Q. No. 2 (i) $AlCl_3$ is non conductor in both solid and molten states:- but NaCl is conductor?

Ans

In $AlCl_3$, size of molecule is small so lattice energy is high as a result they don't ionize (bond breakage) easily in molten or in solid form. In $AlCl_3$ the lattice energy dominates over ~~hydration energy so~~ $AlCl_3$ cannot be ionized/ in both molten and solid state. Since $AlCl_3$ have small size (free electrons) / electrons are not easily available. On the other hand NaCl has large size and less lattice energy, so NaCl can easily be ~~ioni~~ ionized/ (bond breakage) in molten / aqueous state. or free electrons are easily available in molten state

NaCl → conductor, $AlCl_3$ → not a conductor

Q. No. 2 (ii)

Q. No. 2 (iii) (a)

$PbCl_4$ is thermally unstable than $PbCl_2$

$PbCl_4$ is thermally unstable than $PbCl_2$ due to inert pair effect. The ns^2 electrons are inert and donot participate in bonding. It is called inert pair effect. due to inert pair effect +2 configuration is more stable than +4

$Pb^{+2} > Pb^{+4}$ $PbCl_4 \rightarrow PbCl_2 + Cl_2$

(b)

CCl_4 doesnot undergo hydrolysis

In CCl_4 **d orbital** is not present to accomodate the lone pair of electrons given by oxygen. As a result it doesnot go hydrolysis. It reacts

$CCl_4 + H_2O \rightarrow COCl_2$ (phosgene) $+ HCl$

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

Step 1

In step 1 OH^- reacts with $[Cr(H_2O)_6]^{+3}$

$[Cr(H_2O)_6]^{+3} + 3(OH)^- \rightarrow Cr[(H_2O)_3(OH)_3] + 3H_2O$

green solution green p.pt.

Step 2

$Cr[(H_2O)_6]^{+3} +$

In this step OH^- react further

$[Cr(H_2O)_3(OH)_3] + 3(OH)^- \rightarrow [Cr(OH)_6]^{3-}$

step 3

$[Cr(OH)_6]^{3-} + H_2O_2 \rightarrow CrO_4^{2-} + H_2O + OH^-$

Q. No. 2 (v) **Fe^{+2} as catalyst :-**

Fe^{+2} acts as a catalyst between $S_2O_8^{2-}$ and Iodide ions

$$S_2O_8^{2-} + 2I^- \rightarrow 2SO_4^{2-} + I_2$$

Mechanism:-

Step 1:-

$$S_2O_8^{2-} + 2Fe^{+2} \rightarrow 2SO_4^{2-} + 2Fe^{+3}$$

$$2Fe^{+3} + 2I^- \rightarrow 2Fe^{+2} + I_2$$

This reaction can also be carried out by using Fe^{+3} as catalyst.

In this way Fe^{2+} ~~oxidi~~ acts as a catalyst.

.....

Q. No. 2 (vi) **Functional group :-**

An atom or group of atoms which give characteristic properties to a molecule is called functional group :-

e.g $-OH$, $-\overset{O}{\overset{\|}{C}}-OH$

Some compounds are poly functional.

Importance

) It is site where a chemical reaction takes place

) Function group is important for naming of organic compounds.

) It is used to classify organic compounds

Q. No. 2 (vii)

Structural Isomerism	Stereoisomerism Isomerism
It is the	
• It is the type of isomerism in which the moleales/ compounds has same molecular formula but different structual formula.	• It is type of isomerism in which the molecules has same structual and molecular formula but different arrangement of atoms.
• It includes ~~Optical and~~ functional group isomerism, metamerism, position isomerism, tautomerism etc.	• It includes optical and geometrical isomerism
• ethers and alcohol ~~ands~~ are structural isomers.	• tartaric acid shows stereoisomerism
• Ipropanone and propan aldehyde show structual isomerism	• 2 hexene shows stereo isomerism

.....

Q. No. 2 (viii) 1 Butene.

a) Br_2/CCl_4

$$H_2C=CH-CH_2-CH_3 + Br_2 \xrightarrow{CCl_4} CH_2(Br)-CH(Br)-CH_2-CH_3$$

1,2 diBromo Butane

b) Cl_2/H_2O

$$CH_2=CH-CH_2-CH_3 + Cl_2 + H_2O \rightarrow CH_2(Cl)-CH(OH)-CH_2-CH_3$$

1 Chloro, 2 Hydroxy Butane.

c) $C_6H_5-\overset{O}{\overset{\|}{C}}-OOH$

Q. No. 2 (ix) **Trend of Halide ions as reducing agent :-**

$I^{-1} > Br^{-1} > Cl^{-1} > F^{-1}$

Among halide ions I^{-1} is strongest reducing agent.

Reason:-

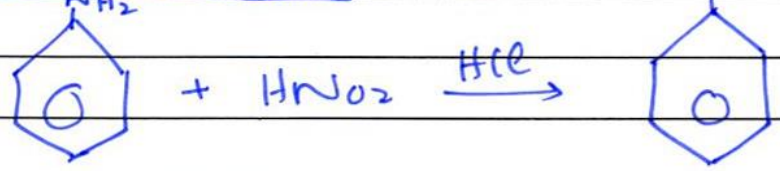
In case of I^{-1} **size** is very **large**, as a result the outermost elections are easily availble and due to **large sheilding effect**. the outmost electrons are easily available so I^{-1} ions give electron easily. on the other hand F^{-1} has a very small size, so electrons are not easily available.

.....

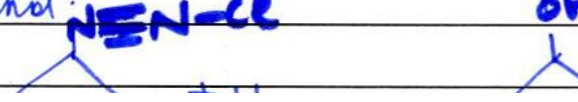
Q. No. 2 (x) **Diazonium Salts:-**

Diazonium salts are prepared when amines are treated with nitrous acid in the presence of HCl. They contain $-N\equiv N-$ group

From Aniline



If temperature is increased beyond **10°C** then the diazonium salts ~~or~~ will decay. producing phenol:



Q. No. 2 (xi) Ethanol reaction with H_2SO_4 at 140°C

Reaction:-

$$2C_2H_5OH \xrightarrow[140^\circ C]{H_2SO_4} C_2H_5-O-C_2H_5$$

(diethyl ether)

Mechanism:-

In first step protonation of C_2H_5OH takes place

$$C_2H_5OH + H^+ \rightarrow CH_3-CH_2-\overset{+}{O}(H)-H$$

Step 2

$$CH_3-CH_2-\overset{+}{O}(H)-H + CH_3-CH_2-\ddot{O}H \rightarrow CH_3-CH_2-\overset{+}{O}(H)-CH_2-CH_3 + H_2O$$

Step 3

$$CH_3-CH_2-\overset{+}{O}(H)-CH_2-CH_3 + H_2\ddot{O} \rightarrow CH_3-CH_2-O-CH_2-CH_3 + H_3O^+$$

oxonium ion — diethyl ether

Q. No. 2 (xii)

Q. No. 2 (xiii) **Test to differentiate Aldehydes and Ketones :-**

Aldehydes react with mild oxidising agents whereas ketones don't react with mild reducing agents. Therefore Benedict's solution test, silver mirror test and Tollen's test and Fehling solution is used to differentiate them.

Fehling solution test :-

when Aldehydes react with Cu^{+2} ions in presence of sodium tartarate red brown Cu_2O is found.

$CH_3COOH + Cu^{+2} + OH^- + \text{Sodium tertarate} \rightarrow CH_3COO^- + Cu_2O + H_2O$

Tollens test :-

when aldehydes reacts with Ag^{+1} Silver mirror $Ag\downarrow$ is formed.

$CH_3COOH + [Ag(NH_3)_2]^{+1} \longrightarrow CH_3COO^- + Ag\downarrow + NH_3 + NH_4^+$

Silver mirror.

Q. No. 2 (xiv)

a) $CH_3-\overset{O}{\overset{\|}{C}}-NH_2$ → Ethyl amine

i) Reaction

$CH_3-\overset{O}{\overset{\|}{C}}-NH_2 \xrightarrow{LiAlH_4} CH_3-CH_2-NH_2$

ethyl amine

b) Acetyl chloride → acitic anhydride

i) $CH_3-\overset{O}{\overset{\|}{C}}-Cl + CH_3COOH \rightarrow CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3 + HCl$

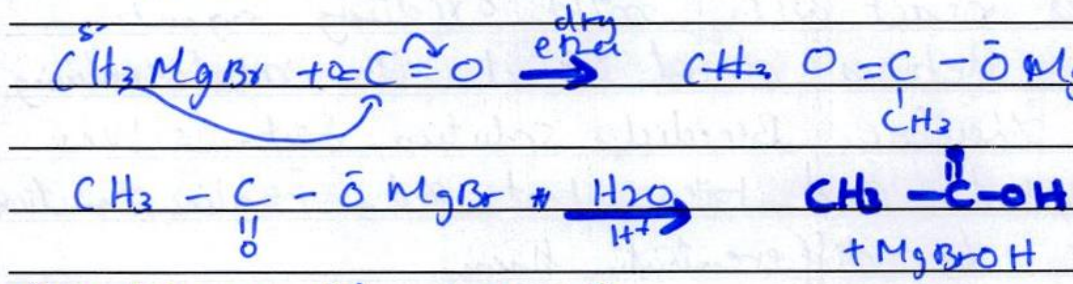
acitic anhydride.

c) Calium ~~cyanide~~ → acetone

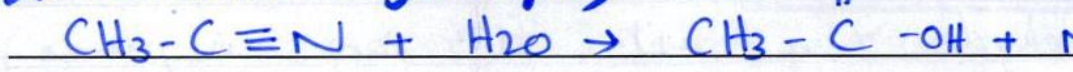
CH_3-COO

Q. No. 2 (xv) CH_3COOH

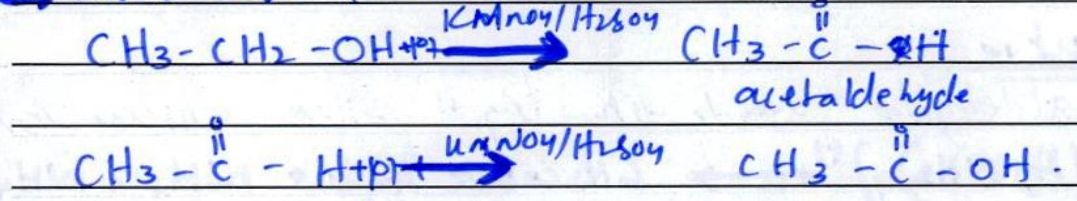
a) by grignard reagent:-



b) Nitrile (hydrolysis)



c) Alcohol:- (oxidation)



Q. No. 2 (xvi)

DNA	RNA
• It is deoxyribonucleic acid	• It is ribonucleic acid
• It is double stranded molecule	• It is single stranded molecule.
• It contains deoxy ribose sugar in which carbon 2 lack -OH	• It contains ribose sugar.
• nitrogeneous bases are adenine, guanine, cytosine, thyamine.	• nitrogenous base are. adenine, uracil, guanine, cytosine

Q. No. 2 (xvii) **Petrochemical Raw Materials:-**

Petrochemical raw materials include.

- olefins
- aromatic compound
- synthetic gas.

Olefins:- It includes ethylene, propylene, butadigne. ethylene and propylene are important for raw industrial material and for making plastic. butadigne is used to synthesize synthetic rubber

aromatics:- It includes **Xylene toulene** and **benzene.** At oil refinneries they are produced by cracking of oil.

synthetic gas:- It is a mixture of **CO** and **H_2** gas. It is used to manufacture ammonia and methanol which are further used to manufacture **urea.**

Q. No. 2 (xviii) **Refinning of Petroleum:-**

The proces of seperation of various products from crude oil mixture is called refinning.

Basic Principal:-

The basic principal of refinning is based upon fractional distillation. In which different fractions of petroleum are seperated from **immiscible liquids** based on difference in **boiling points** under high pressure and high temperate (**400°C**) in absence of air. 6 fractions are ~~collected~~ collected. The fractions which are volatile and have low boiling point boil out first than those fractions having high boiling point and low volatility

Q. No. 2 (xix) **U.V spectroscopy:-**

when the organic compound is subjected to the UV spectroscopy following type of electronic transition takes place

) $\sigma \rightarrow \sigma^*$. It is a highly ~~elevated~~ energetic and takes place in vaccum U.V

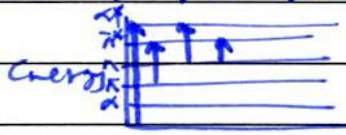
) $n - \sigma^*$ such type of transition takes place in molecule having atoms having lone pair of electrons like Nitrogen, oxygen.

) $\pi - \pi^*$ such type of transition tell us about presence of unsaturation and conjugation.

) $n - \pi^*$: such type of transition takes place from $n - \pi^*$ and are least energetic.

Energy

$\sigma - \sigma^* > n - \sigma^* > \pi - \pi^* > n - \pi^*$



Q. No. 2 (xx)

Atomic Emmision Spectroscopy	Atomic absorption spectroscopy :-
) In this spectroscopy dark lines are seperated by bright lines.	) In this spectroscopy bright lines are seperated by dark lines.
) It occurs mostly in atoms	It occurs in molecules.
) It occurs when atoms absorbs heat.	It occurs when atoms absorb light.
) It is used to trace elements. but requires more concentration of sample	) It works even if concentration of sample is small.
) It is not widly used	It is much more recognized that AES

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

Q. No. 3 (Page 1/6)

Q. No. 3 (Page 2/6)

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

Q. No. 3 (Page 3/6)

The relevant question should be answered only in the allotted space and inside the outer mark

Q. No. 3 (Page 4/6)

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

Q. No. 3 (Page 5/6)

Space for diagram/rough work

Q. No. 3 (Page 6/6)

Q. No. 4 (Page 1/6) (a)

Geometrical Isomerism:-

Isomerism:-

Isomerism is the proces in which compounds have same ~~stru~~ molecular formula but different structural formula.

Isomerism is of two type

-) **stereo isomerism**
-) **structural isomerism.**

Stereoisomerism:-

Isomerism in which compounds has same molecular and structural formula but different arrangement of atoms.

Type:-

) **Geometrical isomerism**

) **Optical Isomerism:-**

→ **Geometrical Isomerism**

Geometrical Isomerism occurs due to restriction of rotation about **double bond** in alkene and due to resmition (about) of rotation about **ring**

In Alkenes:!

In alkenes carbon atoms are bonded by pi-bond and are sp^2 hybridized. due to presence of pi-bond, the two carbond atoms

Q. No. 4 (Page 2/6)

Rotation not possible:-

Rotation about double bond is not possible because it would break the ring.

Cis- Isomer:-

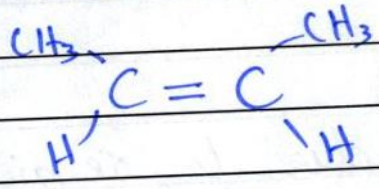
Cis Isomer is the one in which two similar groups are present on the same side of double bonded carbon atoms. They are present on the same side on adjecent double bonded Catom.

Tran- Isomer.

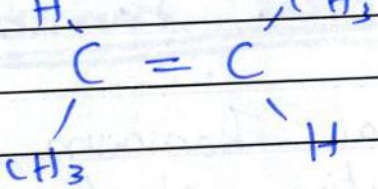
In trans isomer the bulky / similar groups are present on opposite side on double bonded carbon.

2 Hexene, 2 Butene.

2 Butene:-



Cis- 2 -Butene



Trans- 2-Butene.

Energy to Break bond (double)

about 62 K cal of energy is required to break the bond. by heating. Once the bond is broken a mixture of cis and trans isomer is obtained.

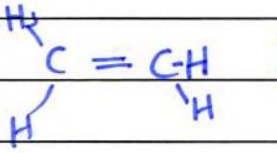
Q. No. 4 (Page 3/6) isomer because in Trans isomer the **steric hinderence** is less but in cis-isomer since bulkier groups are present on the same side of double bond so they offer steric hinderence

Conditions:-

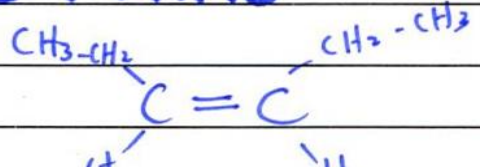
for alkenes to show cis-trans isomer each **double bonded carbon** must contain **two different atom/ groups of atom**

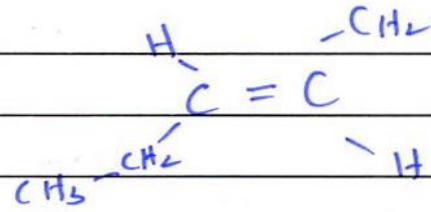
example

Propene

$CH_3-CH=CH_2 \rightarrow$  (donot show geometrical isomerism)

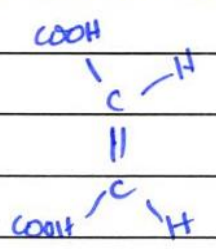
3-Hexene

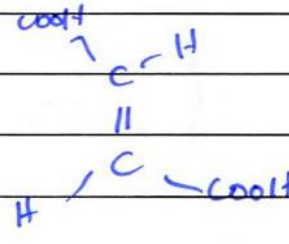




Cis - 3 hexene **trans- 3hexene.**

Butandioic acid:-



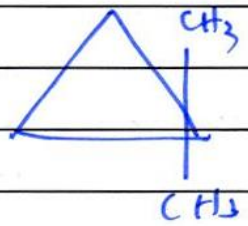


malonic acid fumeric acid.

In Ring:-

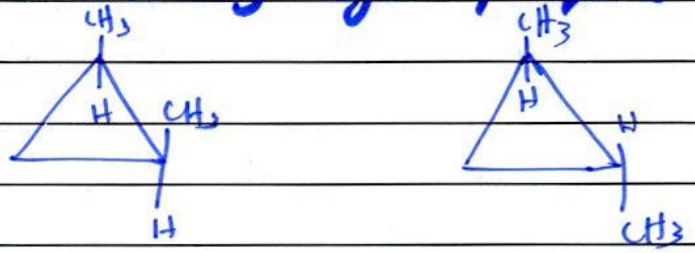
In ring geometrical isomerism exists due

Q. No. 4 (Page 4/6) **Condition:-** There must be atleast two different groups and they must be present on different carbon in ring.



•) 1,1 dimethy cyclo propane does not show geometrical Isomerism.

1,2 dimethy cyclo propane



CIS Trans.

shows geometrical enzymes.

Q4

(b)

Inhibbition of Enzymes:-

Enzymes:-

Enzymes are biomolecules which speed up the rate of Biochemical reactions taking place in human body.

Q. No. 4 (Page 5/6)

Inhibitors:-

The substances which decreases the enzyme activity or stops it completely are called inhibitors and process is called **enzyme innhibbition**

Types of Enzyme Inhibbition

There are two types of enzyme innhibbition

:) **Irreversible innibition.**
:) **Reversible inhibition.**

Irreversible Inhibbition:-

The proces / innhibbition in which inhibbitor forms a strong covelent bond with enzyme and enzyme activity can not be restored. It defunctions enzyme completely is irreversible Inhibbition.

Reversible Inhibbition:-

The proces in which a temporary bond is formed between inhibbitor and enzyme and enzyme activity can be restored. It is further classified into.

:) **competative inhibition**

Space for diagram/rough work

Q. No. 4 (Page 6/6)

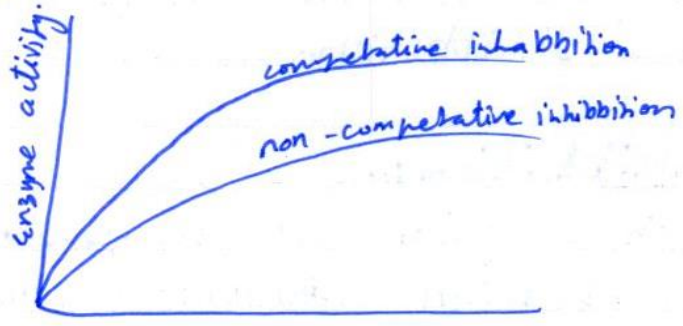
Competative Inhibbition:-

In this type of inhibition enzyme resembles substrate and bineds with active site in the same way as substrate do. A temporary bond is formed between enzyme and inhibitor. Enzyme activity can be restored by increasing concentration of substrate.

Non competative Inhibbition:-

In this type of inhibbition, inhibbitor acts on a place on enzyme other than active site and changes the shape of active site. so substrate cannot attack on the active site.

Graph.



Q. No. 5 (Page 1/6) Q5

(a)

Iodoform test:-

This test is given by compounds having $CH_3-\overset{O}{\overset{\|}{C}}-$ - It is given by carbonyl compound having $CH_3-\overset{O}{\overset{\|}{C}}-$ group present. This test is also given by some alcohols.

General Reaction.

$$CH_3-\overset{O}{\overset{\|}{C}}-R + I_2 + NaOH \rightarrow CHI_3 + NaI + H_2O + RCOONa$$

Ethanol

In ethanol given iodoform test and yellow ppt of CHI_3 are formed.

$$CH_3-CH_2-OH + 4I_2 + 6NaOH \rightarrow \underset{\text{yellow ppt}}{CHI_3} + HCOONa + 5NaI + 5H_2O$$

CHI_3 ↓ iodoform.

Secondary Alcohol ($CH_3-\overset{OH}{\overset{|}{C}}H-$)

All those secondary alcohols containing $CH_3-\overset{OH}{\overset{|}{C}}H-$ gives iodoform test positive. It

Q. No. 5 (Page 2/6)

Reaction:-

$$CH_3-\underset{\displaystyle OH}{\underset{|}{C}}H-R + 4I_2 + 6NaOH \rightarrow CHI_3 + R-COONa + 5H_2O + 5NaI$$

Aldehydes:-

In aldehydes only **acetaldehyde** give this test positive because of presence of $CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-$ group.

Reaction:-

$$CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-H + 3I_2 + 4NaOH \rightarrow \underset{\text{yellow ppt. (iodoform)}}{\underset{\downarrow}{CHI_3}} + HCOONa + 3H_2O + 3NaI$$

Ketones:-

In ~~aldeh~~ ketones, only methyl ketones give this test positive which contain $CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-$ group.

Example:-

$CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-C_2H_5$ $CH_3-\overset{\displaystyle O}{\overset{\|}{C}}-CH_3$

Q. No. 5 (Page 3/6)

Reaction

$CH_3 \cdot \overset{O}{\overset{\|}{C}} - R + 3I_2 + 4NaOH \rightarrow CHI_3 + RCOONa + 3H_2O + 3NaI$

CHI_3 ↓ iodoform yellow ppt.

Significance of Iodoform test:-

Iodoform test is used to distinguish **acetaldehyde** from all other aldehydes, **methyl ketones** from all other ketones, **ethanol** from all other primary alcohols and $CH_3 \cdot \overset{OH}{\overset{|}{C}} -$ alcohols (secondary) from other secondary alcohols.

Q5

(b)

Ozone Hole

Ozone:-

Ozone is an essential component of stratosphere that extents to 25-28 km. above the Earth surface. The Ozone is an important part of stratosphere. It absorbs the harmful U.V rays coming to

Q. No. 5 (Page 4/6) Skin burn, skin cancer etc.

Ozone Hole:-

In 1980's it was discovered that the ozone hole is made in the region of antarctica. Ozone Hole occurs when there is depletion of Ozone layer in the stratosphere.

- The depletion of ozone layer in stratosphere produces "ozone holes" when a ozone hole is made, the harmful UV rays can reach Earth and can cause serious health problem i.e eye infection, skin burn, skin cancer.

Reasons of its formation:-

Ozone layer is depleted due to

1) Oxides of nitrogen ~~on~~ Oxides of nitrogen present in the air are major cause of ozone depletion. Ozone reach with NO_2

$$NO + O_3 \rightarrow NO_2 + O_2.$$

$$NO_2 \rightarrow NO + O$$

Q. No. 5 (Page 5/6) stations a large amount of heat is produced. At high temperature nitrogen and oxygen in air combine to form oxides of nitrogen.

$$N_2 + O_2 \rightarrow NO_2$$

$$NO_2 \rightarrow NO + O$$

$$NO + O_3 \rightarrow NO_2 + O_2.$$

Chlorofluorocarbons:-

Chlorofluorocarbons used in the refrigerants, propellents, aerosols are major cause of ozone depletion. It included feron I ($CFCl_3$) and feron II (CF_2Cl_2). ~~Then~~ When U.V light falls on them, they produce $\dot{C}l$ free radical which destroy the ozone layer.

$$CF_2Cl_2 \xrightarrow{h\nu} CF_2\dot{C}l + \dot{C}l$$

$$\dot{C}l + O_3 \rightarrow \dot{C}lO + O_2.$$

$$\dot{C}lO + O_3 \rightarrow \dot{C}l + 2O_2$$

In this way a single chlorine free radical destroys thousands of ozone molecules.

Protection:-

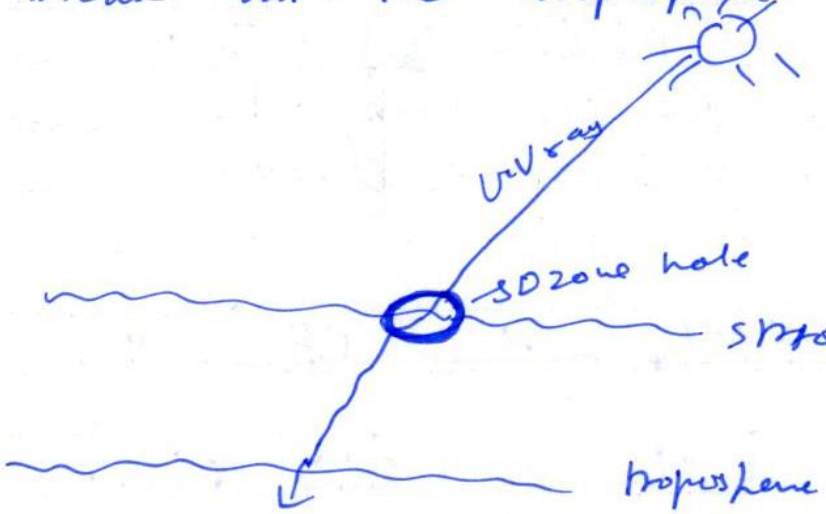
Ozone layer can by prevented by taking certain measures.

:) The industries should treat smoke before

Q. No. 5 (Page 6/6)

Hydrofluorocarbons

In order to prevent ozone depletion > hydrof carbons are taking place of Chloro fluorocarbons, I.e 1,1,1,2 tetra fluoro ethane CF_3CH_3F. They donot contain Chlorine ~~radical~~ as a result no Chlorine free radicals are produced and also C-H bonds Me reactio and break in the troposphere.



In this way ozone depletion can be prevented.