Section B

Question no: 02

(i)

Answer:-

IONIZATION ENERGY:-

Definition:

It is the minimum amount of energy required to remove an electron from one mole of an isolated gaseous atom.

Representation:

I.E.

Unit:

It is measured in KJ/mol or ev

General rxn:

$$I.E + atom \longrightarrow atom^{+1} + 1\bar{e} \quad +I.E$$

+ive sign shows that the energy has been given.

There are two types of ionization energy

1st ionization energy
2nd ionization energy

1st Ionization Energy:

It is the energy required to remove an electron from isolated neutral gaseous atom.

exp:

$$Mg \longrightarrow Mg^{+1} + 1\bar{e} \qquad I.E = X\,KJ/mol$$

2nd Ionization Energy:

It is the energy required to remove an electron from a mono positive ion.

exp:

$Mg^{+1} \longrightarrow Mg^{+2} + \bar{i}\bar{e}$ $\quad I.E = +XKJ/mol$

Ionization energy depends upon the following factors

1. Atomic size
2. Sheilding effect
3. Nuclear attraction
4. Electronic configuration.

Now we know that the ionization energy of phosphorus is higher than Sulpher because of the following reasom:

That is because of the stable electronic configuration of phosphorus. as it has half filled p-orbital while sulphur has partially filled p-orbital.

$_{15}P = 1s^2, 2s^2, 2p^6, 3s^2, 3p^3$

[1][1][1]

As half filled orbitals are more stable than that of partially filled orbital.

And as sulphur has partially filled p- orbital thus that's why sulphur needs less energy to remove electron from it.

$_{15}S: 1s^2, 2s^2, 2p^6, 3s^2, 3p^4$

So the energy required to remove electron from half and completely filled orbital is greater than that of energy required for partially filled orbital.

(VII)

ANSWER:

LUCAS TEST:

Definition:

It is a test used to distiquish between primary, secondary and tertiary alcohol by means of a reagent called lucas reagent.

Lucas reagent:

It is a mixture of Hydrochloric acid and anhydrous zinc-chloride. i.e.

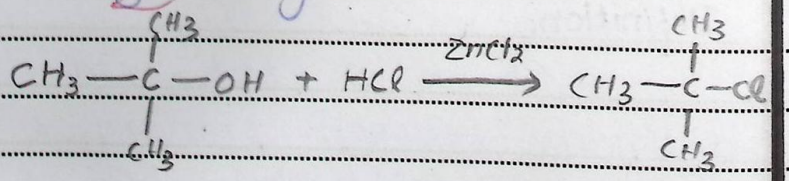
$HCl / ZnCl_2$.

When Lucas reagent react with alcohol, they result in alkyl halide formation. the speed of the reaction determine the type of alcohol.

In case of Tertiary alcohol.

In case of tertiary alcohol alkyl halide forms in 8 sec which is determined by the formation of a white milky smog.

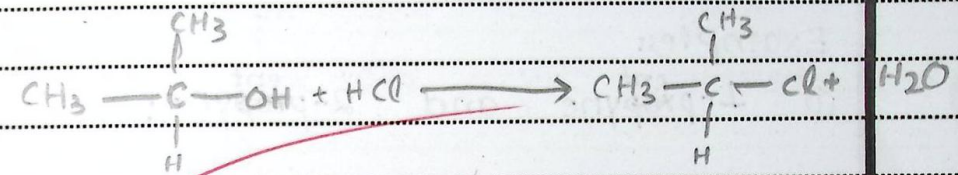
rxn:



rxn occur in 8 sec

In case of secondry alcohol.

In case of secondary alcohol, the alkyl halide formation occurs in 15–18 min. This time determine the type of alcohol.



The rxn takes 15–18mins.

In case of primary alcohol.

In case of primary alcohol no rxn occurs thus no alkyl halide is formed

(iv)

ANSWER:

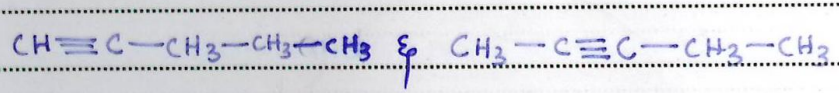
METAMERISM:

The type of isomerism

in which the isomers differ from each other on the basis of difference in the number of carbon atoms on each side of the functional group.

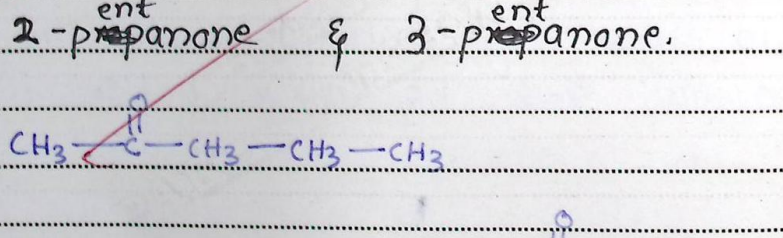
Examples:

(i) 1-propyne and 2-propyne:



(ii)

2-propanone & 3-propanone.

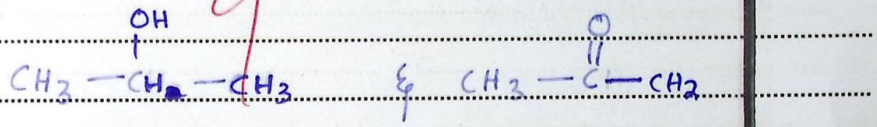


TAUTOMERISM:-

A type of isomerism in which the isomers differ from each other on the basis of difference in the relative position of

a hydrogen atom. The two isomers are called tautomers. They exist in equilibrium state with each other.

Example:



(x)

ANSWER:-

EFFECT OF PH ON ENZYME ACTIVITY:-

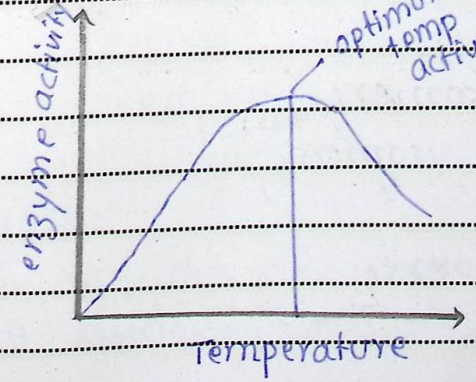
PH is called the power of hydrogen. PH has a great effect on the activity of enzyme in sense that change in pH distort the charge distribution on enzyme making it unsuitable for the specific reaction. for example, enzyme called pepsin can only

work in a pH of 2 it doesnot work in a pH lower or greater than 2.
Similarly an enzyme called Trypsin can only work in a pH of 8 and don't work in a pH greater or lower than 8: because of the reason that change in pH distort the charge distribution on aminoacid.
Simple is that the enzyme can either work in acidic i.e pepsin or in basic i.e trypsin pH.

Effect of Temperature on Enzyme Activity:

Temperature is also a factor that affect the enzyme activity upto an large extent. Temperature has a direct relation with that of an increase in the activity of an enzyme.
If we increase the temperature

the k.E of substrate molecules also increases which lead to an increase in possibility for a reaction to occur. Also there is a temperature at which enzyme activity is maximum and that is known as optimum Temperature.
Now if we increase the temperature beyond the optimum temperature the activity then lowers because at that temperature the enzymes denature.
Now if we lower the temperature to the freezing temperature, then also the activity is lowered down b/c at lower temp the enzymes cease to do a rxn.



Conclusion:

Enzyme activity is maximum at optimum temperature.

(V)

ANSWER:

CONDITIONS FOR GEOMERICAL ISOMERISM:-

Geometrical isomerism is the type of isomerism in which the isomers differ from one another on the basis of difference in position of groups attached along the functional grp carbon atom.

There are two types of geometrical isomerism. i.e

Cis-isomers

Trans isomers.

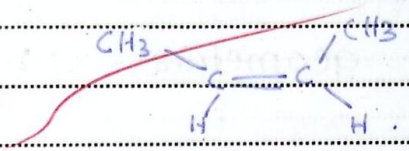
Cis Isomers:

Those isomers in which

the grps attached to the functional grps are on the same side

example:

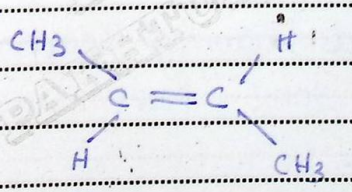
cis-2-butene.



Trans-isomers:

Those isomers in which the grps attached to the functional grp are on the opposite side to each other

example:



Trans-2-butene.

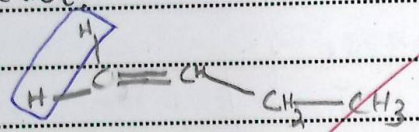
Conditions:

Following are the conditions that are necessary for geometrical isomerism.

1. Groups attached alongside to the double bond (in given exp) should be different. because if they are the same, no isomerism can exist in that case.

i.e in

1-butene geometrical isomerism don't exist.



Now the hydrogens are the same thus no geometrical isomers exist for them.

2. In compounds having carbon less than three don't have any geometrical isomers.

(ii)

ANSWER:

Transition metals are those having partially filled d-orbital.

They have varying oxidition states.

NON-

Typical Transition Metals:

Those transition metals which have variable valency state in its common oxidition state.

They have completely filled d-orbital.

example:

$_{30}Zn = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}$

As they have completely filled d-orbital thus called non-transition metal.

$_{28}Zn^{+2} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^0.$

In this ion form, also they have completely filled d-orbital thus Zn is non typical transition metal.

→ Also - it won't have d-d transition thus won't give any characteristic colour to its complex while typical transition metals have d-d

transition which gives its ~~ions~~ complex characteristic colour.

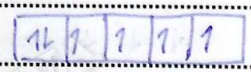
Typical Transition metals:-

Those transition metals which have partially filled d-orbital. They have variable oxidition states. They also have variable valency.

example:

Fe_{26}: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^6$

↓



It has partially filled d-orbital.

Fe^{+2}_{26}: $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^4$

As we have seen that iron has partially filled d-orbital in both its neutral and ionic state. Thus it is a typical transition metal. In periodic table there are ~~three~~ four series of typical transition metals

i.e

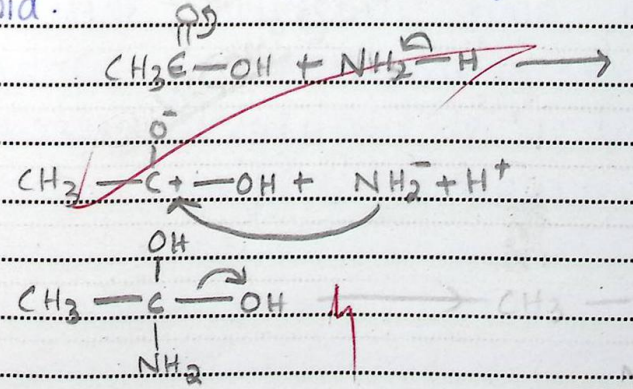
1st T. series → has partially filled 3d orbital
2nd T. series → has partially filled 4d orbital
3rd T. series → has partially filled 5d orbital
4th T. series → has partially filled 6d orbital.

(IX)

ANSWER:

Conversion of carboxalic acid into Amides:

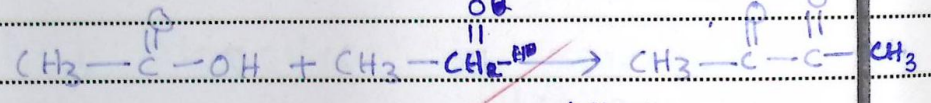
Carboxalic acids can be converted into amides by treating them with amonia.



Conversion of carboxalic acid into Anhydrides.

carboxalic acids can be coverted into anhydrides by reacting it with ~~alcohol. alkene~~ aldehyde.

rxn.



Thus When we react carboxalic acid and aldehyde they result in the formation of anhydride and a water molecule. the reaction is given above.

(VI)

ANSWER:-

SN1 mechanism:-

It is also old nuclear substitution reaction. occurs in presence of polar protic solvent (H_2O) favors in tertiary alkyl halides b/c they have 3- electron donating grps which increase -ive charge on carbon.

OR

B/c when carbocation of tertiary alkyl halide is formed is more stable. Thus a rxn whose product is more stable is favoured the most. tertiary carbocation is more stable than any other.

(xi)

Uses:

in wire

Section C:

Question no: 03:

Solubility:

It is the property of a substance to dissolve in water. Solubility of the following ions is discussed below.

Hydroxides:

Hydroxide is a small ion. Thus its solubility increases down the grp b/c the cation size of alkaline earth metals increases down the group thus the difference in their hydration energy increases down the grp but their lattic energy ↑ses down the grp. Inspite of this the hydration factor overcome the lattice energy factor and thus the solubility ↑ses down the group of hydroxide ions in alkaline earth metals.

Sulphates:

Sulphate is a large ion. and the size of cation increases down the group and the diff: in their hydration energies ↓ses but diff in lattice energy increases thus the hydration energy factor overcome the factor of lattice energy and as a result the solubility of sulphates decreases down the group for alkaline earth metals.

Carbonates:

Carbonates are any compounds having CO_3^{-2} ion. Carbonates of grp 2 solubility ↓ses down the group b/c carbonate is a large ion and ase we move down the group, their lattice energy decreases and their hydration energy decreases as a result

the solubility of carbonates decreases down the group for alkaline earth metals.

Question no: 04

Alkene:

It is a type of unsaturated hydrocarbon containing carbon carbon double bond. As alkenes have a pie bond thus they can undergo addition rxn. Chemical reaction of alkenes are as follow.

(i) **Hydrogenation:**

It is the addition of hydrogen to the double of the alkene. this rxn occurs in the presence of catalyst (Ni, Pt, Pd) at a temp of 150—250 and

a pressure of 1-5 atm.

Reaction:

$$CH_2=CH_2 + H_2 \xrightarrow{Ni, Pt} CH_3-CH_3$$

Hydrogenation of alkenes result in the formation of saturated compounds called alkanes.

Industrially:

Industrially this reaction is used to convert oil into ghee.

(ii) **Halogenation:**

It is the addition of halogen atoms to the double bond of the alkene.

→ It results in the formation of vicinal dihalides.

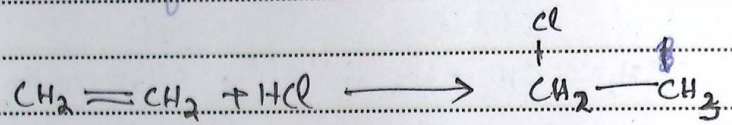
rxn:

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

(iii) Hydrohalogenation:-

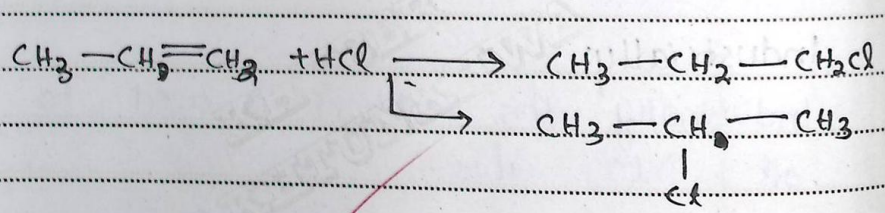
It is a type of addition reaction in which hydrogen and halogen both are added to an alkene molecule. In case of symmetrical alkene only one product is formed

i.e



But in case of a-symmetrical alkenes two types of products are formed

i.e.



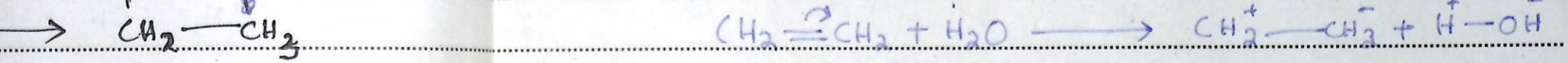
So in such case we would follow Markonikov's rule as stated

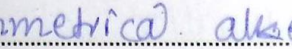
" Hydrogen of a molecule are added to that carbon atom having greater number of hydrogens attached with it".

(iv) Hydration:

It is the addition of a water molecule to an alkene. this reaction occurs in the presence of H_2SO_4 at 120°C.

rxn:



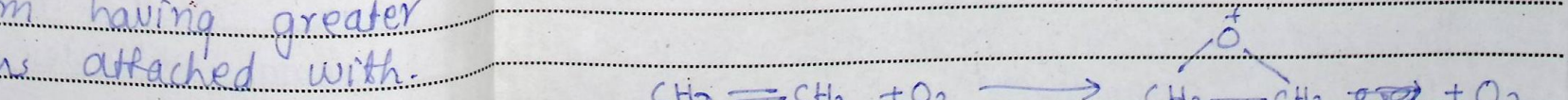


This reaction results in the formation of alcohol.

This reaction also occurs according to Markonikov's rule.

(v) Ozonolysis:-

It is the addition of an ozone molecule to the alkene compound.



it results in a oxonium ion.

Question no:06

Aldehyde:

It is a compound having carbonyl group attached with its carbon atom i.e

carbonyl group → C=O

To one side of the carbonyl carbon is methyl grp attached and at the other side is one hydrogen atom attached.

i.e

$CH_3-C(=O)-H$

Acetaldehyde.

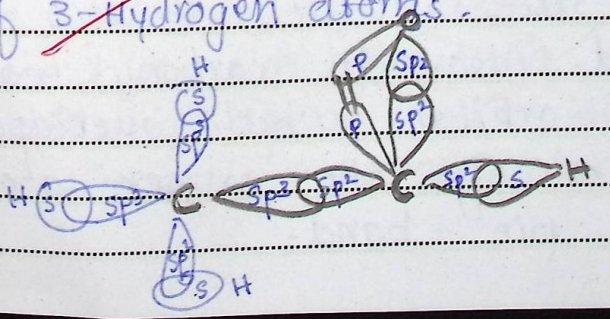
Simplest aldehyde is formaldehyde → $H-C(=O)-H$

Structure:

The carbonyl carbon of the carbonyl group is sp^2 hybradized and is attached with sp^2 hybradized oxygen atom.

and also there a partially filled p-orbital ⊥ to the sp^2 orbital and that overlaps with the partially filled p-orbital of oxygen atom sidewise resulting in a pie bond formation.

And as carbon has 3 sp^2 hybradized orbitals in which the two orbitals overlape with other carbon atom which is sp^3 hybradized and ~~with~~ on the other side is attached with s-orbital of Hydrogen atom as in case of formaldehyde. The sp^3 hybrid carbon atom of the methyl group is further attached with s-orbital of 3-Hydrogen atoms.

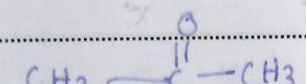


It was the structure of formaldehyde.

Ketone:-

It is a type of carbonyl compound having carbonyl (grp) which has two methyl grps attach to either side of the carbonyl carbon.

exp:



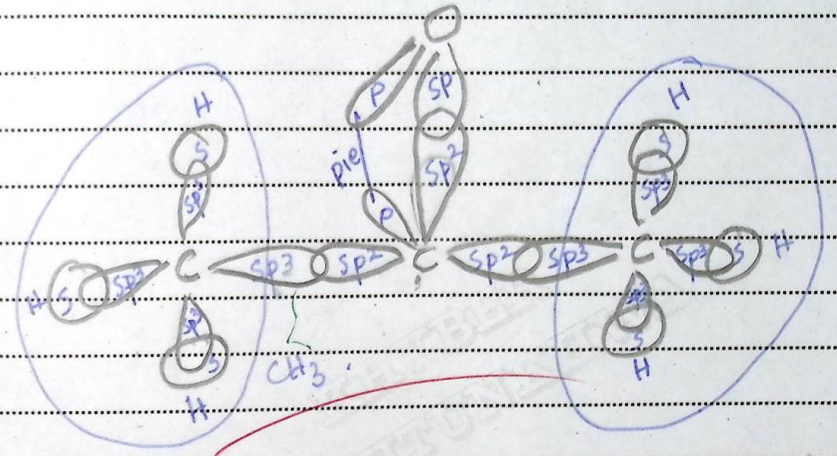
propanone.

Simplest ketone is the propanone.

Structure:

As discussed earlier the carbonyl carbon has 3- sp^2 hybradized orbitals which overlape with carbon on each side which are sp^3 hybradizeds and with oxygen atom which is also sp^2 hybradized. Also it (carbonyl carbon) has one p-orbital which overlape with the p- orbital of the oxygen atom forming pie bond.

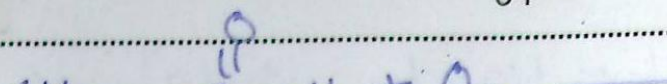
The sp^3 hybradized orbital attached to the sp^2 orbital are further attached with 3 hydrogen atoms s-orbital.



It is the structure of propanone.

Oxidation rxn of aldehyde:-

The oxidation of aldehyde takes place in the presence of strong oxididizing agent as potassium permanganate ($KMnO_4$).



Oxidition of aldehyde gives carboxalic acid.

Oxidition of ketone:-

Oxidition of ketone does not occur because it does not have any α-H.