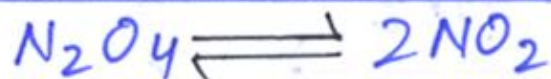


Q. No. 2 Part (i) Law of Mass Action Statement: "It states that

the rate at which a substance/ reactant reacts is directly proportional to its active mass. The rate at which reaction proceeds is directly proportional to the product of active masses of reactants."

Equilibrium Constant Expression



Rate of forward reaction  $\propto [N_2O_4]$

Rate of forward reaction =  $k_f [N_2O_4]$

Rate of reverse reaction  $\propto [NO_2]^2$

Rate of reverse reaction =  $k_r [NO_2]^2$

Rate of forward reaction = Rate of reverse reaction

$$k_f [N_2O_4] = k_r [NO_2]^2$$

$$\frac{k_f}{k_r} = \frac{[NO_2]^2}{[N_2O_4]}$$

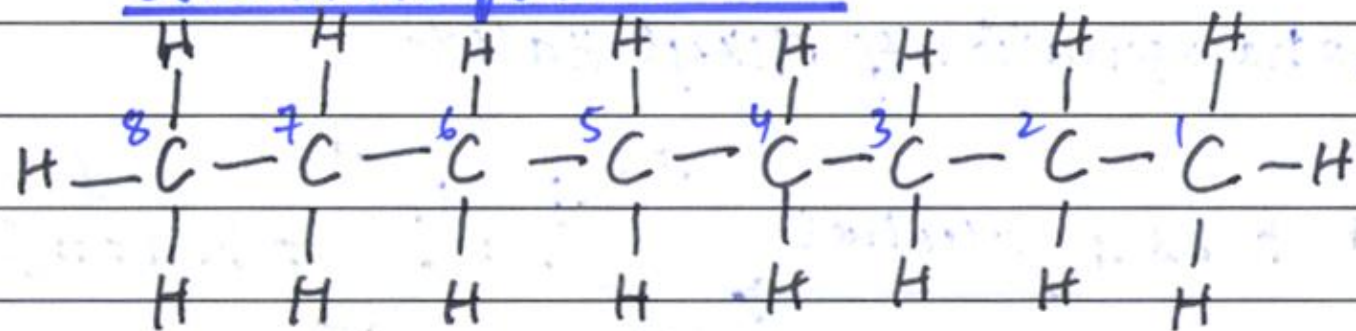
$$\frac{k_f}{k_r} = K_c$$

$k_r$

$$\therefore K_c = \frac{[NO_2]^2}{[N_2O_4]}$$

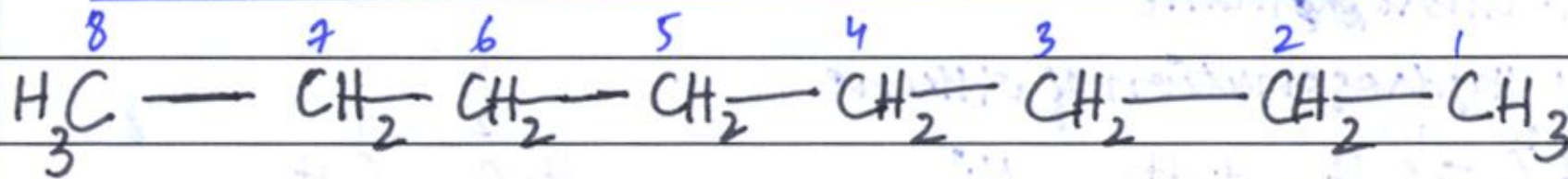
Q. No. 2 Part (v) Octane

Structural formula

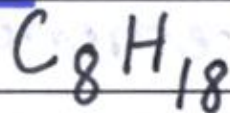


n-octane

Condensed structural formula: Octane

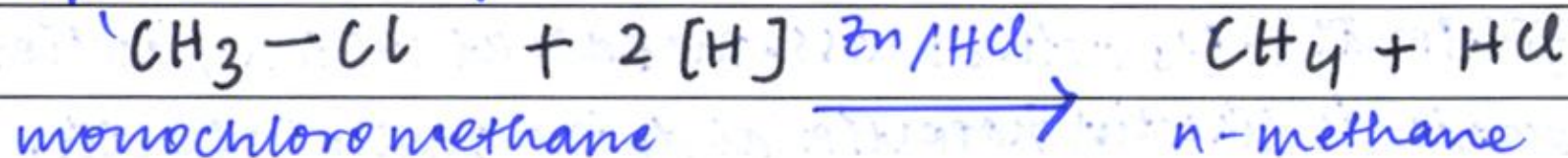


Molecular formula:



Q. No. 2 Part (vi) (a)  $\text{CH}_3-\text{Cl} + 2[\text{H}] \xrightarrow{\text{Zn/HCl}} ?$

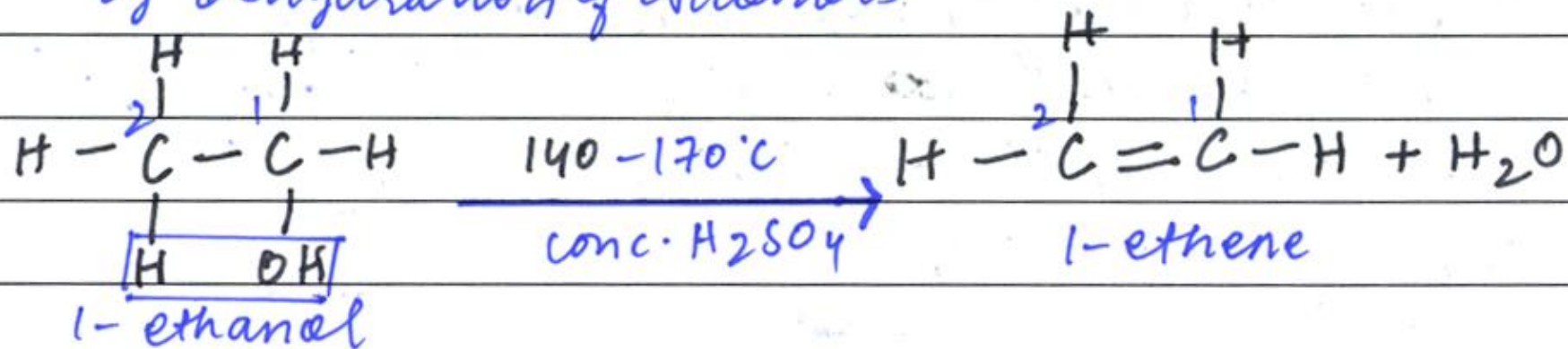
By Reduction of Alkyl Halides



Product:-  $\text{CH}_4$  &  $\text{HCl}$ .

(b)  $\text{CH}_3-\text{CH}_2-\text{OH} \xrightarrow[140-170^\circ\text{C}]{\text{conc. H}_2\text{SO}_4} ?$

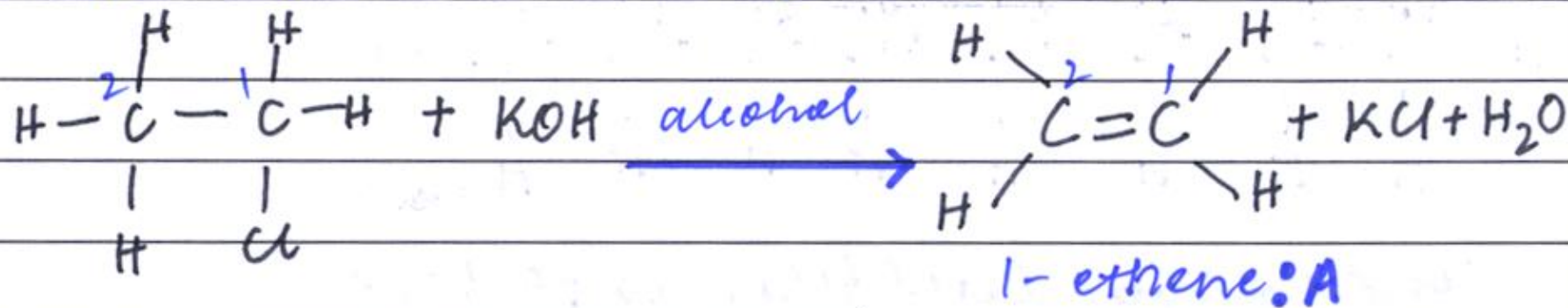
By Dehydration of Alcohols



Product:- 1-ethene & water ( $\text{H}_2\text{O}$ )

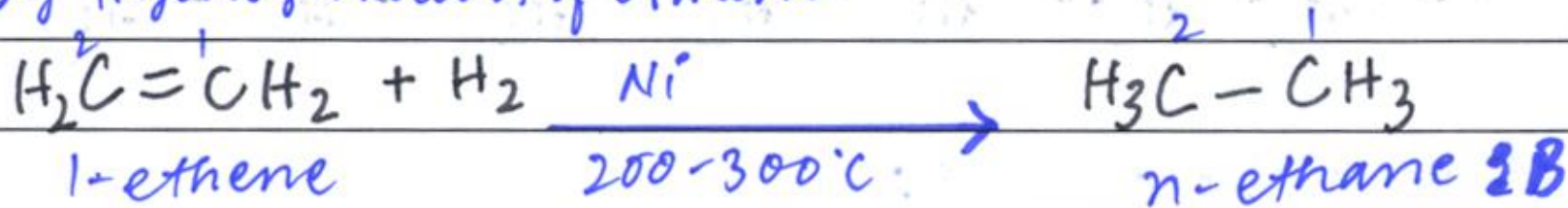
Q. No. 2 Part (vii)  $\text{CH}_3\text{-CH}_2\text{-Cl} + \text{KOH}$  alcohol  $\xrightarrow{\text{A}}$   $\xrightarrow[\text{H}_2]{\text{Ni, 200-300}^\circ\text{C}}$  B

→ By Dehydrohalogenation of Alkyl Halide



1-chloroethane

→ By Hydrogenation of Alkene.



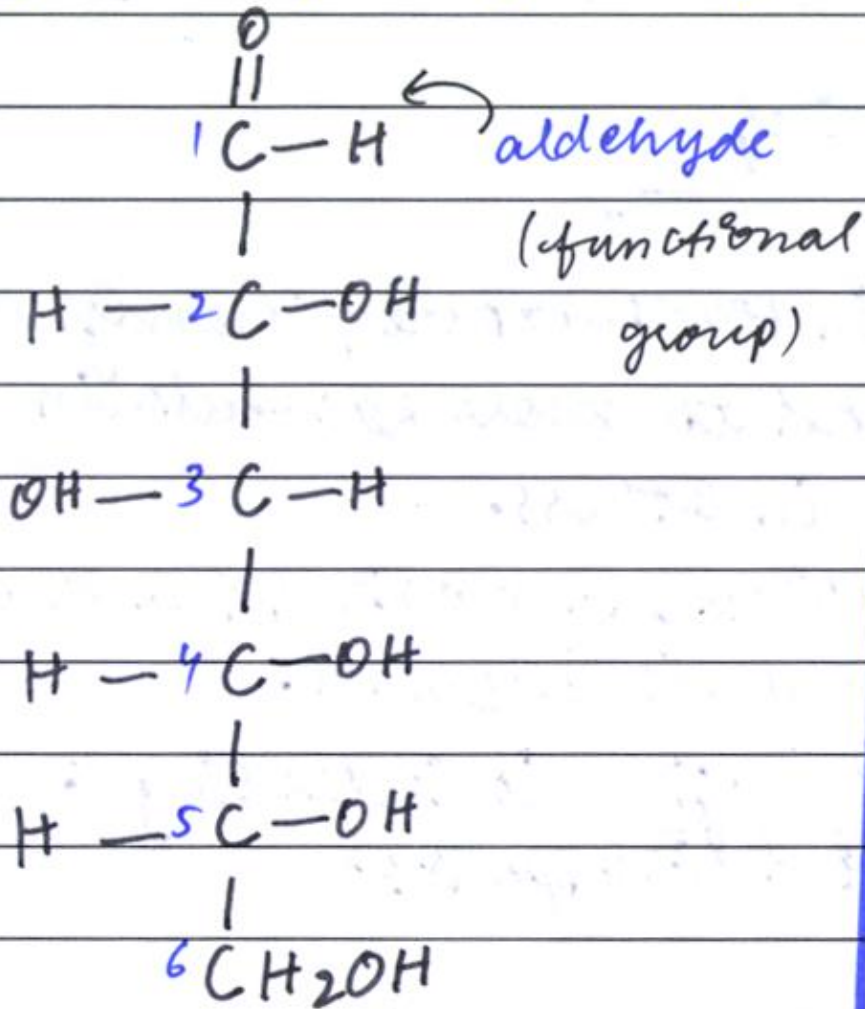
A:  $\text{H}_2\text{C} = \text{CH}_2$  (1-ethene)

B:  $\text{H}_3\text{C} - \text{CH}_3$  (n-ethane)

Q. No. 2 Part (ix) Structural Formulas

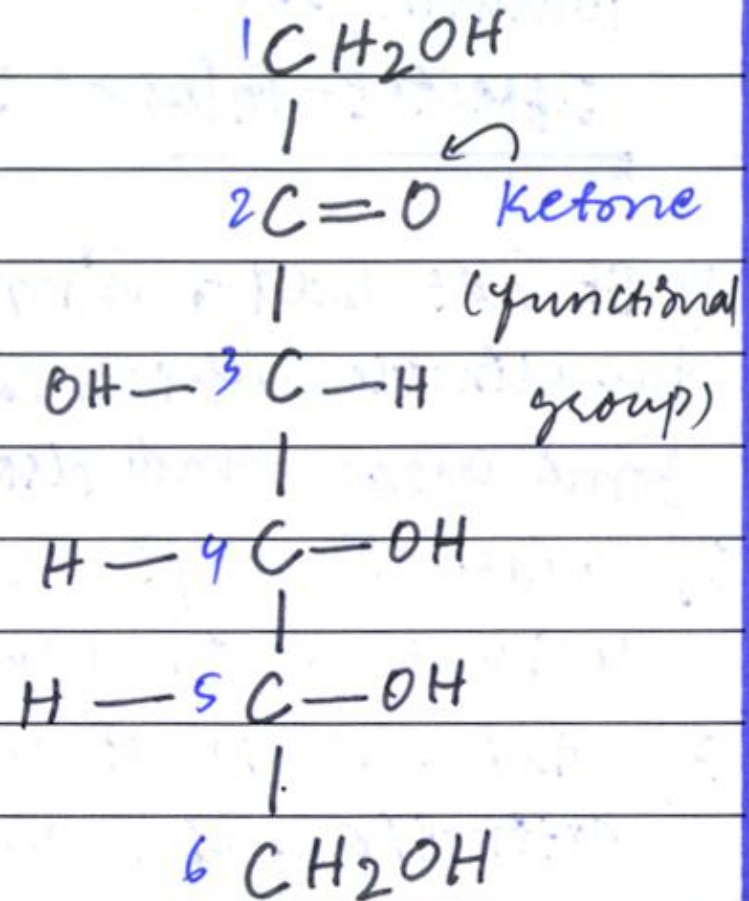
Glucose

Penta-hydroxy aldehyde



Fructose

Penta-hydroxy ketone



Q. No. 2 Part (X)

## Sulphur dioxide: Air pollutant

Source:- Power stations

### Harmful effects:-

- 1) It causes respiratory disorders.
- 2) It causes greenhouse effect, which leads to global warming.
- 3) It causes emphysema, bronchitis, lung cancer etc.
- 4) It causes damage to nervous system, kidney, liver and lungs.
- 5) It contributes to air pollution which causes cough and asthma.

Q. No. 2 Part (xi) Global Warming:- Definition:-

66 The increase in temperature/warming due to our influence on greenhouse effect is known as global warming. 99

Effects:- Global Warming

- 1) It has led to increase in temperature & changing the climate which can lead to more rainfall in some areas and drought in others.
- 2) Polar ice caps are melting, increasing the sea level and increasing chances of flood.
- 3) As the temperature is changing it is leading to extinction of many wild life species.

Q. No. 2 Part (xii)

## Strange behaviour of water: Survival of Aquatic

life: As water like other solids and liquids expands on heating and contracts on cooling. When water is cooled, it contracts and its density increases. But till  $4^{\circ}\text{C}$  water contracts on cooling, further cooling leads to expansion and decrease in density. Its density is maximum at  $4^{\circ}\text{C}$ . So water expands as it freezes. So that is why ice floats on the surface of lakes and rivers and keeps/maintains thermal insulation beneath it. This is because below  $4^{\circ}\text{C}$  water expands and its density decreases. So this strange behaviour of water enables fish and aquatic animals to survive in winter as ice maintains an insulation.



Q. No. 2 Part (iii) List of Raw Materials used in Solway's Process

- 1) Ammonia gas ( $\text{NH}_3$ )
- 2) Brine (concentrated solution of  $\text{NaCl}$ )
- 3) Limestone as a source of carbon dioxide
- 4) Slaked lime [ $\text{Ca}(\text{OH})_2$ ]

Names of steps:-

Preparation of ammoniacal brine, Carbonation, filtration, Calcination, Preparing carbon dioxide and slaked lime, Recovery of Ammonia.

Q. No. 2 Part (Xiv)

## Advantages of using Urea as fertilizer

(i) Concentration of Nitrogen :- It has the highest percentage of nitrogen 46%.

(ii) It does not affect the texture of soil

(iii) Breakdown in presence of  $H_2O$

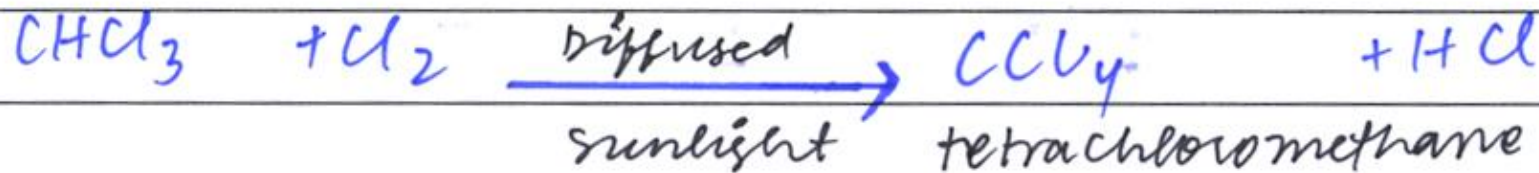
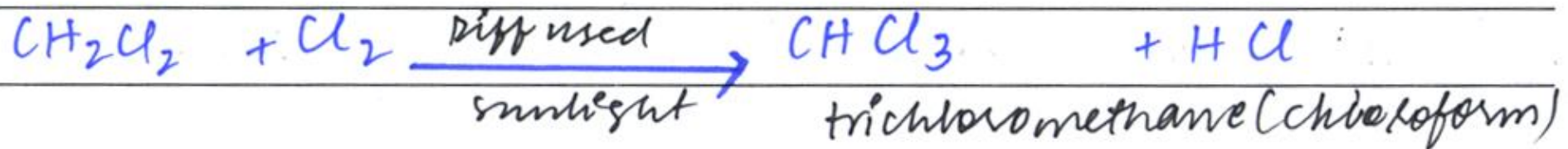
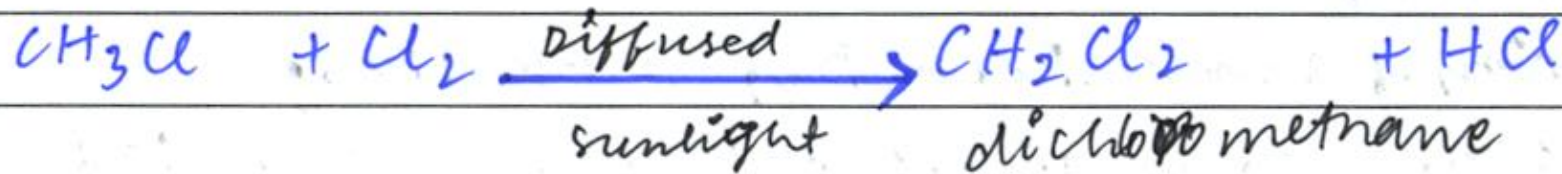
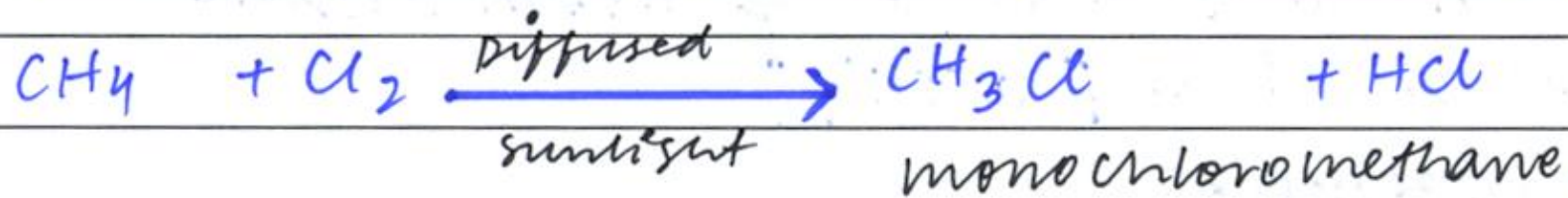
When urea is put in soil it hydrolyzes quickly to ammonium carbonate then to ammonia and then decomposes into  $N_2$  and  $H_2$ . Nitrogen is the main constituent of proteins.

(iv) Importance of  $N_2$  :- Nitrogen is required by stems and leaves during early development. Nitrogen is also required to make protoplasm and components of cell.

(v) It fulfills the essential nutrients required.

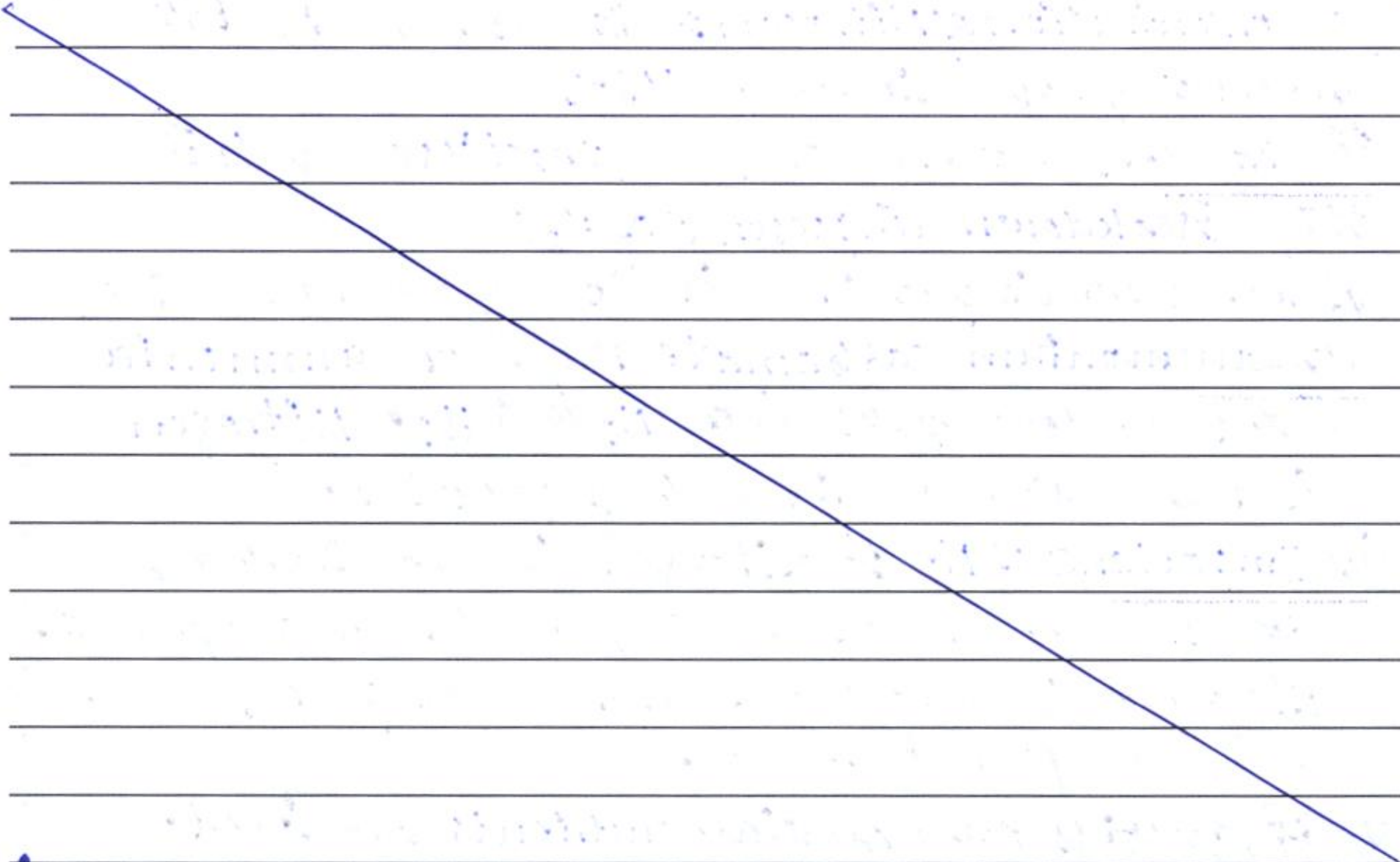
Q. No. 2 Part (XV) Substitution Reaction:- Reaction of alkane with halogen is a substitution reaction. Halogen atom substitutes for 1 or more hydrogen atoms of alkane.

### Halogenation of Methane in diffused sunlight



.....

Q. No. 2 Part ( ) \_\_\_\_\_



.....

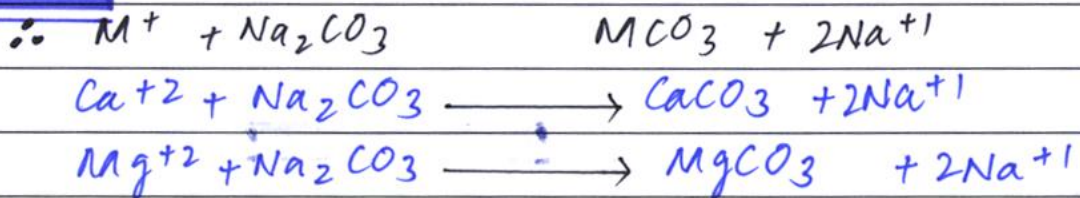
Q. No. 4 Part (a) (Page 1/2) Hardness of Water  
Methods to Remove Permanent Hardness

(i) By adding washing soda

Permanent Hardness of water on large scale can be removed by adding washing soda  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ .

By adding washing soda  $\text{Ca}^{+2}$  and  $\text{Mg}^{+2}$  ions are removed as insoluble carbonates.

Reactions:-



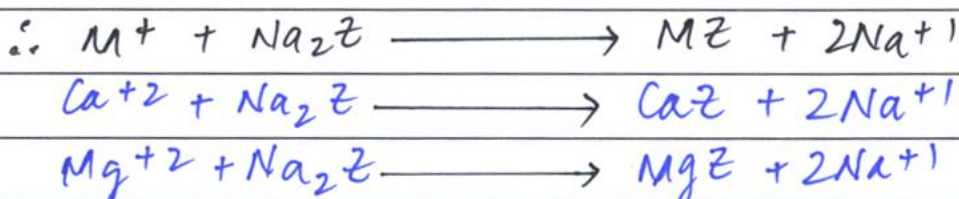
(ii) By Ion Exchange Resins

Hard water is fed into a tank containing suitable resins containing sodium ions.

Zeolite:- It is a natural ion exchanger. Chemically it is sodium aluminium silicate. It is represented as  $\text{Na}_2\text{Z}$ .

Process:-  $\text{Ca}^{+2}$  and  $\text{Mg}^{+2}$  ions are exchanged with sodium ions in the resin, and are removed.

Reactions:-



## Recovery of used zeolite:-

The used up zeolite can be recovered by heating with concentrated solution of sodium chloride.

Profitable:- This makes the process economically beneficial.

## Reactions:-



Q. No. 4 Part (b) (Page 1/2)

## Ozone layer and its Depletion

### Ozone Hole:-

#### Definition:-

“The region in which the amount of ozone has been reduced is called Ozone hole.”

Discovery:- It was first discovered in 1980 over Antarctica.

#### Allotropic form:-

Ozone is the allotropic form of oxygen consisting three oxygen atoms. It is present in Stratosphere.

#### Protection from UV radiations:-

The ultraviolet radiations coming from Sun are filtered or screened by ozone.

#### Destruction and Reformation:-

##### Destructions-

On absorbing the UV radiation, the ozone molecule breaks down into oxygen molecule and atomic oxygen

##### Reactions:-



Reformation:- Atomic oxygen is very reactive.

It reacts with molecular oxygen to form ozone and gives out heat.

##### Reactions:-



(Page 2/2) Balance of Ozone layer: - The rates of destruction and reformation remain equal without outside interventions.

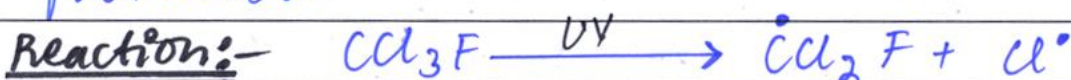
### Depletion of Ozone layer

#### Use of CFC's :-

Chlorofluorocarbons are very unreactive gases or low boiling liquids. They escape from aerosol sprays, refrigerants and air conditioning systems where they are used as solvents and refrigerants. They are so inert that they do not react with any chemical till troposphere. They slowly diffuse in ozone layer in stratosphere.

#### Depletion of Ozone by CFC's :-

CFC absorb UV radiation and breaks into chlorine free radical.



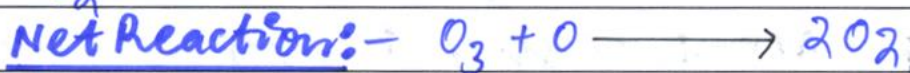
The chlorine free radical reacts with ozone and forms chlorine monoxide and molecular oxygen.

#### Reaction: -



Then  $\text{ClO}$  reacts with atomic oxygen produced during destruction of ozone and forms  $\text{Cl}^\bullet$  &

$\text{O}_2^\bullet$



#### Conclusion: -

Thus 1 chlorine free radical destroys a number of ozone molecules and  $\text{O}_3$  is not reformed which leads to ozone hole.



space for diagram  
(Section C)

Q. No. Part ( )



space for diagram  
(Section C)

Q. No. Part ( )



Q. No. 5 Part (a) (Page 1/2)

Reversible Chemical ReactionDefinition:-

“The reaction in which products can react together to reform the original reactants is called reversible reaction. It proceeds both in forward and reverse direction and never goes to completion.”

Double Arrow:-

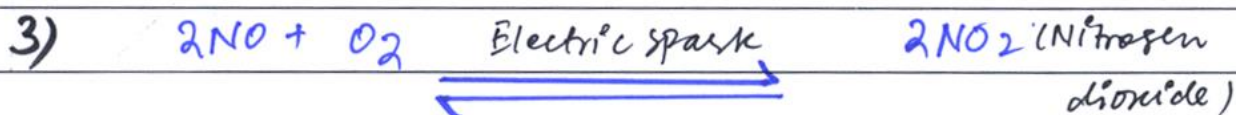
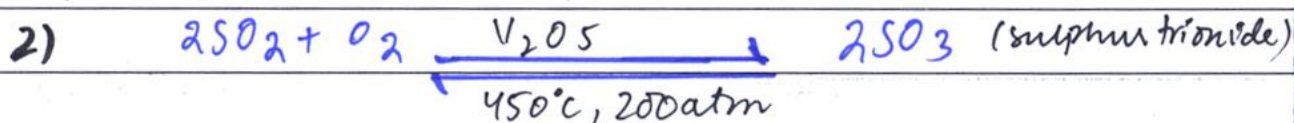
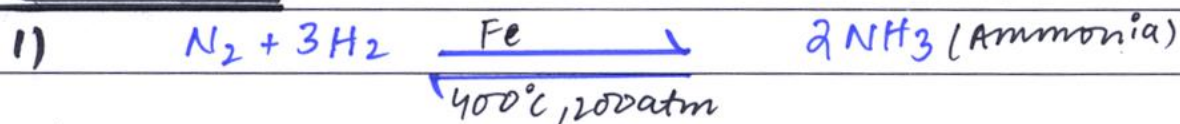
It is represented by a double arrow ( $\rightleftharpoons$ ).

Incomplete Reaction:- It is incomplete reaction because it never goes to completion.

2 directional:-

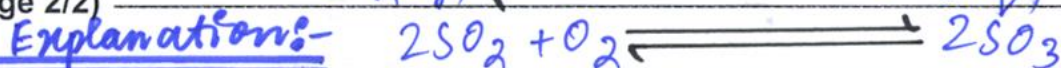
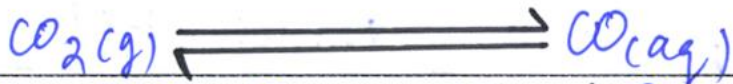
It is a 2 directional reaction.

Reactants & Products:- Reactants react to form products in forward direction and products react to form reactants in reverse reaction.

Reactions:-

Example:- When fizzy drinks are made  $\text{CO}_2$  is put in bottle by pressure and sealed. This is the forward reaction. When lid is opened, suddenly bubbles of  $\text{CO}_2$  are formed. This is reverse reaction.

Reaction:- (Forward & Reverse)



Forward Reaction:-



In beginning there is no  $\text{SO}_3$  so the rate of reverse reaction is zero. As there is highest concentration of reactants in beginning so rate of forward reaction is highest. As reactants decrease the rate of forward reaction decreases.

Reverse Reaction:-  $2\text{SO}_3 \longrightarrow 2\text{SO}_2 + \text{O}_2$

As concentration of  $\text{SO}_3$  increases, it slowly decomposes into  $\text{SO}_2$  &  $\text{O}_2$ . The reverse reaction has begun. As concentration of  $\text{SO}_3$  increases, the rate of reverse reaction increases.

Chemical Equilibrium:- When the rates of forward and reverse reactions become equal equilibrium is established.

Definition:- "The state of chemical reaction at which rates of forward and reverse reactions become equal is known as chemical equilibrium."

Dynamic Equilibrium:- After equilibrium is achieved forward and reverse reactions occur at equal rates and concentration of reactants and products remains constant.

Conditions for Chemical Equilibrium

- 1) Concentrations of reactants and products should remain unchanged.
- 2) Temperature of system remains constant.
- 3) Pressure & volume of system remains constant.

Nucleic Acids

Q. No. 5 Part (b) (Page 1/2)

Difference between DNA & RNA.DNARNA1) Name

Deoxy ribonucleus  
(full form)

Ribonucleus.  
(full form)

2) Strands

It is a double helix structure. It has two strands.

It has only one strand. It is not a double helix structure.

3) Sugar

It contains deoxyribose sugar.

It contains ribose sugar.

4) Nitrogenous bases

It has adenine, guanine, cytosine and thymine.

AGCT

It has adenine, guanine, cytosine and uracil.

AGCU

5) Function

It contains the genetic information and transfers it to next generations.

It is involved in protein synthesis.

6) Location

It is present in

It is synthesized in

nucleus.

front of DNA (nucleus)  
but also travels to  
cytoplasm.

7-Components

Phosphate group  
Nitrogenous bases  
Deoxyribose sugar

Phosphate group  
Nitrogenous bases  
Ribose sugar

8-Importance

It stores the genetic  
information. It  
controls inheritance.

It receives, reads and  
decodes the order of  
nucleotides (amino  
acids).

9-Template

It is the template from  
which mRNA copies the  
specific sequence of  
nucleotides.

It is synthesized in  
front of DNA (template)  
and copies the specific  
sequence of nucleotides.  
(mRNA)

10-Diagram

double  
stranded  
structure



DNA

single  
stranded  
structure



RNA

Q. No. 5 Part (b)

DNA



Double  
stranded  
structure

RNA



Single  
stranded  
structure

Q. No. 5 Part (b)

DNA



Double  
stranded  
structure

RNA



Single  
stranded  
structure