



03

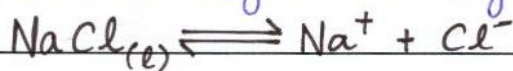


متعلقہ سوال کا جواب صرف منتخب کردہ جگہ پر اور بیرونی نشان کے اندر دیا جائے۔



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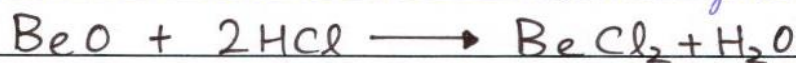
Q. No. 2 (i) Conductance of  $AlCl_3$  and  $NaCl$ : In solid state, the ions of  $AlCl_3$  are strongly held together due to strong electrostatic forces of attraction so there are no free ions available to conduct. In molten state (under high pressure), the compound  $AlCl_3$  still has no free ions to move. This is because it also possesses a partial covalent character. So,  $AlCl_3$  can't conduct either in solid or molten state. On the other hand, the ions in  $NaCl$  are not free to move because they are held in lattice strongly. But when  $NaCl$  is melted,  $Na^+$  and  $Cl^-$  ions become free to move thus conducting electricity.



Q. No. 2 (ii) Reasons

a)  $BeO$  is amphoteric as it can react with both acids and bases;

(i)  $BeO_2$  reacts with an acid  $HCl$  to give its salt.



(ii)  $BeO$  reacts with sodium hydroxide to give beryllates;



b) Although  $BeO$  is covalent, it has high boiling point. This is because  $BeO$  has polymeric structure. It has a giant covalent structure that is not easy to breakdown hence it has high melting and boiling

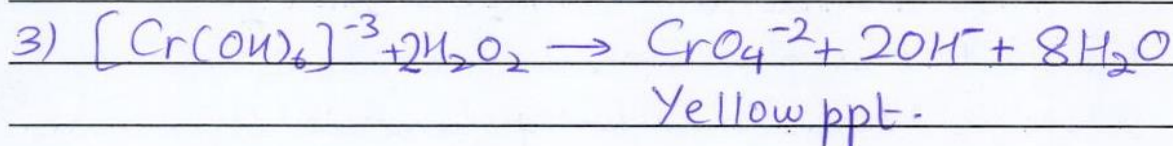
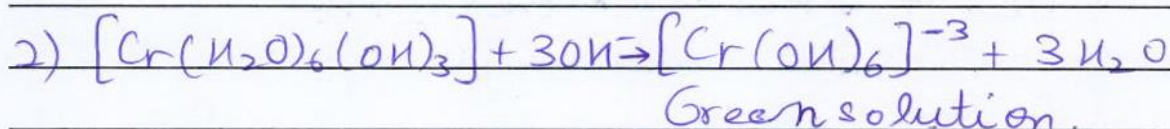
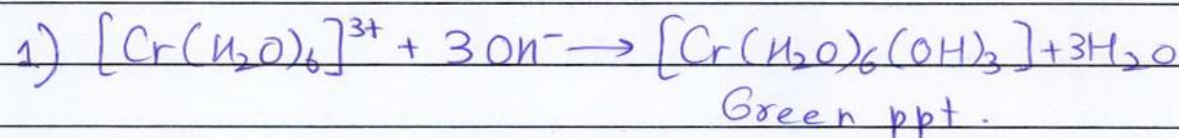


Q. No. 2 (iii) Reasons:

a) The compounds of Pb are more stable in +2 oxidation state as compared to +4. The  $Pb^{+2}$  compounds are readily oxidized to form  $Pb^{+4}$  compounds. In  $PbCl_4$ ,  $Pb^{+4}$  is present so it is unstable whereas  $Pb^{+2}$  in  $PbCl_2$  makes it stable

b) In  $CCl_4$ , one carbon atom is bonded to four chlorine atoms. A carbon atom does not have any d-orbitals because it is a member of 2nd period. Hence, it cannot accept lone pairs from other water to form the unstable intermediate. Due to this,  $CCl_4$  does not undergo hydrolysis.

Q. No. 2 (iv)  $[Cr(H_2O)_6]^{3+}$  to  $CrO_4^{2-}$





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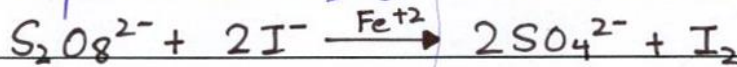


متعلقہ سوال کا جواب صرف منتخب کردہ جگہ پر اور بیرونی نشان کے اندر دیا جائے۔



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Q. No. 2 (v) Fe<sup>+2</sup> as Catalyst: The reaction between peroxodisulphate ion (S<sub>2</sub>O<sub>8</sub><sup>2-</sup>) and iodine ions is given as;



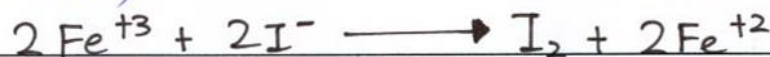
### Mechanism

The reaction mechanism consists of two steps:-

(i) Peroxodisulphate ions interact with Fe<sup>+2</sup>;



(ii) In second step, generated Fe<sup>+3</sup> interacts with iodide ions;



•- The regeneration of Fe<sup>+2</sup> ions shows that it is being used as a catalyst.

Q. No. 2 (vi) Functional Group: "Functional group is an atom or group of atoms that give characteristic properties to a compound."

Example: Alcohols (-OH), Aldehyde (-C(=O)-H), Ether (-O-), Ketone (-C(=O)-) etc.

Importance: Functional group is important in organic chemistry for following reasons.

- (i) Functional group serve for the classification of compounds. They divide the compounds into classes.
- (ii) Functional groups are the site of chemical reaction in a compound.
- (iii) They give characteristic properties to compounds.

Q. No. 2 (vii) Structural IsomerismStereo Isomerism

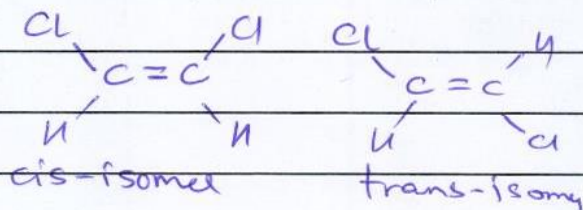
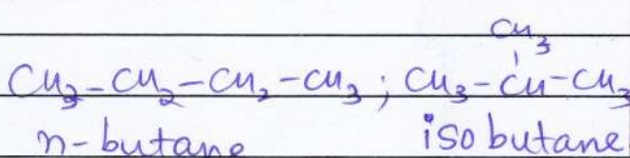
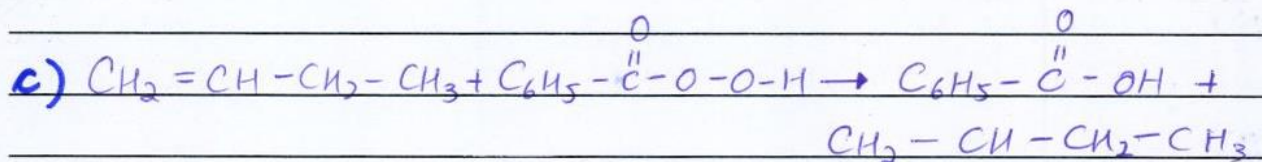
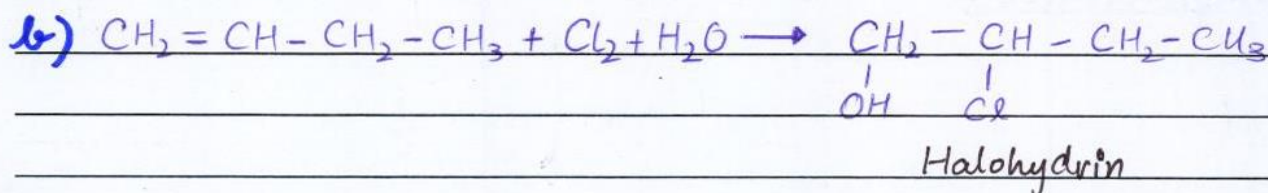
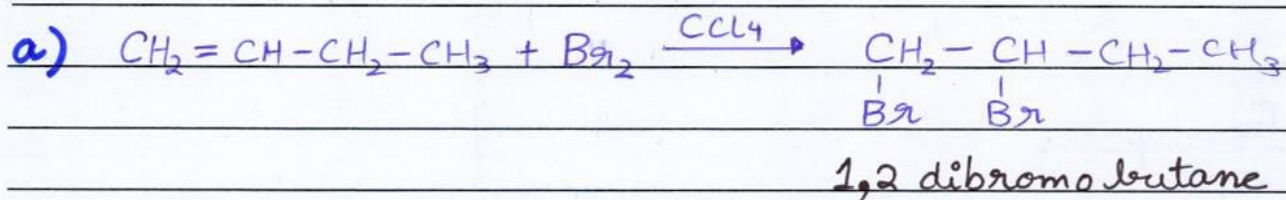
1) "The isomerism in which isomers have same molecular formula but different structural formula's called structural isomerism."

"The isomerism in which compounds have same molecular and structural formula but different orientation of atoms in space."

2) It has 5 types (Chain, Position, Functional group, Metamerism, Tautomerism)

It has 2 types  
(i) Optical isomerism  
(ii) Geometrical isomerism

3) Example:

Q. No. 2 (viii) Reactions



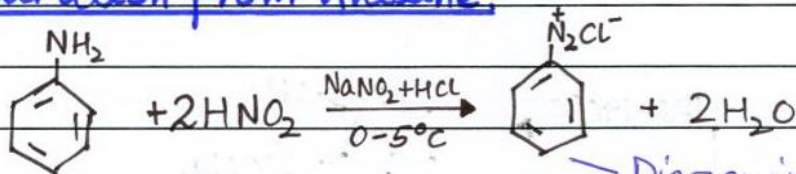
Q. No. 2 (ix) Halide Ions as Reducing Agents: Reducing agents are referred to as the compounds that reduce other substances and oxidize themselves. The trend of halide ions as reducing agents is;



The iodide ion ( $I^-$ ) has larger size as compared to above members so it is easier for it to lose electrons as compared to them. The fluoride ion ( $F^-$ ) being the smallest in size is a very weak reducing agent because it is very difficult for it to lose electrons.

Q. No. 2 (x) Diazonium Salts: Diazonium salts are the salts containing  $-N^+ \equiv N^- Cl^-$  in their composition. They are prepared by reacting compound with nitrous acid  $HNO_2$  (obtained by reaction of  $NaNO_2 + HCl$ ).

Preparation from Aniline:



— Diazonium salt.

Temperature above  $10^\circ\text{C}$

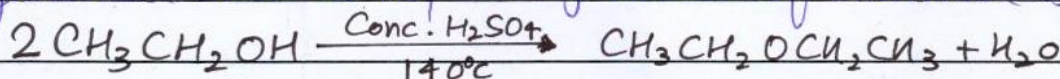
Diazonium salts are very unstable. Hence, at temperature greater than  $10^\circ\text{C}$ , they get readily decomposed.



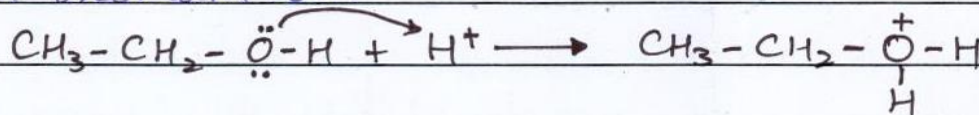


Q. No. 2 (xi) Mechanism

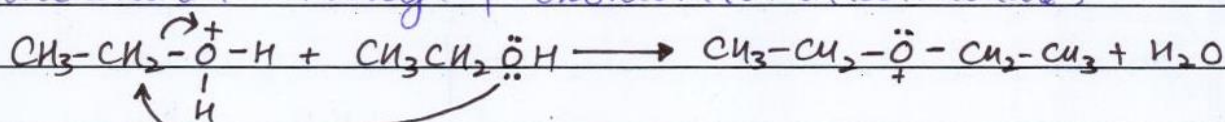
The general reaction of dehydration of alcohol is;



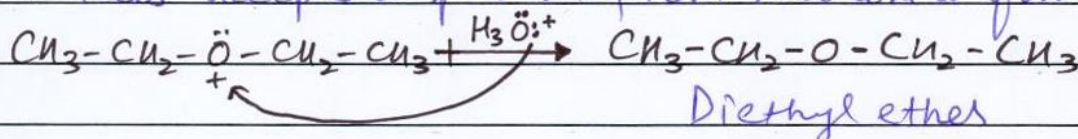
(i) The lone pair of oxygen of ethanol accepts a proton to form oxonium ion.



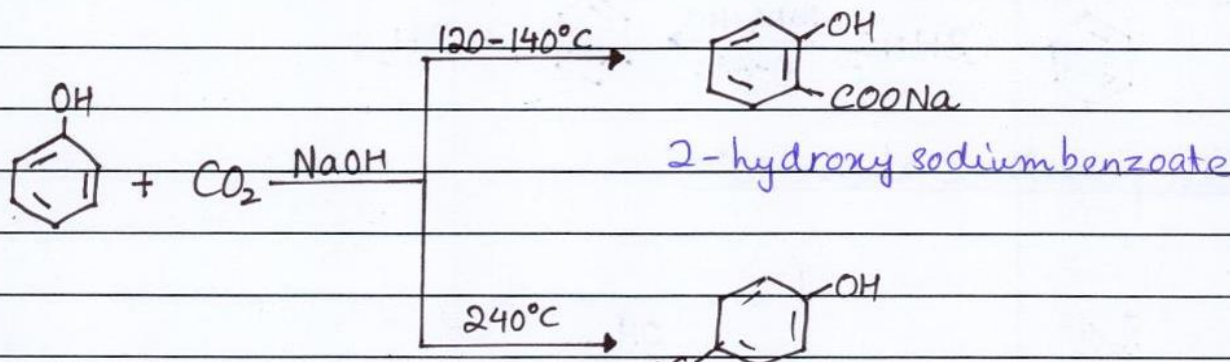
(ii) The lone pair of oxygen of second molecule of ethanol attacks on carbonyl of oxonium ion intermediate.



(iii) This accepts a proton from medium to form ether.

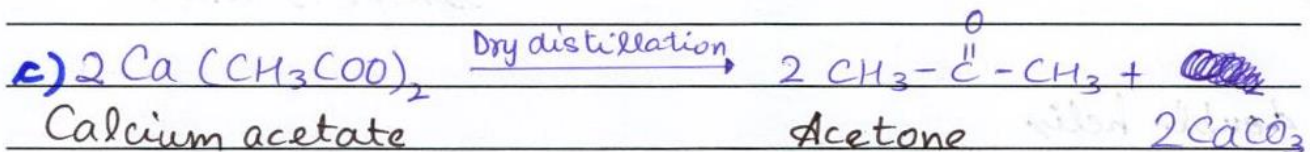
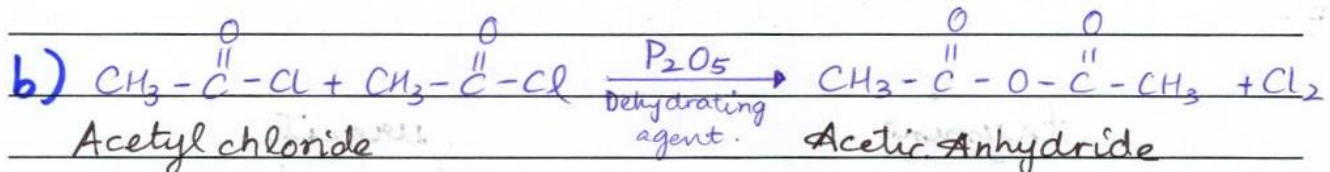
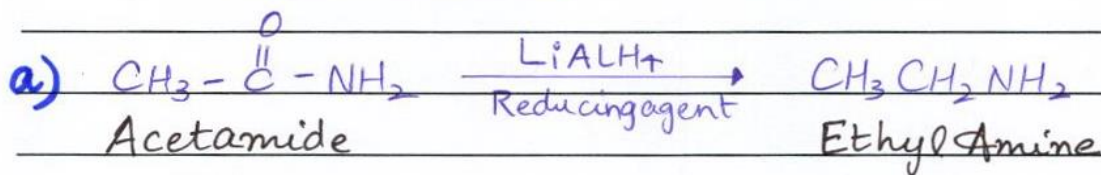


Q. No. 2 (xii) Kolbe-Schmitt Reaction: The reaction of phenol with  $\text{CO}_2$  in the presence of a base such as  $\text{NaOH}$  is referred to as Kolbe Schmitt reaction. This results in production of sodium salicylate and different temperatures give different products.



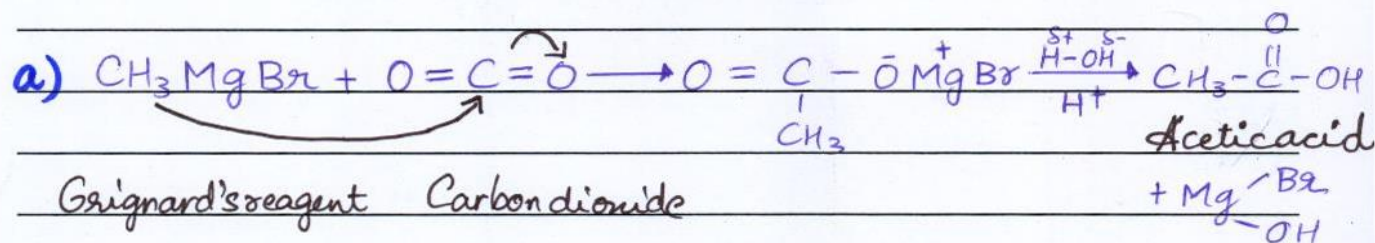


Q. No. 2 (xiii)

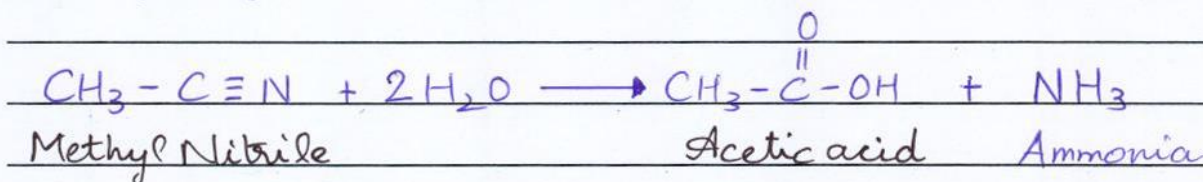
Q. No. 2 (xiv) Conversions



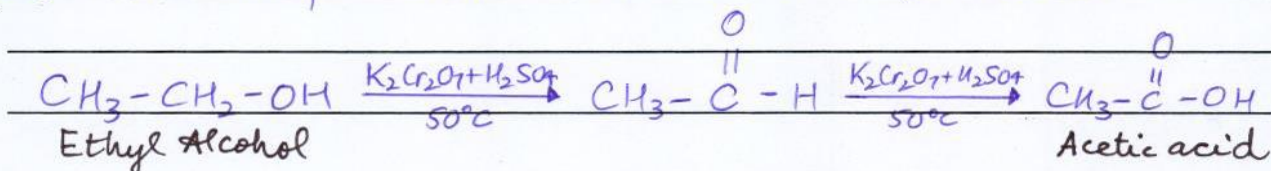
Q. No. 2 (xv) Preparation of  $\text{CH}_3\text{COOH}$  :-



b) Hydrolysis of a nitrile is done to obtain acetic acid.



c) Oxidation of Alcohol is done to obtain acetic acid.



Q. No. 2 (xvi) DNA

RNA

1) DNA contains deoxyribose sugar in its composition.

RNA contains ribose sugar in its composition.

2) It consists of nitrogenous bases; adenine, guanine, cytosine, thymine.

It consists of nitrogenous bases; adenine, guanine, cytosine, uracil.

3) The two strands of nitrogenous bases are arranged in a double helix pattern. The two strands are held together by hydrogen bonds

It is a single stranded molecule. Sometimes, it can coil around itself to form a helical structure.





Q. No. 2 (xvii) Refining of Petroleum: "The refining of petroleum is defined as the separation of different components of crude oil mixture into different components." Crude oil is a black, thick sticky liquid. Many components are present



Q. No. 2 (xviii) Refining of Petroleum: "The refining of petroleum is defined as the separation of crude oil mixture into different useful components."

•- Crude oil is a black, thick sticky liquid which is made up of a lot of useful products. To extract them, refining is done.

### Principle:

The refining of petroleum is done on the principle of fractional distillation. The crude oil is converted into vapours at high temperature ( $400^{\circ}\text{C}$ ).

The different components in the crude oil vapours are having boiling points at different temperatures. As a result, they condense at different temperatures as they move up the fractionating region from a hot to cold region. Their pure form is obtained by condensation of vapours.



















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**Q. No. 3 (Page 6/6)**

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(a)

Q. No. 4 (Page 1/6)

## GEOMETRICAL ISOMERISM

### TYPE OF

Geometrical isomerism is a type of stereoisomerism.

### DEFINITION

“The type of isomerism that results from a restriction in the rotation about double bond is called as geometrical isomerism.”

### EXPLANATION

Between compounds like alkenes, there are two bonds. One is sigma and one is pi. The pi bond results from the side way overlap of the p-orbitals of atoms. Therefore, the bond is fixed and it is impossible to rotate it.

An analogy for this is given by nail & board. Driving one nail through a board will not prevent its free rotation. But if we drive two nails in the board, it will not be able to move.

### TYPES

There are two types of geometrical isomers.

- 1) Cis Isomers: “The geometrical isomer in which the bulky groups are on the same side of non-rotatable double bond.”



Q. No. 4 (Page 2/6) non-rotatable double bond."

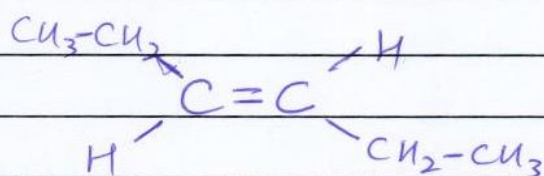
Interconversion of Isomers: The cis and trans isomers can be converted into each other by providing ample heat energy. A heat energy of about 62 kcal/mole breaks the double bond of an isomer allowing it to rotate freely. As a result, the new mixture obtained consists of both cis and trans isomers.

Stability: The trans-isomers are ~~present~~ more stable than cis-isomers. In cis, the steric repulsion between bulky groups on both sides make it unstable.

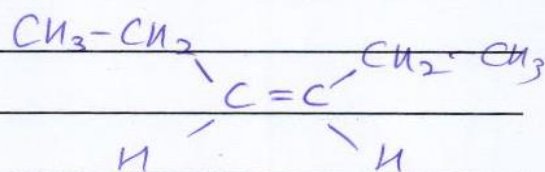
### EXAMPLE

#### (i) Alkenes

An example of geometrical isomerism in alkenes is 3-Hexene.

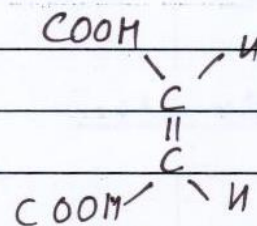
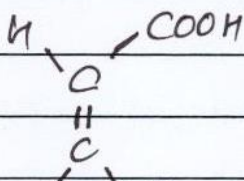


trans-3-hexene



cis-3-Hexene

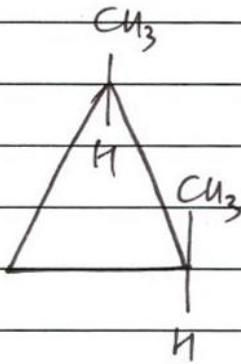
Butenedioic acid is another example of geometrical isomerism in alkenes.



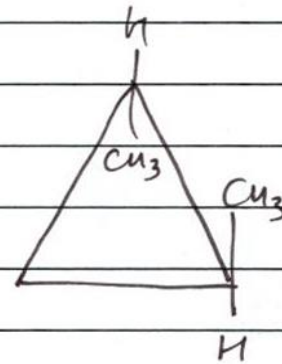


Q. No. 4 (Page 3/6) Cii) Cyclic Compounds

An example of geometrical isomer in cyclic compounds is <sup>1,2</sup>dimethylcyclopropane. If the bulky groups are on same side, it is cis isomer. If they are on opposite side, it is trans.



cis 1,2 dimethyl cyclopropane



trans 1,2 dimethyl cyclopropane

(b)

## INHIBITION

### DEFINITION

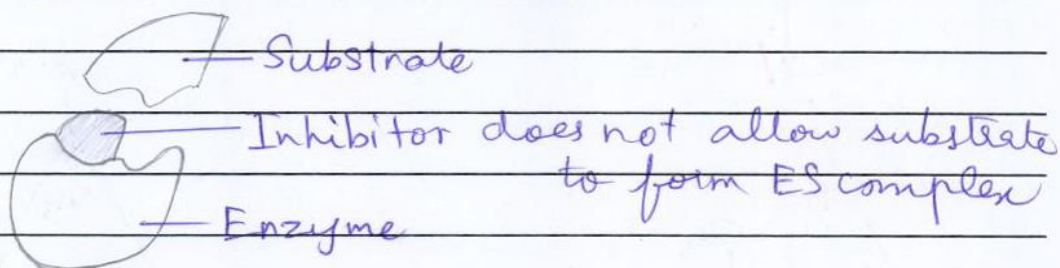
"The chemical process in which the activity of an enzyme is inhibited is caused by or called inhibition."

### EXPLANATION

An enzyme has an active site. The substrate fits into the active site to form an ES complex. This intermediate state is then converted into products.



Q. No. 4 (Page 4/6) But sometimes, an inhibitor like a specific compounds blocks the active site of the enzyme and does not allow the substrate to convert into products. This phenomenon is called inhibition



## TYPES

### (i) Irreversible Inhibition

In this inhibition, the inhibitor reacts chemically with the ~~the~~ enzyme thus forming chemical bonds with it. As a result, the enzyme loses its function and become useless. Now there is no way for the enzyme to convert a substrate into products therefore irreversible inhibition has occurred. The pH and temperature changes may also result in irreversible inhibition.

### (ii) Reversible Inhibition

In this type of inhibition, the enzyme is not destroyed. The changes only occur in the active site of enzyme. It is of two types:-

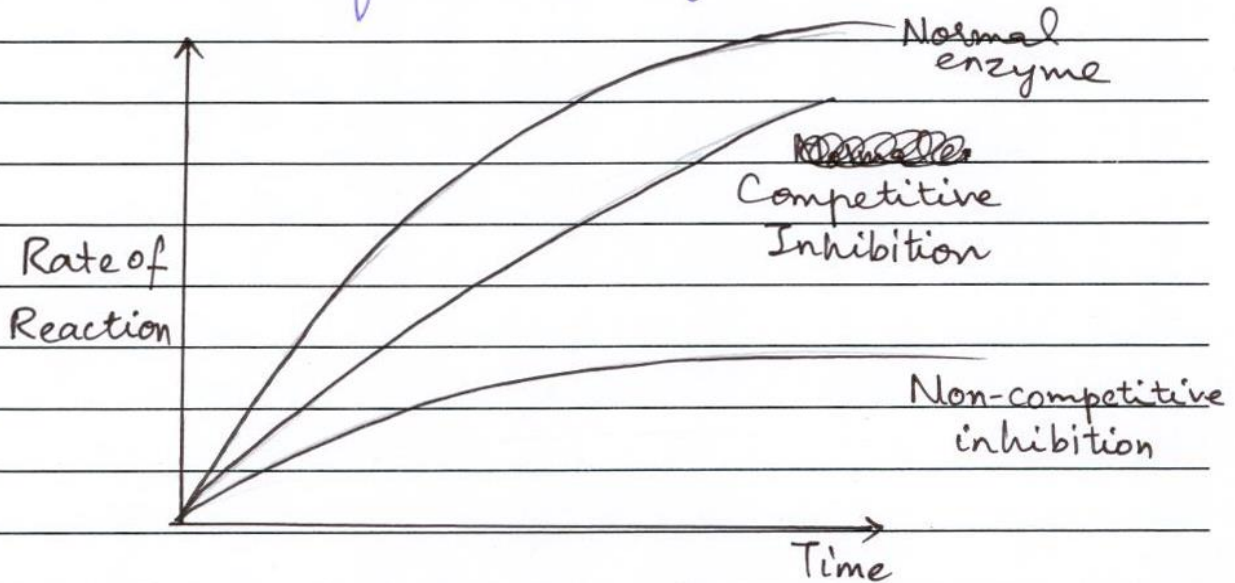


## Q. No. 4 (Page 5/6) 1) Competitive Inhibition

In competitive inhibition, the inhibitor occupies a place on the body of the enzyme. As a result of this, the active site of the enzyme is temporarily deformed. During this period, the enzyme is unable to convert a substrate into its products. But when the inhibitor leaves, the enzyme regains its active site thus making it functional again.

## 2) Non-Competitive Inhibition

In non-competitive inhibition, the enzyme occupies another site on the enzyme. As a result of this, the active site of the enzyme is destroyed. Thus, the enzyme is completely destroyed and can't become functional again.





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**Q. No. 4 (Page 6/6)**





Q. No. 5 (Page 1/6)

(b)

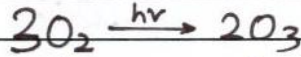
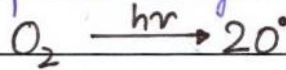
## OZONE HOLE

### LOCATION OF OZONE

Ozone is present at distance of about 15-20 km above in the stratosphere.

### FORMATION OF OZONE

The ozone formation takes place in the upper stratosphere by natural processes;



The oxygen in stratosphere is converted into ozone by the absorption of sunlight. The concentration of ozone in the stratosphere is about 10 ppm but 0.1 ppm of  $O_3$  in the atmosphere can be toxic for humans.

### PURPOSE OF OZONE

The ozone molecules form a layer called ozone layer in the stratosphere. This ozone layer protects the UV radiations of sunlight to enter in Earth. If these UV radiations come in contact with humans, it may cause serious diseases like skin cancer. So, ozone layer plays an important role for sustaining life on Earth.

### OZONE HOLE

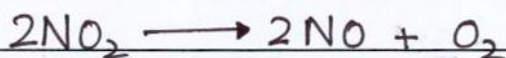
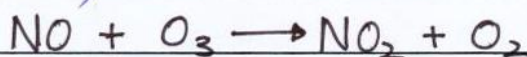
In 1990, scientists discovered an ozone



Q. No. 5 (Page 2/6) factors that may cause ozone layer to deplete

### CAUSES OF OZONE DEPLETION

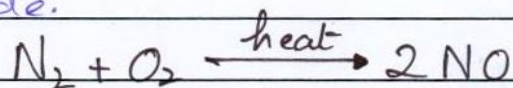
(i) Nitrogen Oxides: The nitrogen and oxygen are present in air naturally. Under high temperature, they combine together to give nitrogen oxides  $\text{NO}$  and  $\text{NO}_2$ . Moreover, they are also emitted from artificial sources. They deplete the ozone layer as follows;



They also get formed again in the atmosphere.

Nitrogen oxides cause almost 70% of ozone layer depletion.

(ii) Nuclear Tests: Nuclear tests are being conducted in different regions on earth. Here, a high temperature is achieved leading to formation of nitrogen oxide.



These nitrogen oxides are destroying ozone layer.

(iii) Chloro Fluoro Carbons (CFCs): One of the major causes of ozone layer depletion are chlorofluorocarbons (CFCs) like Freon-1 ( $\text{CFCl}_3$ ) and Freon-2 ( $\text{CF}_2\text{Cl}_2$ ). Being inert and safe, CFCs are used in refrigerants, coolants, aerosols, engines etc. They are also used in cooling electric components of circuit. If released in atmosphere, it does not react with anything but once it reaches the stratosphere, it



Q. No. 5 (Page 3/6) ozone layer.



## PROTECTION OF OZONE LAYER

Scientists all over the world are worried about the depletion of ozone layer. Different methods have been suggested for prevention of depletion. One of them is the use of HFCs.

HFCs: HFCs stand for hydrofluoroalkanes. An example is 1,1,1,2 tetrafluoroethane ( $\text{C}_2\text{F}_4\text{H}_2$ ). These hydrofluoroalkanes don't release chlorine free radicals that deplete the ozone layer. Moreover, if they are released in air, the C-H being reactive starts to react and disintegrates. Thus, HFCs are a better alternative to CFCs.

(a)

## IODOFORM TEST

### DEFINITION

"The formation of yellow precipitates when a halogen is added to an alkaline solutions of organic compounds; this test is called as iodoform test."

### ELIGIBILITY

All organic compounds don't give this



Q. No. 5 (Page 4/6) precipitates formed are of  $CHX_3$ .

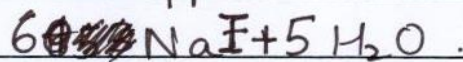
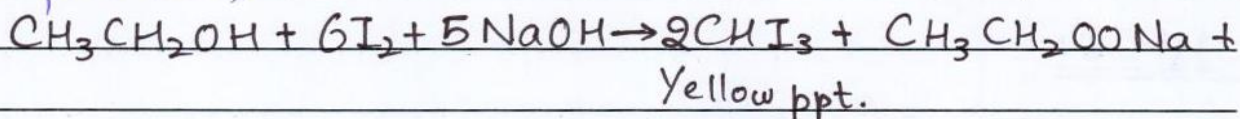
### GENERAL REACTION

The general reaction of iodoform test is;  
 Organic compound +  $3I_2 + 4NaOH \rightarrow CHI_3 + RCOONa + 3NaI + 4H_2O$

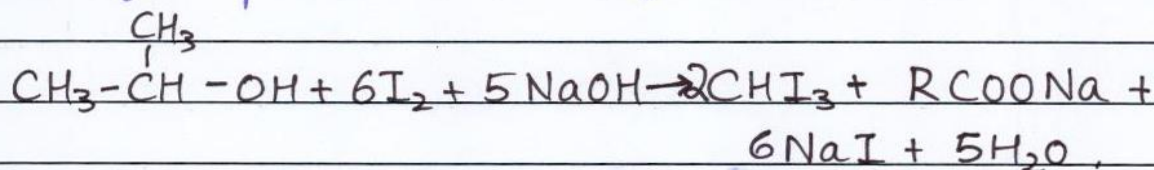
### REACTION WITH COMPOUNDS

#### 1) Alcohols

(i) The primary alcohols give this reaction as follows;



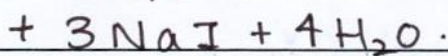
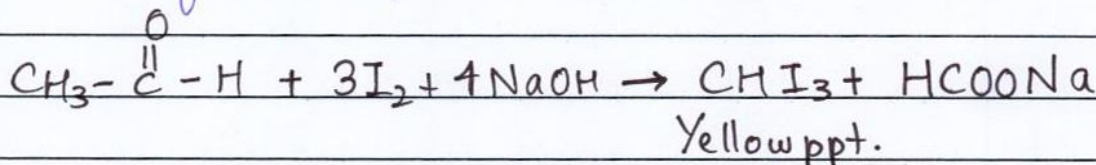
(ii) The secondary secondary alcohols having the group  $CH_3-\overset{CH_3}{\underset{|}{C}}-$  give this reaction.



(iii) The tertiary alcohols do not give this reaction.

#### 2) Aldehydes

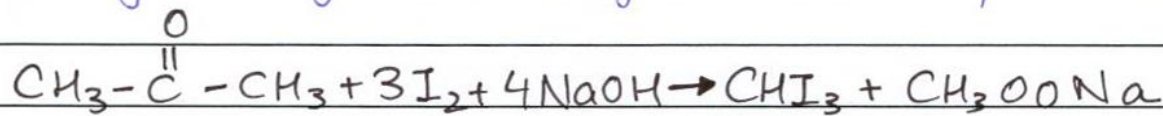
Among aldehydes, only ethanal tests positive for iodoform test.



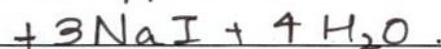


Q. No. 5 (Page 5/6) 3) Ketones

Only methyl ketones give the iodoform test.



Yellow ppt.



### Applications

As the iodoform test is not valid for all compounds, it only forms yellow precipitates with a few of them. Due to its this characteristic, it can be used to distinguish.

- (i) Methyl ketones from other ketones
- (ii) Formaldehyde from other aldehydes
- (iii) Tertiary alcohols from primary and secondary alcohols.



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**Q. No. 5 (Page 6/6)**