

QUESTIONS

SECTION: B

QUESTION: 1

Ionization Energy:

Amount of energy required to remove an electron from valance shell of isolated gaseous atom.

UNIT: It is measured in KJ mol^{-1} .

Endothermic:

It is an endothermic process and assigned positive value.

Ionization Energy of Phosphorous Is more than Sulphur:

As we move from left to right ionization energy increases but here is an anomalous at some level (3) *No example mentioned*

Phosphorous have half filled p orbital on the other hand sulphur has partially filled p orbital as half filled orbital is more stable is responsible for extra stability of phosphorous as compare to sulphur.

Configuration of Phosphorous:



No mention given

QUESTION: 3

FRIEDRIK WOHLER'S WORK:

Background:

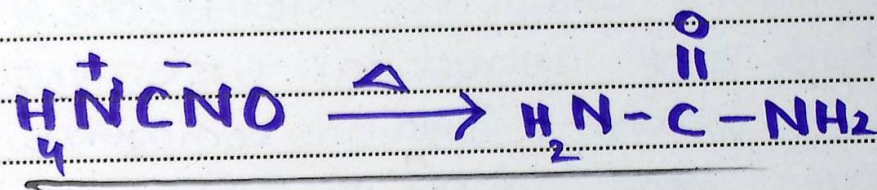
In old days it was thought that organic compounds can be only obtained from living organisms and couldn't be prepared in laboratory.

Vital force theory predicts that organic compounds are only prepared by vital force existing in living organisms.

Wohler's Work:

In 1828 Friedrich Wohler for the first

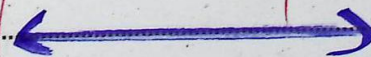
time prepared organic compound in laboratory. He prepared urea by heating ammonium cyanate previously obtained from living source.



IMPORTANCE:

Friedrich's work opened the door for synthesis of organic compounds.

Now many organic compounds are prepared in laboratory which are of prime importance.



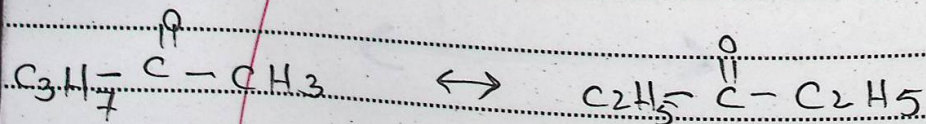
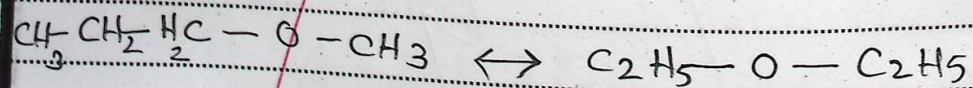
QUESTION: 4

METAMERISM:

It is the type of structural isomerism in which two compounds have same molecular formula but have unequal carbon chain on either side of functional group.

Examples:

propyl methyl ether and diethyl ether.

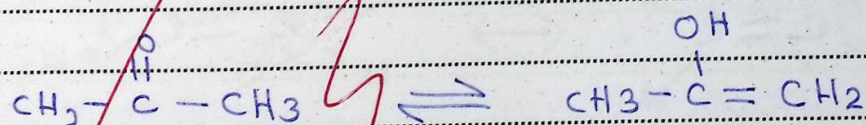


Tautomerism: Type of isomerism in which there is a difference in position of proton or pi bond.

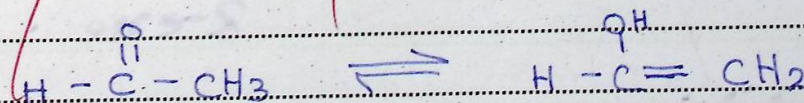
EXPLANATION:

The compound showing tautomerism are called tautomers. It is special type of functional group isomerism. At equilibrium solution contains two types of tautomers.

Examples:



This is called keto enol shift.

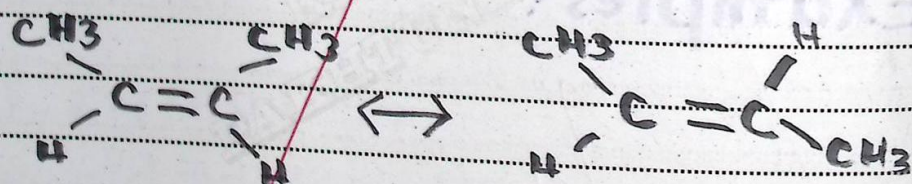


QUESTION: 5

NECESSARY CONDITION FOR GEOMETRIC ISOMERISM:

Defination:

Those isomers which have different position of atoms or group of atom in restricted motion.



cis but-2-ene.

trans-but-2-ene.

Conditions: Necessary condition

for geometric isomerism is that each double bonded carbon atom must be attached to different groups.

- Geometric isomers have restricted rotation.
- They are not interconvertible without breaking of π bond.
- They are possible also in substituted cycloalkane.

Explanation with Example:

Because of required condition, geometric isomerism is not possible in propene bcz it has a carbon which is bonded to two hydrogen atoms (same atoms).



QUESTION: 6

Tertiary Alkyl Halide

FOLLOWS S_N1 MECHANISM:

REASON: 1

Tertiary alkyl halide follow S_N1 mechanism because:

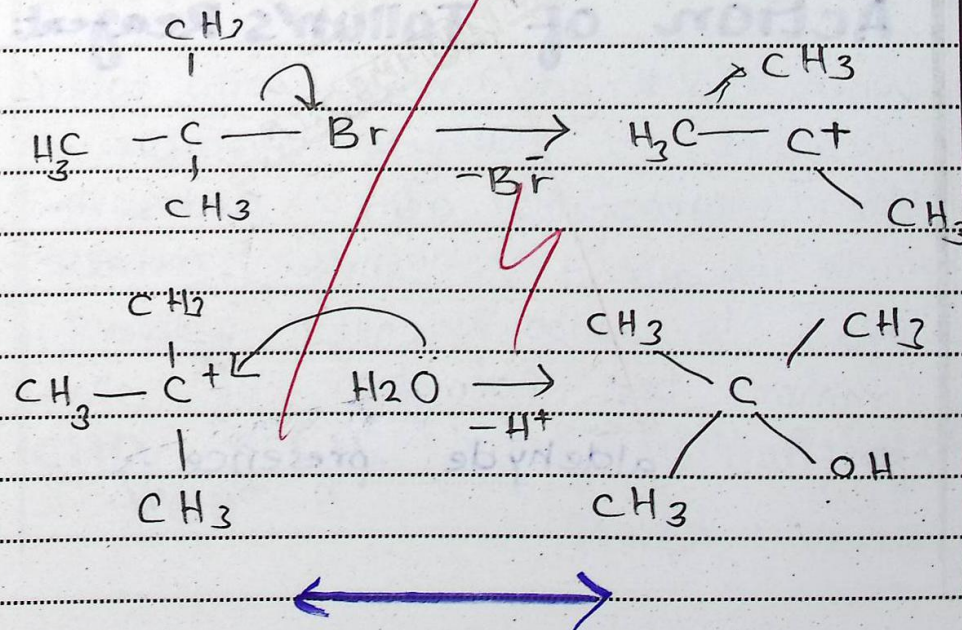
In tertiary alkyl halide there is due to presence of bulky groups, nucleophile cannot attack in a single step because of steric hindrance.

It is a two step reaction in which first intermediate carbocation is formed.

Carbocation is planar and incoming nucleophile can easily attack from front or back.

REASON: 2

So due to steric effect and also intermediate carbocation is stable to be attacked by nucleophile in second step.



QUESTION: 8

TOLLENS TEST:

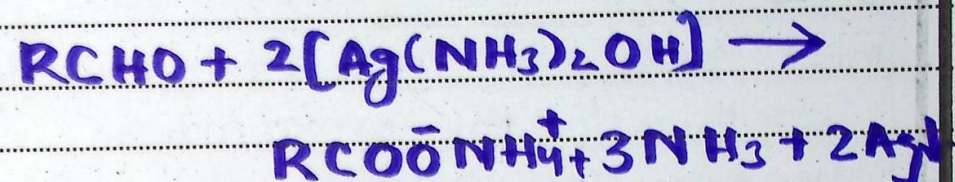
This is ammoniacal silver nitrate solution in which ammonium have been dissolved in silver nitrate which form silver (I) oxide dissolves. Silver nitrate form tetrahydroxo aluminium.

Action of Tollun's Reagent:

When aldehyde react with tollens reagent, aldehyde is oxidized to carboxylic acid and silver is reduced to silver metal.

This is also called silver mirror test. Formation of silver confirms aldehyde presence.

REACTION:

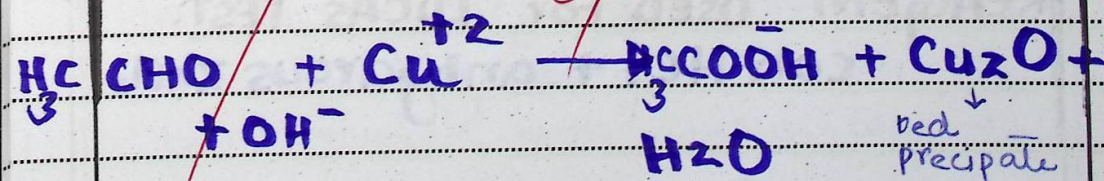


Fehling's Test:

It contains cupric ion mixed with tartarate ion in alkaline medium.

ACTION:

If it react with aldehyde, cupric ion is oxidized to cuprous oxide which precepitate and is red coloured. This determines presence of aldehyde.



Importance:

- This test is used to identify whether the compound is aldehyde or ketone.
- Aldehyde gives reaction. This reaction is world wide used to find glucose level in blood and urine.

QUESTION: 7

Lucas Test:

This test is used to distinguish between tertiary, secondary and primary alcohol.

REAGENT USED FOR LUCAS TEST:
 $\text{con. HCl} + \text{anhydrous ZnCl}_2$

Alcohol react with HCl in the presence of anhydrous ZnCl_2 to form alkyl halide. Alkyl halide is insoluble and forms white cloudiness in test tube. Time taken for cloudiness determines nature of alcohol.

i) **Tertiary alcohol:** It reacts rapidly with Lucas reagent and cloudiness appears rapidly.

ii) **Secondary alcohol:** It reacts after some times with Lucas reagent and cloudiness appears later.

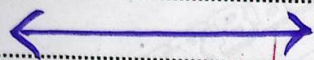
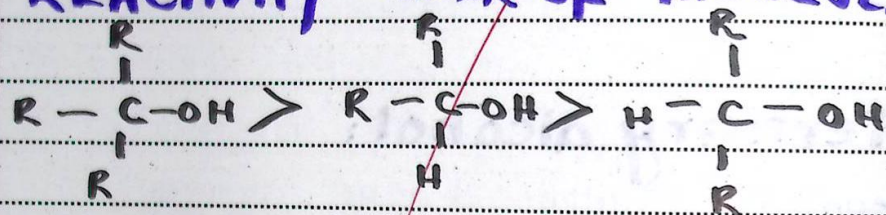
iii) **Primary or Simply Primary alcohol:**

Primary and simple primary alcohol do not react at room temperature with Lucas reagent.

Importance of Lucas Test:

Thus time taken for cloudiness to appear can be used to distinguish between primary secondary and tertiary alcohol.

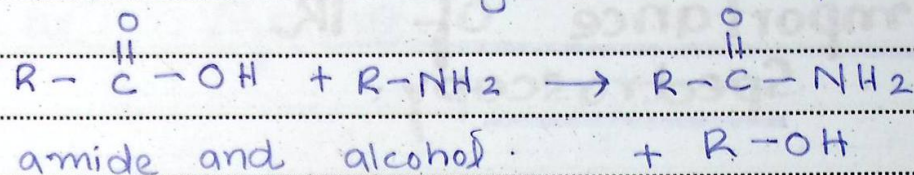
REACTIVITY ORDER OF ALCOHOLS



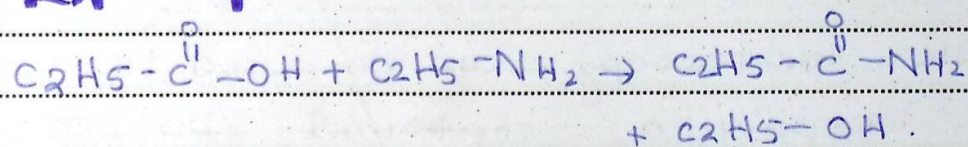
QUESTION: 9

CONVERSION OF CARBOXYLIC ACID TO AMIDE AND ANHYDRIDE

CONVERSION TO AMIDE When amine react carboxylic acid it forms



Example:



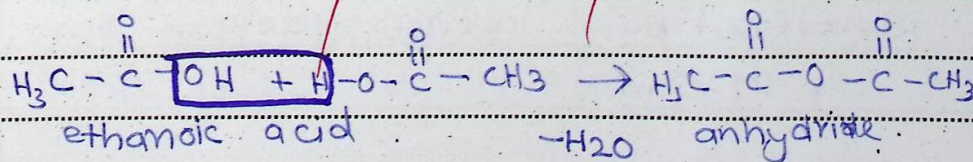
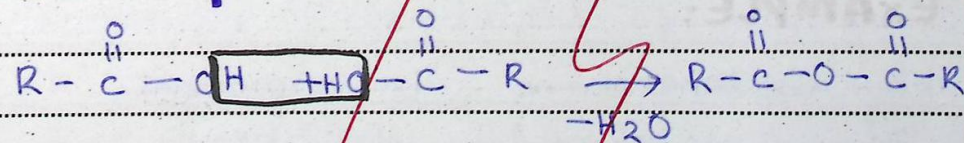
propanoic acid

ethanamine

CONVERSION TO ANHYDRIDE:

When two carboxylic acid combine. They release a water molecule and anhydride is formed

Example:



QUESTION: 13

Importance of IR Spectroscopy:

(i) Identification of Compound:

IR spectroscopy can be used to identify a compound by comparing fingerprinting of unknown compound to known compound.

(ii) Identification of Impurity:

IR spectroscopy can be used to find impurity in a compound.

EXAMPLE:

If cyclohexanone is present in cyclohexanal it be identified by intense beam of 1735cm^{-1}

(ii) Identification of FUNCTIONAL GROUP:

IR Spectroscopy can be used to find different functional groups present in a compound.

(v) To check Progress Of REACTION:

It can be used to check progress of reaction with interval of time.

Example:

Formation of (oxidation) of cyclohexanol to cyclohexanone can be determined by the disappearance of OH bond peak and appearance of carbonyl bond peak at 1735cm^{-1}

QUESTION: 10

Effect of pH on Enzyme Activity:

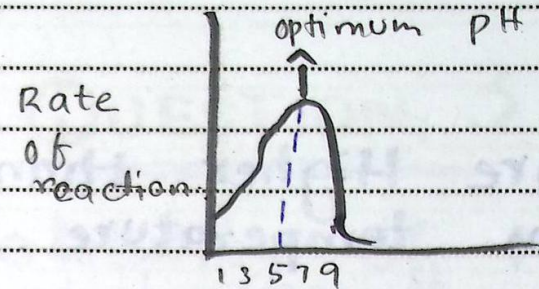
Enzymes are specific in action and are greatly affected by pH of solution.

pH of most Enzymes:

Most of enzymes work at a pH of 5-7. However pepsin (pH = 2) is exception to this case.

Optimum pH:

The pH at which the activity of enzyme is maximum is called optimum pH.



Effect of Temperature:

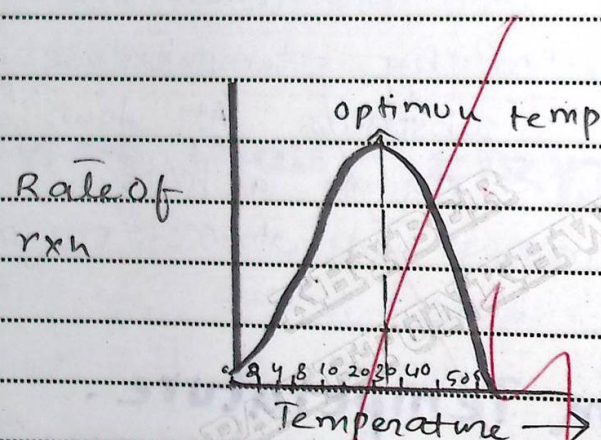
Enzymes are highly affected by temperature of a substance. At low temperature, enzyme activity is minimum and at 0°C enzyme activity ceases.

Optimum Temperature:

If a temperature of a substance is raised at some specific value at which enzymatic activity is maximum is called optimum temperature. Most of enzymes have pH from 35-40°C. However ureases is exception it works best at

at 60°C
 Temperature Higher than optimum temperature.

If temperature is increased beyond optimum temperature. Enzyme activity decrease because of denaturation of enzyme.



(SECTION: C)

QUESTION: 3

Solubility of Hydroxide Sulphate and Carbonates of alkaline Earth Metals.

(i) Solubility of Hydroxides

Group (II) elements alkaline earth metals dissolves slowly as compare to group I metals.

Solubility of $Mg(OH)_2$:

$Mg(OH)_2$ magnesium hydroxide appears to be insoluble however if it is shaken then filtered solution is slightly basic.

pH of solution having $Mg(OH)_2$ have a pH of 9

(ii) Calcium Solubility $Ca(OH)_2$:

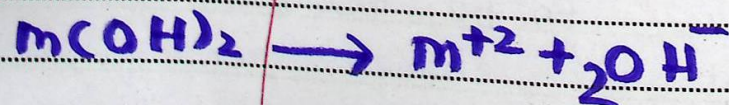
Calcium hydroxide is more soluble than magnesium hydroxide.

pH of calcium hydroxide has pH = 11.

It means calcium hydroxide contains more OH^- ions than magnesium.

(iii) Down the Group $M(OH)_2$

As we move down the solubility of hydroxide increases down the group.



(i) Solubility of sulphates

Solubility of sulphate decreases as we move down the group. ($Be \cdot SO_4 \cdot 4H_2O$). Here

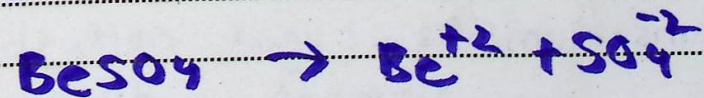
only hydrated barium sulphate is considered.

a) $Be \cdot SO_4 \cdot 4H_2O$:

Hydrated ($Be \cdot SO_4 \cdot 4H_2O$) is considered for solubility. It is most soluble of all sulphate of group (II) elements.

Anhydrous $Be \cdot SO_4$.

Anhydrous beryllium sulphate is insoluble.



(ii) $MgSO_4$

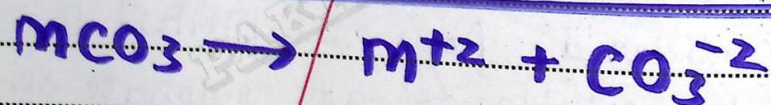
$MgSO_4$ is more soluble than $CaSO_4$ but less soluble than $BeSO_4$.

(iii) $BaSO_4$

$BaSO_4$ is least soluble of all sulphates of group II elements.

This is because $BaSO_4$ is less hydrated because of decreased charge density.

(iii) Solubility Of Carbonates



MCO_3 as we move down group they become less soluble. However, this

trend is broken at end. $BaCO_3$ is more soluble than Strontium CO_3 .

Down The Group Lattice Energy

As we move down the group lattice energy decrease because bond becomes weaker due to increased bond length.

Down The Group Solvation Forces:

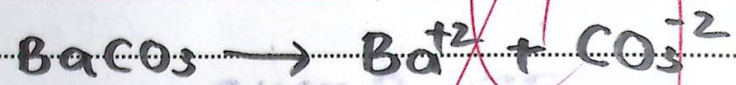
However, on the other hand hydration energy also decreases because of decreased charge density. Hydration energy is responsible for solubility.

Combined Effect On Solubility:

The combined effect is this hydration energy is dominant factor. As down the group hydration energy decrease and so solubility decrease.

Anomalous At the END

However at the end this trend break at end. barium carbonate is more soluble than strontium carbonate.

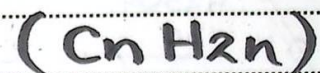


QUESTION: 4

Important Chemical Reactions Of Alkenes:

Alkenes: Alkenes are those unsaturated organic compounds that contain carbon-carbon double bond ($\text{C}=\text{C}$).

It can be represented by general formula:



where n stands for number of carbon atoms.

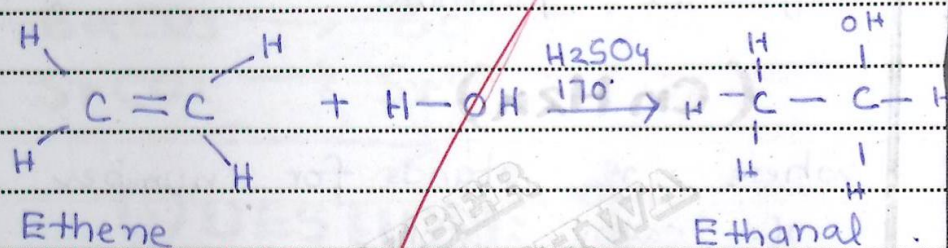
Important REACTIONS Of ALKENES:

i)

HYDRATION:

Addition of water is called hydration reaction.

Alkenes in the presence of sulphuric acid catalyst at 170°C add water molecule and get converted to alcohols.



ethene after hydration converted to ethanol

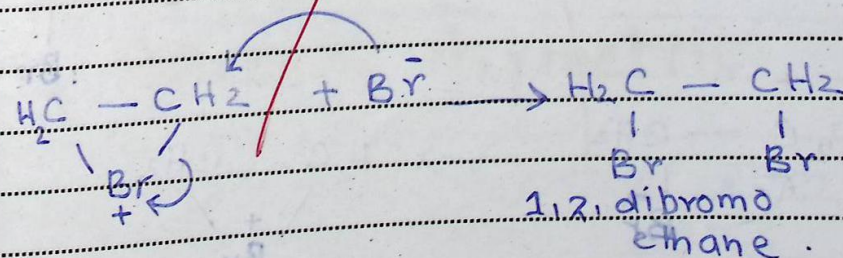
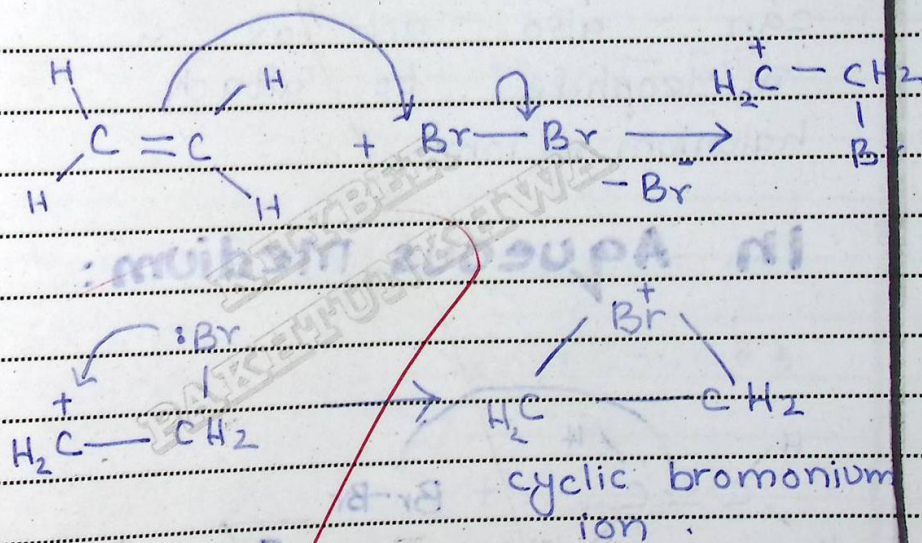
(ii)

HALOGENATION:

Alkenes react with halogen in inert solvent to form haloalkanes

Bromination:

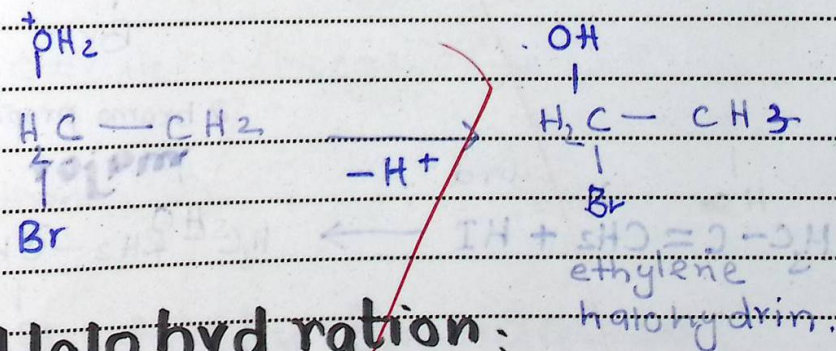
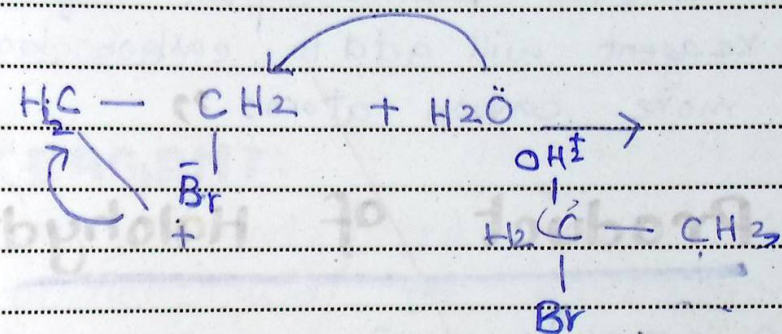
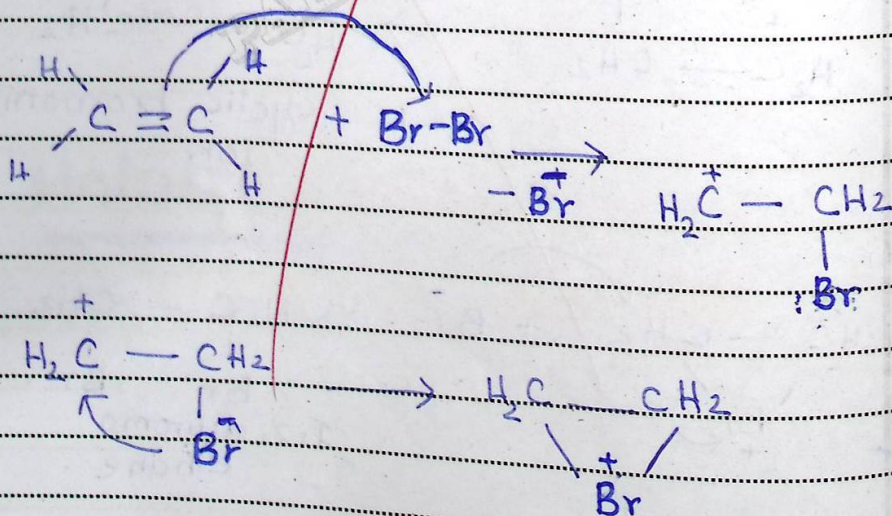
Alkenes react with bromine in inert solvent to form vicinal dihalide via intermediate bromonium ion.



Halogenation:

In case of halogenation halide ion is only nucleophile to attack intermediate halonium ion. However in case of aqueous solution, water can also act as a nucleophile to attack halonium ion.

In Aqueous Medium:



(iii) Halohydration:

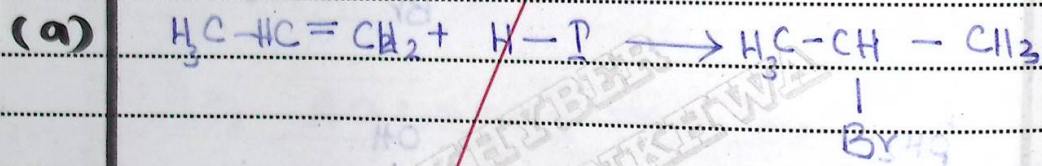
If Alkene is Asymmetric:

If alkene is asymmetric then halohydration takes place according to marknikov rule.

Markanico's Rule:

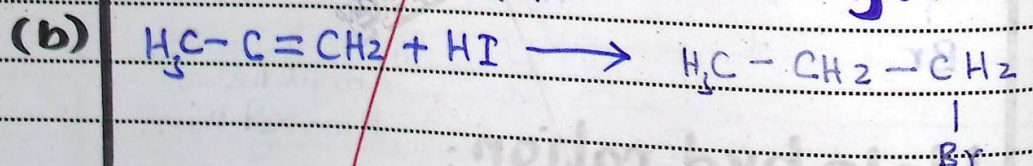
"When an asymmetric reagent is added in asymmetric alkene, positive part of reagent will add to carbon holding more carbon atoms"

Product of Halohydration



2 bromo propane
major

and $\text{H}-$



1 bromopropane
minor

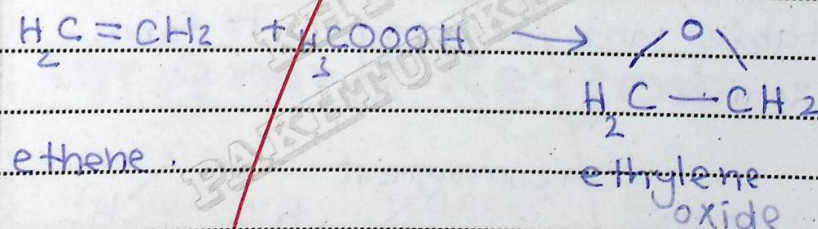
It has been found that major product is according to Markanico's rule.

v) Epoxidation:

Alkenes add peracid to double bond to form cyclic ethers or epoxides.

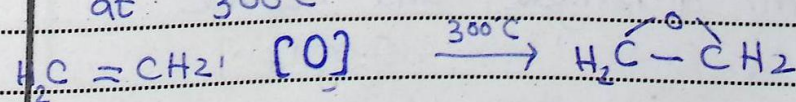
REAGENT:

Most commonly used reagent is peracetic acid for epoxidation



Industrially Epoxidation:

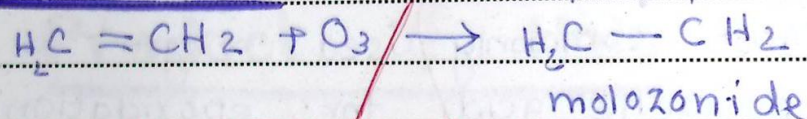
Industrially this process takes place in presence of Ag_2O at 300°C



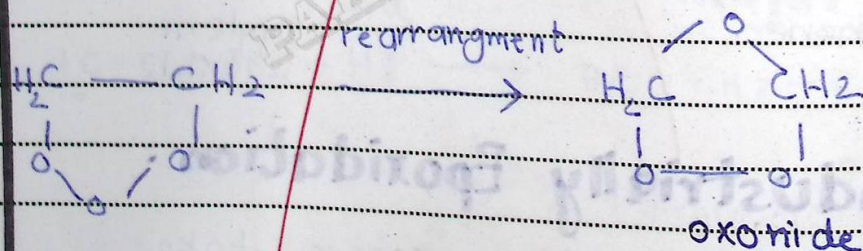
(v) Ozonolysis:

ozonolysis of alkene takes place in the presence of ozone at (-80°C) low temperature.

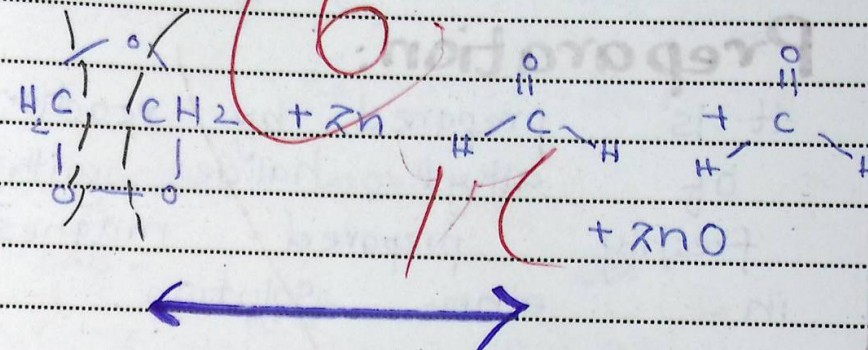
REACTION:



It forms molozonide which is unstable and rearranges to form ozonide.



It can be reduced in Zn dust presence to form aldehyde and ketone.



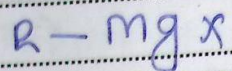
QUESTION: 5

Grignard Reagent:

Grignard's reagent is one of the most important reactive compounds prepared by Grignard.

It is a metal-organic compound in which magnesium is bonded with a halogen and an alkyl or aryl group on the other hand.

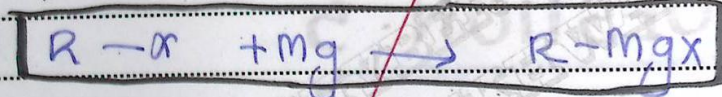
General Formula:



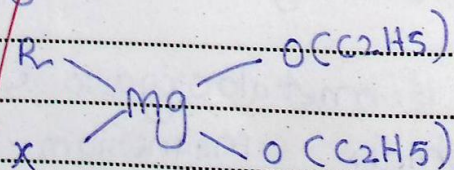
Preparation:

It is prepared by reaction of alkyl halide with freshly prepared magnesium in ether solution.

Rxn

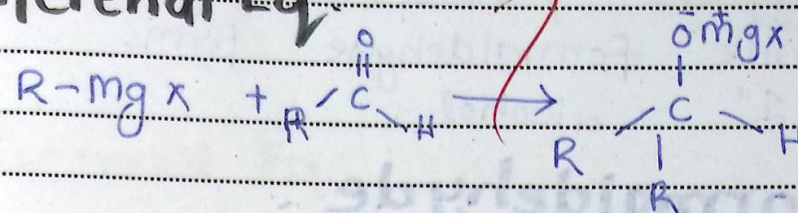


Crystalline solution of etheral solution is used in which Mg is co-ordinated with four groups.

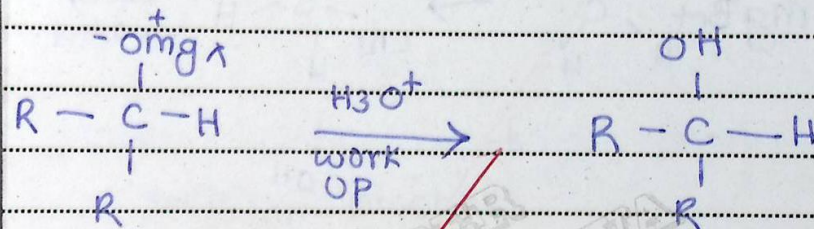


(i) Aldehyde Rxn:

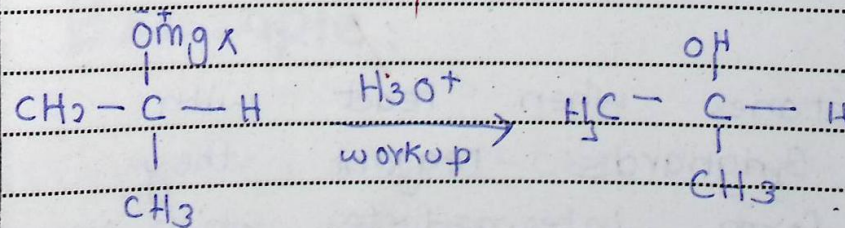
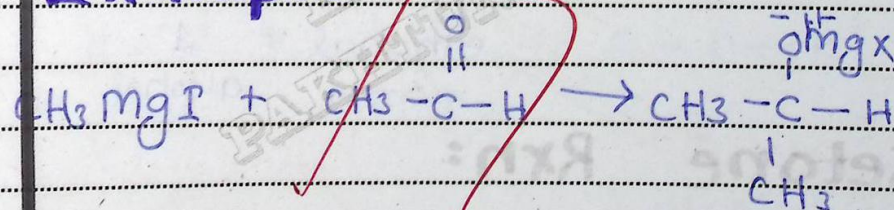
General Eq:



upon acidic work up.



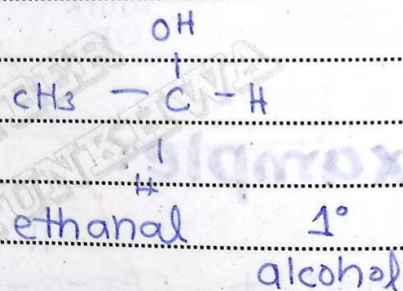
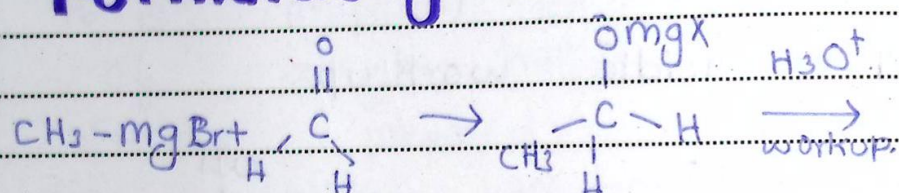
Example:



propan-2-ol

Aldehyde when reacted with Grignard produces 2° alcohol while formaldehyde forms 1° alcohol.

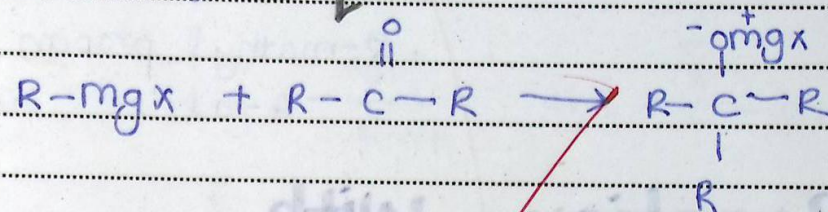
Formaldehyde



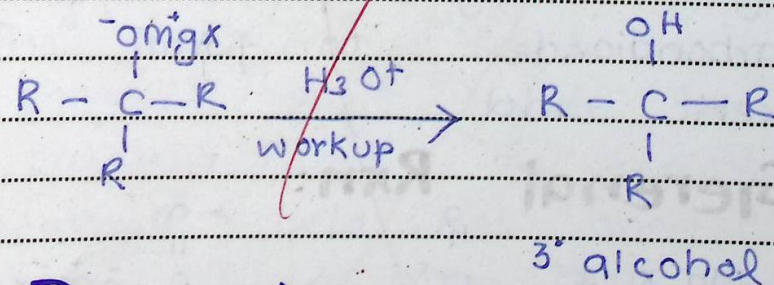
(ii) Ketone Rxn:

Ketones when react with Grignard's reagent they form intermediate, which on workup with acid form 3° alcohol.

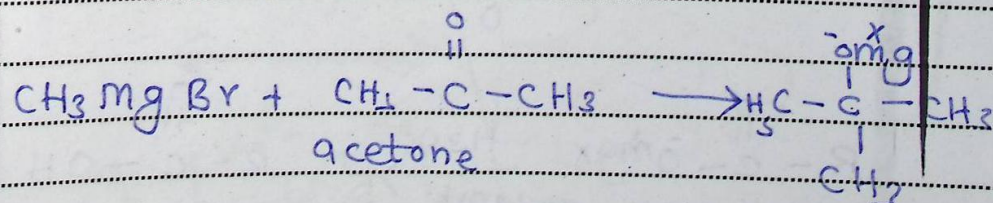
General Eq:

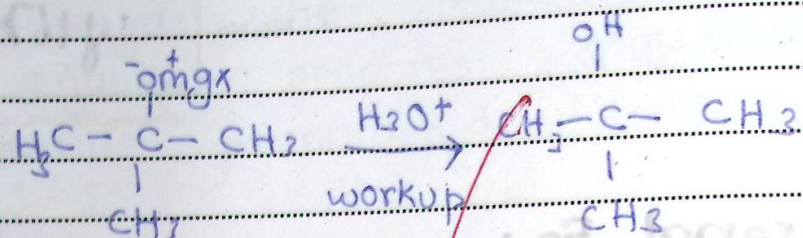


Upon acidic workup produces tertiary alcohol



Example:



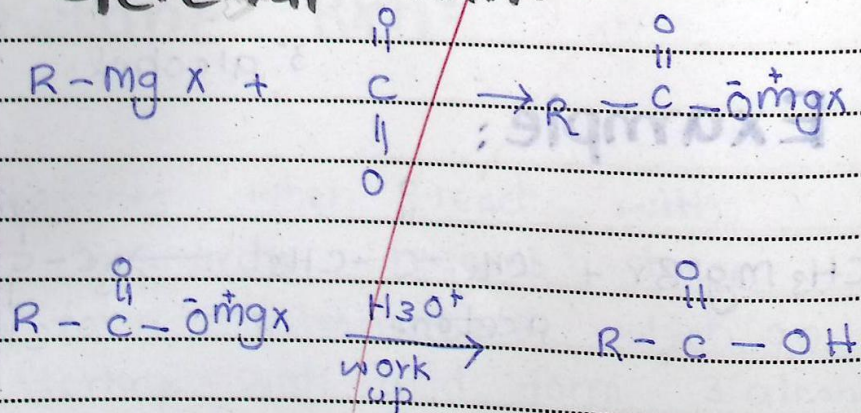


2-methyl propan-2-ol

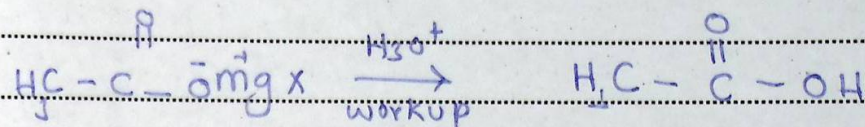
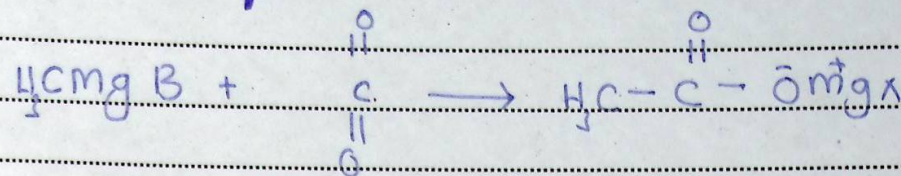
(iii) Reaction with (CO₂):

Grignard reagents react with carbondioxide to form acetic acid.

General Rxn:



Example:



ethanoic acid.

Importance:

This reaction is used to convert alkyl halide to carboxylic acid. The resulting carboxylic acid has one more carbon atom than the parent alkyl halide.

Complete product 9