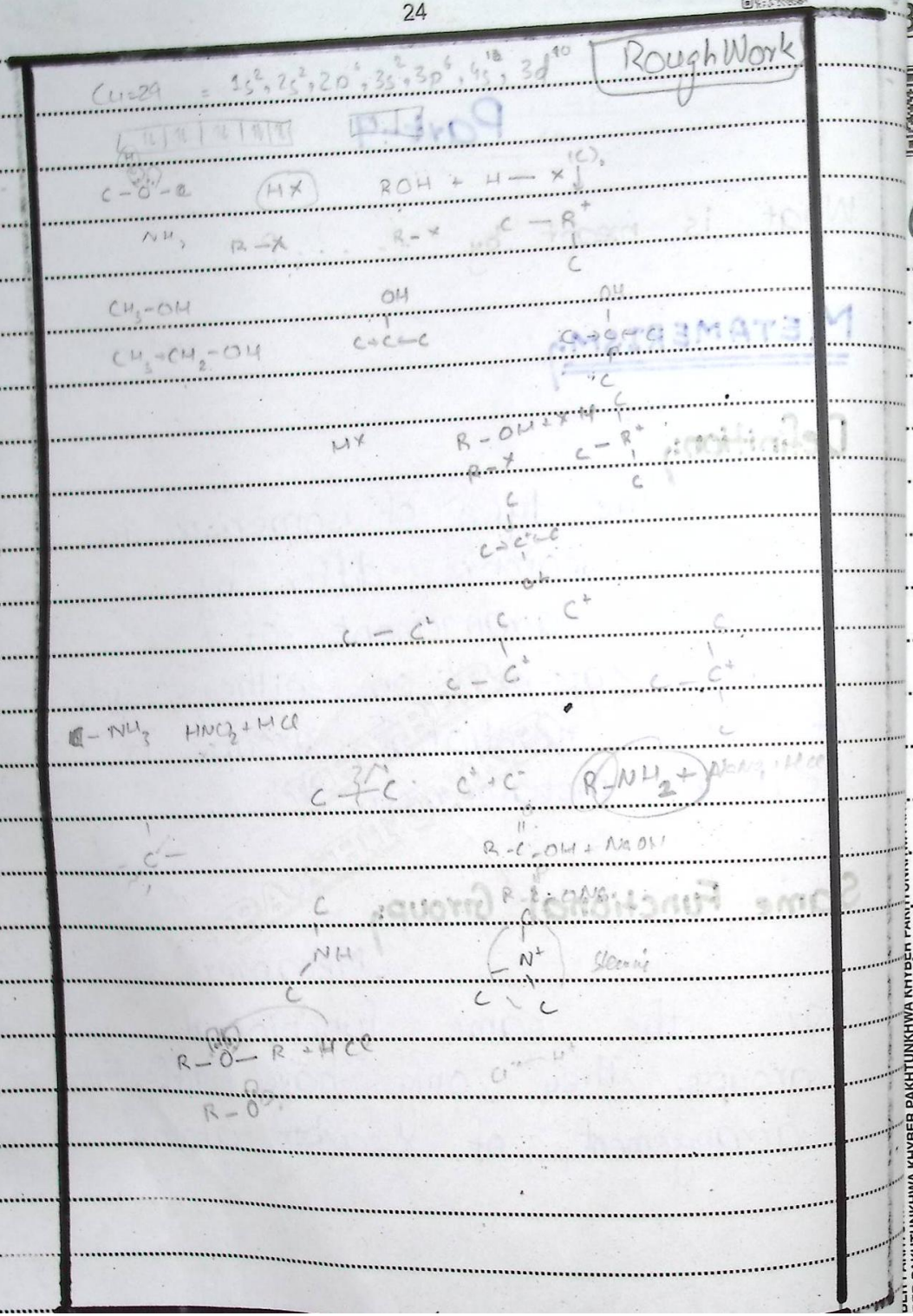
The type of isomerism in which the isomers differ by different arrangement of carbon atoms on either side of the functional group. is called metamerism.

Same Functional Group:

Metamers have the same functional groups. They only have different arrangement of carbon atoms.

Rough Work

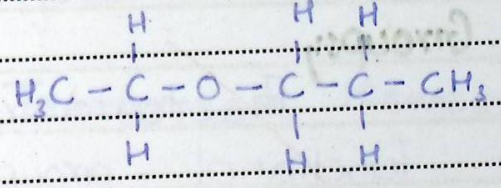
Cu=29 = $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1, 3d^{10}$



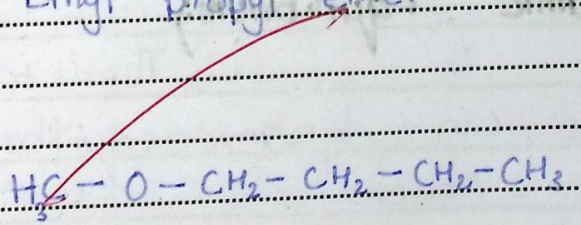
①

Examples:

Following are 2 metamers.



Ethyl propyl ether.



Butyl methyl ether.

TAUTOMERISM:

Definition:

The type of isomerism in which the isomers differ by position of a double bond or a proton is called tautomerism.

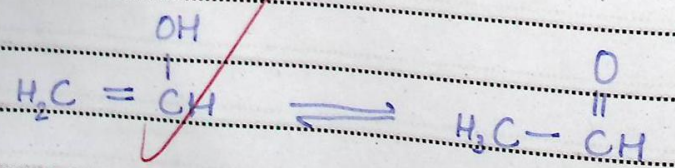
Functional Groups:

The tautomers have different functional groups.

Dynamic Equilibrium:

The tautomers are in dynamic equilibrium with each other.

Example:



ethenol and ethanal are tautomers of each other

Part-10

What are typical - - - - ?

TYPICAL TRANSITION METALS:

Definition:

Those elements which are present in the d-block of periodic table and which show the typical characteristics of transition metals are called typical transition metals.

GROUPS:

Group IVB to Group IB are termed as typical transition

metals.

EXAMPLE:

1) Vanadium.
2) Chromium.
3) Copper
4) Iron.

Properties:

They show typical transition metal properties such as: hardness, conductivity etc.

NON-TYPICAL TRANSITION METALS:

Definition:

Those elements which are present in the d-block of periodic table and which do

not show the typical characteristics of transition metals are called non-typical transition metals.

GROUPS:

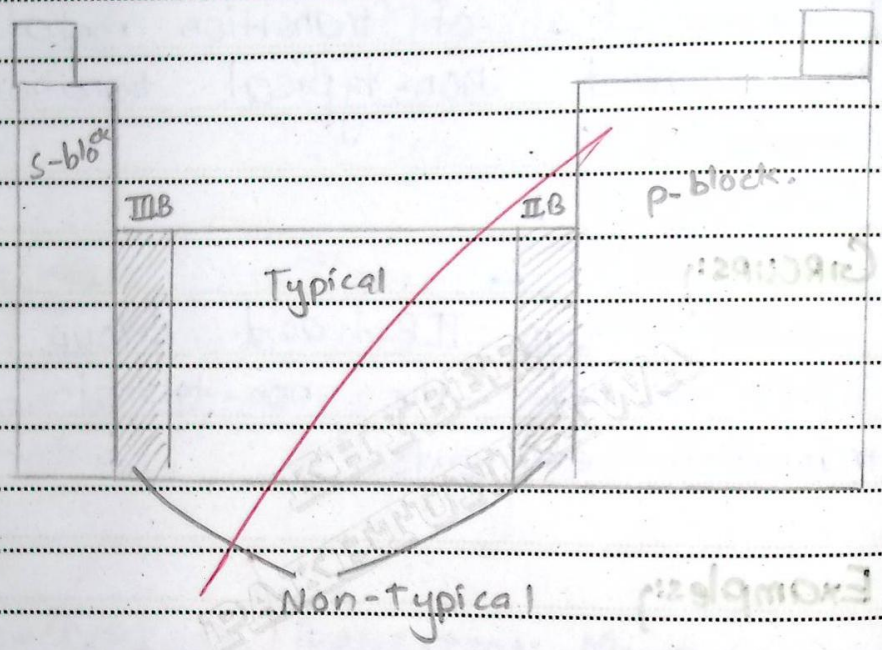
Group IIB and Group IIIB include the non-typical transition elements.

Examples:

1) Scandium.
2) Yttrium
3) Zinc.
4) Cadmium.

Properties:

They do not show the typical characteristics of transmition metals.



SECTION-C

QUESTION-5

What is grignard reagent ----?

GRIGNARD REAGENT:

INTRODUCTION:

Alkyl magnesium halides are commonly called as grignard reagents.

General Formula:

They are represented by the formula,

$$R - Mg\,X$$

REACTIVITY:

Carbon of alkyl group is more electronegative than Mg.

therefore, Carbon atom is nucleophile and Mg is an electrophile.

$$R-\overset{\delta^-}{Mg}-\overset{\delta^+}{X}$$

Preparation of Grignard Reagent:

It is prepared by reaction of Alkyl halide R-Ux with freshly prepared magnesium metal in diethyl ether or tetrahydrofuran solvent.

$$R-X + Mg \xrightarrow{\text{ether}} R-Mg-X$$

Ease of Formation:

1) With Alkyl Group:

Increasing size of alkyl group makes its formation harder.

2) With Halogen:

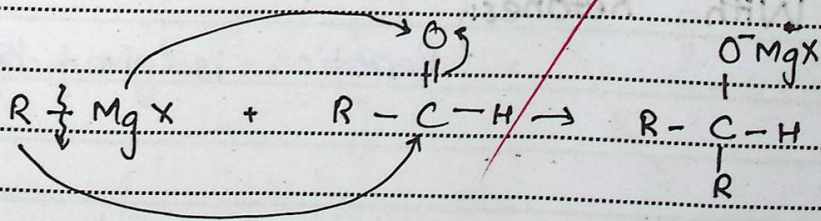
Its preparation becomes easier with going down the halogen group.

REACTIONS:

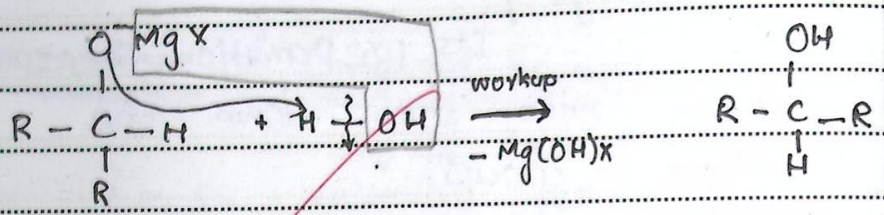
Grignard reagent are reactive species. They perform a number of reactions.

1) With Aldehydes:

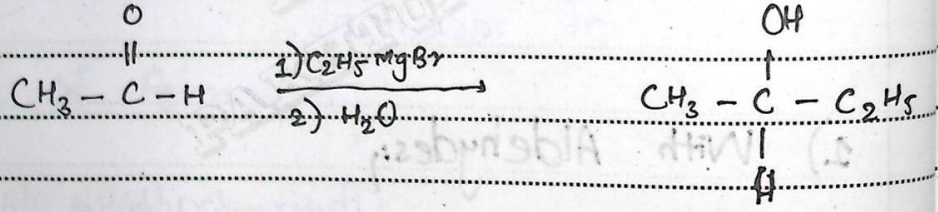
Their reaction with aldehydes is given below.



The addition product formed liberates alcohols through workup with acid or water.

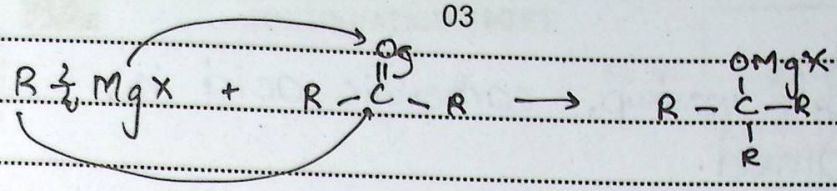


Formaldehyde gives primary, higher aldehydes give secondary alcohols.

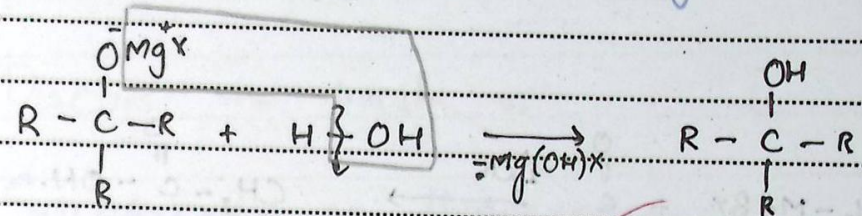


2) With Ketones:

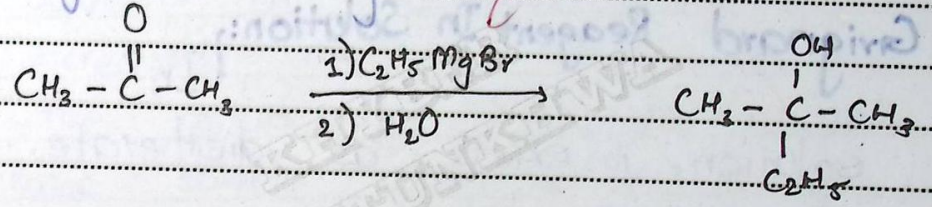
Reaction is given below,



Alcohol is liberated through workup.

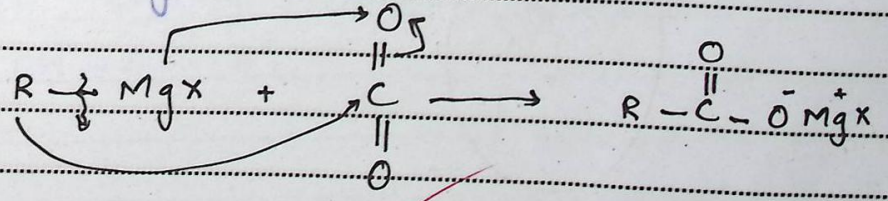


It gives tertiary alcohol.

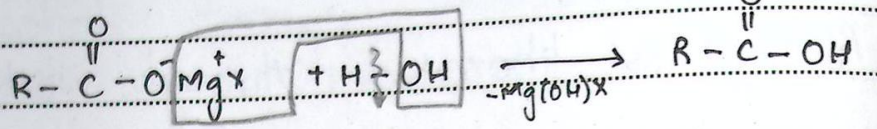


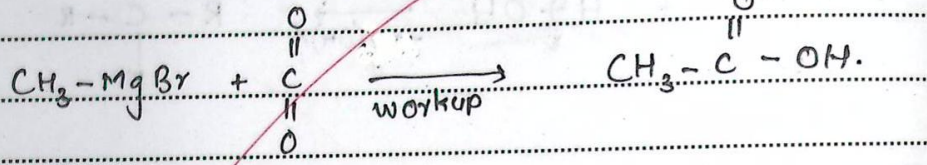
3) With CO_2:

This reaction yields carboxylic acid.



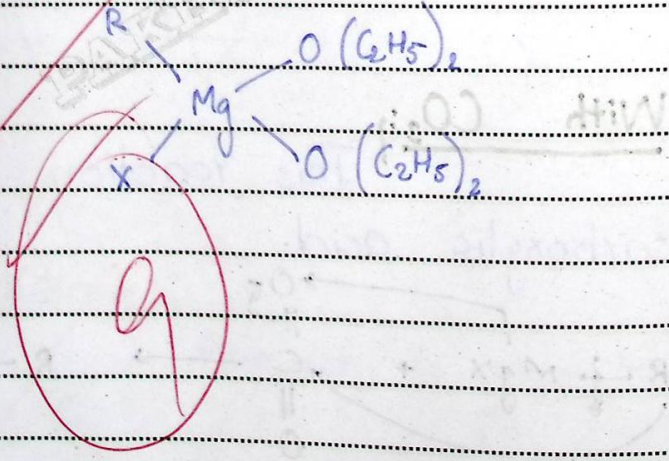
Through workup, carboxylic acid is obtained.





Grignard Reagent In Solution:

In solution, it exists as dietherate.



QUESTION-3

Discuss the trend in - - - - ?

SOLUBILITY OF HYDROXIDES:

The solubility of hydroxides of group-IIA increases as we move down the group. The hydroxides become more soluble down the group.

$Mg(OH)_2$:- It is very less soluble in water. It appears to be insoluble but when shaken, forms a slightly alkaline solution of pH ≈ 8.

$Ca(OH)_2$:-
It is more soluble than $Mg(OH)_2$. It forms an alkaline solution of pH ≈ 9-10.

$Ba(OH)_2$:-
It is very soluble and forms a solution of 0.1 molar concentration.

$$Ba(OH)_2 \xrightarrow{H_2O} Ba^{++} + 2OH^-$$

$Sr(OH)_2$:-
It is less soluble than $Ba(OH)_2$.

SOLUBILITY OF ~~OXID~~ SULPHATES:-
The solubility of sulphates of grp - IIA decreases down the group.

$Be(SO_4)$:-
It is most soluble among the sulphates.

$MgSO_4$:-
It is less soluble than $Be(SO_4)$.

$CaSO_4$:-
It is less soluble than $BeSO_4$.

$SrSO_4$ and $BeSO_4$:-
They are also less soluble than $BeSO_4$.

NOTE:-
It is to be noted that this trend applies for hydrated sulphates. Anhydrous $BeSO_4$ is insoluble in water

while hydrated $BeSO_4$ is soluble. It also holds true for other sulphates of this group.

Solubility of Carbonates:-

The solubility of carbonates of group-IIA decreases down the group.

$BeCO_3$:-

It is most soluble among the carbonates.

$MgCO_3$:-

It is less soluble than $BeCO_3$.

$CaCO_3$:-

It is less soluble than $BeCO_3$.

$SrCO_3$ & $BaCO_3$:-

They are also less soluble than above compounds.

2nd Last

Reason For Trend:-

As we move down the group, the size of atoms increases. As a result, lattice energy decreases which increases solubility. But hydration energy decreases which decreases solubility. The decrease in solubility due to decrease in hydration energy is prominant for sulphates & carbonates of group-IIA, while decrease in lattice energy is prominant for hydroxides. Therefore solubility of hydroxides increases while it decreases for carbonates and sulphates of group-IIA.

QUESTION-4

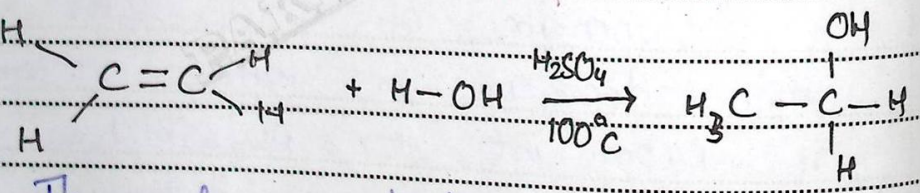
Discuss in detail the ------?

Reactions of Alkenes:

Following are the important reactions of alkenes.

1) Hydration:

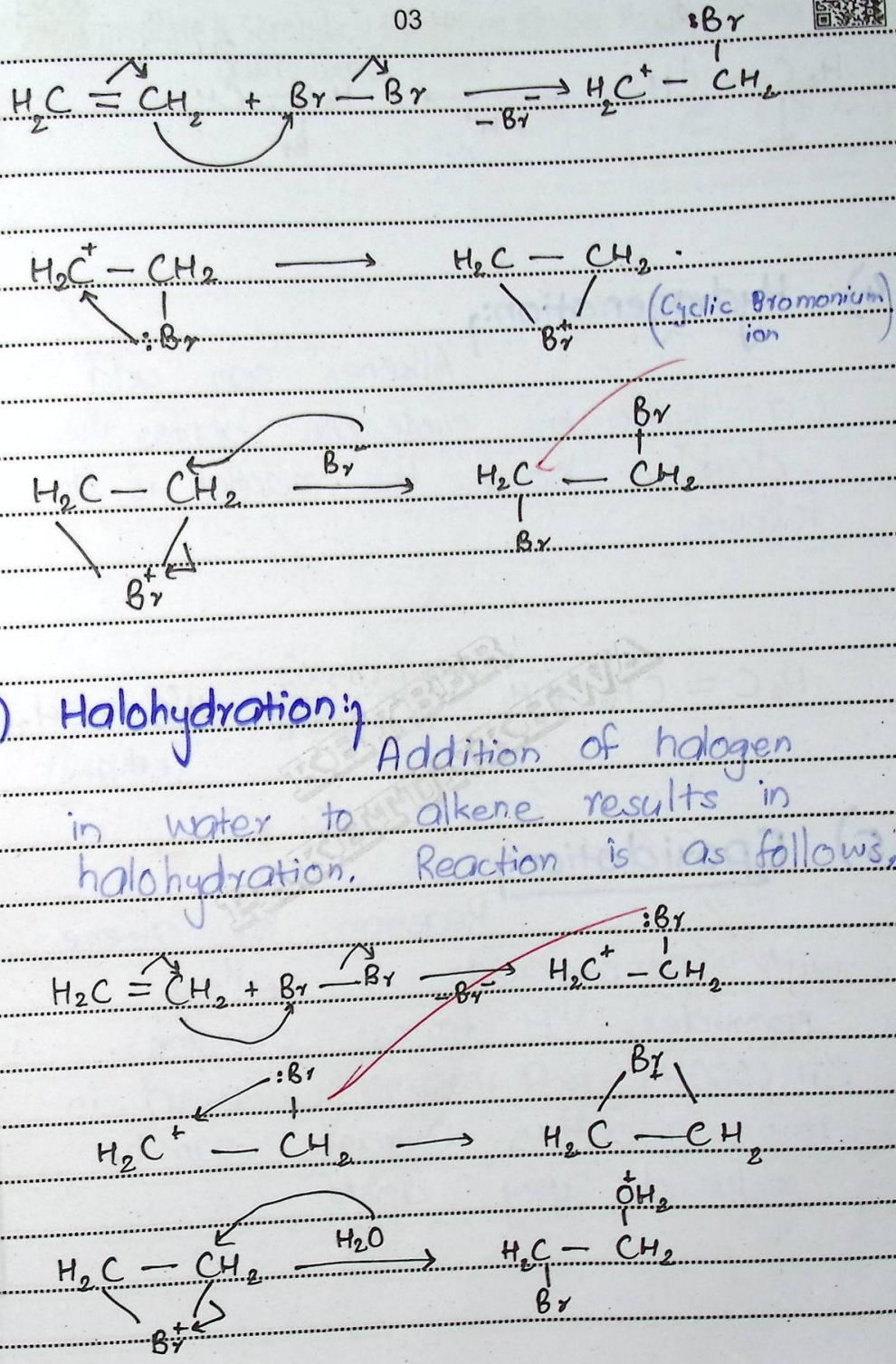
Alkenes undergo hydration under acidic conditions.



They form alcohols.

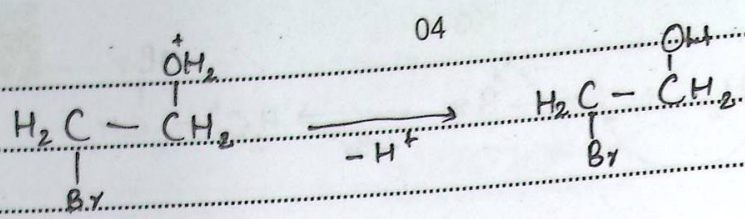
2) Halogenation:

They can add a halogen in inert solvent. The reaction is as follows:



3) Halohydration:

Addition of halogen in water to alkene results in halohydration. Reaction is as follows,



4) **Hydrogenation:** Alkenes can add a hydrogen molecule across the double bond. The reaction is as follows,

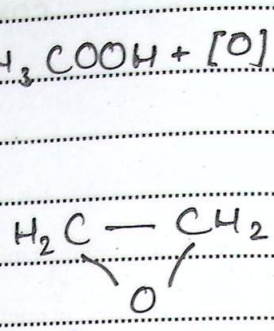
$$H_2C = CH_2 + H_2 \xrightarrow[Pt \text{ or } Pd/25^\circ C]{Ni/250\text{-}300^\circ C} H_3C - CH_3$$

(ethene) (ethane)

5) **Epoxidation:** Reaction of alkene with peroxyacids is called epoxides. It forms oxiranes. CH_3COOOH is commonly used in this reaction. Oxiranes can be reduced using acids.

(Written On Next Page)

$CH_3COOOH \longrightarrow CH_3COOH + [O]$

$H_2C=CH_2 + [O] \longrightarrow$ 

Oxirane

6) Polymerization:

Alkenes undergo polymerization to form polymers e.g. ethene forms polyethylene. at 200°C and 2000 atm with presence of free radicle initiator catalyst.

$$n\ H_2C=CH_2 \xrightarrow[2000atm]{RO;\ 200^\circ C} \left[H_2C-CH_2\right]_n$$

polyetherene

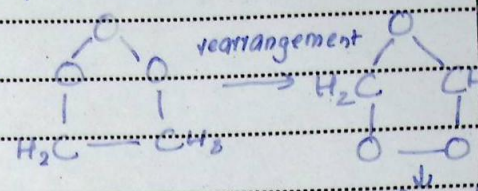
7) Ozonolysis:

Alkenes undergo ozonolysis through following

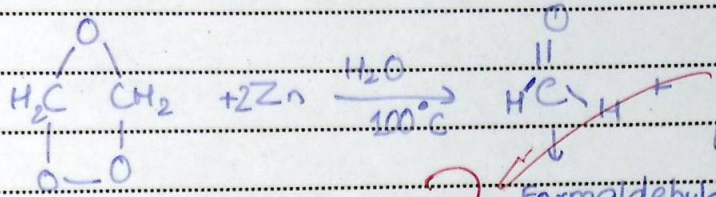
mechanism.

Highly explosive

Molozonide

$H_2C=CH_2 + O_3 \longrightarrow$ 

Ozonide



Formaldehyde

complete All reaction.

8

8) Addition of HX:

Alkenes can add a molecule of HX across double bond.

$H_2C=CH_2 + HX \longrightarrow H_3C-CH_2X$

markonis Rule not reaction

For HCl, Anhydrous $ZnCl_2$ is used as catalyst while no catalyst is required for HI and HBr.

Markonikov's rule.

HI & HBr are produced in situ.