(Section B)

Q. No. 2 Part (i) Q: "Give any three ..... of organic compounds."

Ans: **Organic Compounds:**

Organic compounds refer to hydrocarbons and their derivatives. These compounds include carbon and hydrogen, along with other atoms such as O, N, S etc.

Uses of Organic Compounds:

1. Propane and butane, which are gases obtained from natural gas are used in liquid fuel cylinders.
2. Ethylene is used as starting material for synthesis of various compounds, e.g. ethylene glycol, polymers, synthetic rubber etc.
3. Compounds of phenol are used to ensure antiseptic conditions in hospitals.

Q. No. 2 Part (ii) Q: "Enlist any three ..... of lipids."

Ans: **Lipids (Introduction):**

Lipids are components of living tissues, insoluble in water and soluble in solvents of low polarity. Lipids are esters of fatty acids with a trihydroxy alcohol, glycerol. So, they are called glyceryl esters or glycerides.

Uses of Lipids:

1. In mammals, a layer of fat (lipid) is present under the skin which acts as a thermal insulator.
2. A thin layer of fat surrounds our heart and kidneys, which protects these delicate organs from shock.
3. Fats provide some vitamins (A, D, E, K). These vitamins are not soluble in water, but soluble in fats.

(Section B)

Q. No. 2 Part (iii) Q: "What is meant ..... two harmful effects."

Ans: **Global Warming:**

The increase in temperature of the Earth, which is due to human influence on greenhouse effect is called global warming. It occurs as a result of increase in greenhouse gases in the atmosphere.

Effects of Global Warming:

1. Polar ice caps may melt due to increased temperature which may result in floods.
2. The global climate may change, affecting both the area of rainfall and how much it rains, which will cause draught in some regions and flood in others.

Q. No. 2 Part (iv) Q: "How is carbon monoxide ..... effects."

Ans: **Carbon Monoxide** :-

Carbon monoxide is a poisonous, colourless and odourless gas. It has chemical formula CO.

Production of CO : Carbon monoxide gas is produced as a result of incomplete combustion in presence of limited oxygen, e.g:

Reaction: $3CH_4 + 4O_2 \longrightarrow C + 2CO + 6H_2O$

Effects of Carbon Monoxide:

Carbon monoxide gas has following haimful effects:

1. CO can cause dizziness, headaches and nausea.
2. Inhaling carbon monoxide for long time can be fatal and lead to death.

(Section B)

Q. No. 2 Part (v) Q: "Write down IUPAC ..... following alkanes."

Ans: (a) CH_4:

IUPAC name: methane

(b) $CH_3 - CH_2 - CH_3$:

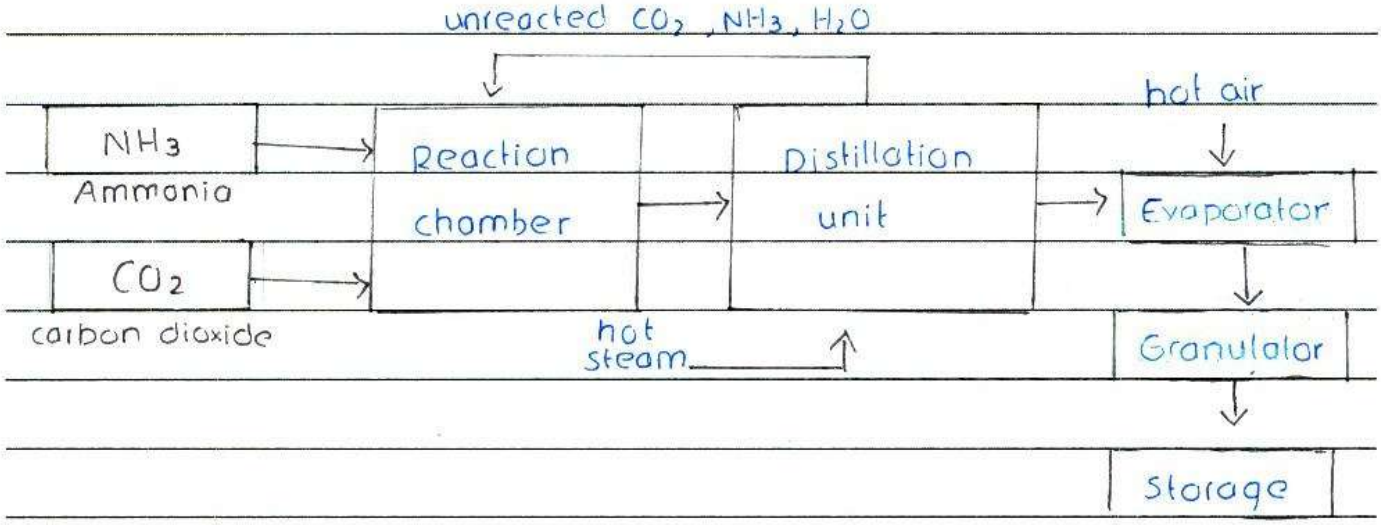
IUPAC name : propane

(c) $CH_3 - CH_2 - CH_2 - CH_3$:

IUPAC name : butane

Q. No. 2 Part (vi) Q: "Draw flow sheet ..... in industry."

Ans: Urea is manufactured as following:



FLOW DIAGRAM FOR UREA MANUFACTURE

(Section B)

Q. No. 2 Part (vii) Q: "Write forward and ..... reversible reactions."

Ans: (a) $H_2 + I_2 \rightleftharpoons 2HI$:

Forward reaction: $H_2 + I_2 \longrightarrow 2HI$

Reverse reaction: $2HI \longrightarrow H_2 + I_2$

(b) $N_2O_4 \rightleftharpoons 2NO_2$

forward reaction: $N_2O_4 \longrightarrow 2NO_2$

Reverse reaction: $2NO_2 \longrightarrow N_2O_4$

Q. No. 2 Part (viii) Q: "Derive an expression ..... its units."

Ans: $2NO + O_2 \rightleftharpoons 2NO_2$

According to law of mass action: rate of forward reaction $\propto [NO]^2[O_2]$

rate of forward reaction $= k_f [NO]^2[O_2]$

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

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

At equilibrium: $k_f [NO]^2[O_2] = k_r [NO_2]^2$

$$\frac{k_f}{k_r} = \frac{[NO_2]^2}{[NO]^2[O_2]} \Rightarrow \boxed{K_c = \frac{[NO_2]^2}{[NO]^2[O_2]}}$$

Unit for K_c: $K_c = \frac{[mol.dm^{-3}]^2}{[mol.dm^{-3}]^2[mol.dm^{-3}]}$

$$K_c = \frac{1}{mol.dm^{-3}}$$

$$\boxed{K_c = mol^{-1}.dm^3}$$

(Section B)

Q. No. 2 Part (ix) Q: "How is tetrachloro ethane ..... two steps."

Ans: $CH \equiv CH$ (ethyne)

1st Step:-

$$\underset{\text{(ethyne)}}{CH \equiv CH} + \underset{\text{(chlorine)}}{Cl_2} \longrightarrow \underset{\text{(1,2 dichloro ethene)}}{\overset{Cl}{\overset{|}{CH}} = \overset{Cl}{\overset{|}{CH}}}$$

2nd Step:-

$$\underset{\text{(1,2 dichloro - ethene)}}{\overset{Cl}{\overset{|}{CH}} = \overset{Cl}{\overset{|}{CH}}} + \underset{\text{(chlorine)}}{Cl_2} \longrightarrow \underset{\text{(1,1, 2,2, tetrachloro ethane)}}{\overset{Cl}{\overset{|}{CH}} - \overset{Cl}{\overset{|}{CH}}}$$

Q. No. 2 Part (x) Q: "Write complete balanced .... three steps."

Ans: Reaction Between H_3PO_4 and NaOH:

1st step:

$$H_3PO_4 + NaOH \longrightarrow NaH_2PO_4 + H_2O$$

(phosphoric acid) (sodium hydroxide) (acid salt) (water)

2nd step:

$$NaH_2PO_4 + NaOH \longrightarrow Na_2HPO_4 + H_2O$$

3rd step:

$$Na_2HPO_4 + NaOH \longrightarrow Na_3PO_4 + H_2O$$

(normal salt, i.e. sodium phosphate)

Q. No. 2 Part (xi) Q: "What is Baeyer's ..... identify ethene."

Ans: **Baeyer's Test: (Reaction with $KMnO_4$):**

The reaction of ethene with potassium permanganate ($KMnO_4$) results in discharge of pink colour of $KMnO_4$ during reaction. This is known as Baeyer's test, used to detect presence of unsaturation. When ethene reacts with dilute alkaline solution (1%) of $KMnO_4$, it is converted to ethylene glycol, and pink colour is discharged which shows presence of unsaturated compound, i.e. ethene.

Reaction: $3CH_2 = CH_2 + KMnO_4 \longrightarrow \underset{\text{(ethylene glycol or antifreeze)}}{3CH(OH)-CH(OH)} + 2MnO_2 + 2KOH$

Use for rough work

Q. No. 3 (Page 1) Q: " Discuss Bronsted - Lowry concept of acids and bases. Discuss reactions ..... both reactions? "

Ans: BRONSTED - LOWRY CONCEPT OF ACID AND BASE:-

History:

In 1923, J.M Bronsted and T.M. Lowry presented a theory on classification of acids and bases, in order to remove defects from Arrhenius theory.

Bronsted - Lowry Acid:

According to Bronsted - Lowry theory:

"An acid is a substance that donates proton in a chemical reaction."

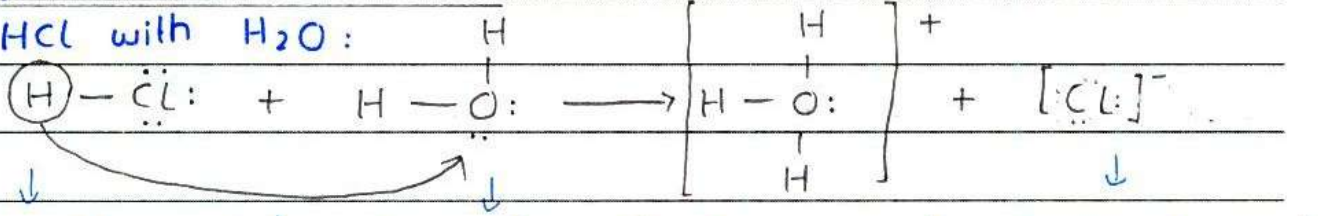
Bronsted - Lowry Base:

According to Bronsted - Lowry concept:

"A base is a substance that accepts a proton in a chemical reaction."

Open - Chain Reactions:

1. HCl with H_2O:



(hydrochloric acid) (water) (hydronium ion) (chloride ion)

(Bronsted - acid) (bronsted base)

Above reaction can also be written as:

$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$

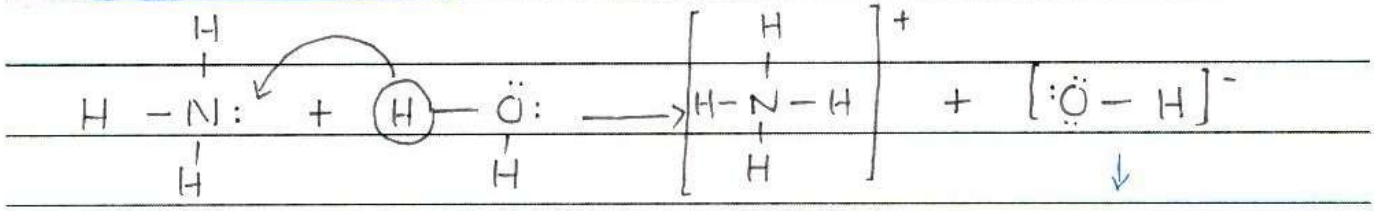
(acid) (base)

In above reaction, HCl donates proton to water

Q. No. 3 (Page 2)

molecule, so it acts as Bronsted acid and H_2O accepts proton from HCl, so it acts as Bronsted base.

2. **NH_3 with H_2O:**



(Ammonia) (water) (ammonium ion) (hydroxide ion)

(Bronsted base) (Bronsted acid)

Above reaction can be written as:

$$NH_3 + H_2O \longrightarrow NH_4^+ + OH^-$$

(base) (acid)

In above reaction, NH_3 accepts proton from H_2O, so it acts as Bronsted base and H_2O donates proton, so it is acid.

Water As Ampholeric Compound:

Water acts both as a Bronsted acid and base. In reaction with HCl, it acts as base and in reaction with NH_3, it acts as acid, so it is amphoteric in nature. Amphoteric compounds are those which react with both acids and bases.

Defects in Bronsted - Lowry Theory:

- Substances which are unable to donate or accept proton cannot be classified as acid or base
- e.g. Bronsted - Lowry theory does not explain why substances like CO_2, SO_2 are acidic although they do not have ability to donate proton.

Q. No. 4 (Page 1) Q: "What is hard water ? Write methods to remove temporary hardness of water."

Ans: **HARD WATER: Definition:-**

Hard water does not form lather with soap and forms scum, which hampers its cleansing action. Hard water is unfit for human use.

Temporary Hardness of Water:

Temporary hardness of water is so called because it can be removed by boiling. Temporary hardness in water is caused by the presence of dissolved magnesium and calcium hydrogen carbonates, i.e. $Mg(HCO_3)_2$ and $Ca(HCO_3)_2$.

Methods to Remove Temporary Hardness:-

Following are the methods used to remove temporary hardness of water.

1. By Boiling:

Temporary water hardness can be removed by boiling the water. As a result, the soluble magnesium and calcium hydrogen carbonates are converted to insoluble carbonates, thus removing hardness of water.

Reaction:

$$M(HCO_3)_2 \longrightarrow MCO_3 + CO_2 + H_2O$$

where M = Mg or Ca

Unfortunately, this is an expensive process and cannot be used on large scale.

Q. No. 4 (Page 2)

2. By Adding Slaked Lime (Clark's Method):

On large scale, temporary hardness of water can be removed by adding an estimated amount of slaked lime ($Ca(OH)_2$). As a result, the slaked lime reacts with the soluble Magnesium and calcium hydrogen carbonates present in hard water and converts them to insoluble carbonates. Thus, water hardness is removed.

Reactions:-

1. $Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2CaCO_3 + 2H_2O$
2. $Mg(HCO_3)_2 + Ca(OH)_2 \longrightarrow MgCO_3 + CaCO_3 + 2H_2O$

Q. No. 5 (Page 1) Q: "What is ozone hole. How CFCs contribute in depletion of ozone ?"

Ans: **OZONE: Introduction:**

Ozone is an allotropic form of oxygen, containing three oxygen atoms (O_3). Ozone gas is present in large quantity in the stratosphere.

Purpose of Ozone: Ozone serves to filter or screen out the dangerous ultraviolet radiations from the Sun, which may cause damaging ~~to~~ effect to life on Earth.

Destruction and Formation of Ozone:

UV radiations break ozone into atomic and molecular oxygen.

Reaction: $O_3 \xrightarrow{UV} O_2 + O$

Atomic oxygen is extremely reactive. It combines with molecular oxygen and releases heat.

Reaction: $O + O_2 \longrightarrow O_3 + \text{heat}$

In absence of outside intervention, the rate of formation and destruction of ozone is equal. Both reactions are powered by UV radiations from Sun. Human activities disrupt the natural process of ozone formation and destruction, resulting in ozone layer depletion.

OZONE HOLE:

The reduction in the amount of ozone was first observed in October, 1980, over Antarctica. This reduced amount of ozone is known as "ozone hole."

Q. No. 5 (Page 2)

Chlorofluorocarbons (CFCs):

Chlorofluorocarbons are a group of chemically unreactive compounds. These are in form of gases or low-boiling liquids. They are used as solvents for electronic circuit cleaning, as propellants in aerosol sprays etc.

Depletion of Ozone by CFCs:

CFCs do not react with any substance in troposphere and diffuse into stratosphere. UV radiations break CFCs and produce chlorine radical.

Reaction: $CCl_3F \xrightarrow{UV} CCl_2F + Cl^{\cdot}$

~~Atom~~ chlorine radical reacts with ozone molecule and breaks it into atomic oxygen and forms chlorine monoxide (ClO).

Reaction: $Cl^{\cdot} + O_3 \longrightarrow ClO + O_2$

ClO then reacts with atomic oxygen and forms molecular oxygen.

Reaction: $ClO + O \longrightarrow Cl^{\cdot} + O_2$

Net Reaction: $O_3 + O \longrightarrow 2O_2$

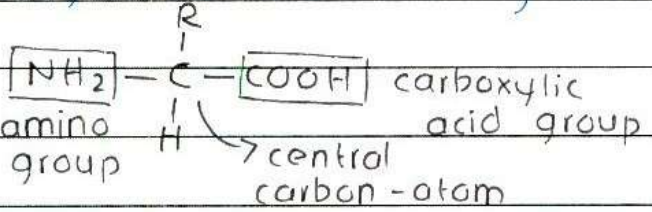
Thus the chlorine radical formed in the first step is regenerated again in last step. Therefore one chlorine radical can destroy thousands of ozone molecules.

Q. No. 6 (Page 1) Q: "Discuss four uses of proteins."

Ans: **PROTEINS: Introduction:**

Proteins are high weight molecular substances. They are complex nitrogenous substances that produce amino acids on complete hydrolysis. Amino acids are the building blocks of proteins.

Amino acids: They are building blocks of proteins. They have the following structure:



They are of two types: essential and non-essential amino acids. Essential amino acids, 10 in number are present in diet, while non-essential, 10 in number are synthesized by our bodies.

Sources of Proteins: Proteins from animals come from variety of substances including meat, eggs, cheese milk etc. Plants are also sources of proteins, e.g. beans, pulses, grams etc.

USES OF PROTEINS:

Following are the uses of proteins:

1. Proteins are required by our bodies to provide amino acids, required for repairing damaged tissues, making muscles etc.

Q. No. 6 (Page 2)

2. Enzymes are large protein molecules that catalyze several chemical reactions.

3. Antibodies are also a type of protein that help us fight against specific diseases.

4. A protein called gelatin, which is obtained by heating bones and tendons in water, is used in baking industry.

5. Proteins are required for mental and physical growth, particularly in children.

Space for rough work