

$$NH_2-(CH_2)_6-NH_2 + COOH-(CH_2)_4-COOH$$

$$-\{NH_2-(CH_2)_6-N-OOC-(CH_2)_4-COOH\}_n$$

Use for rough work

Q. No. 2 Part (i)

~~Structural formula:~~

Zinc is more reactive than copper because it loses electrons more easily than copper gains electrons. Copper has electrode potential (+0.34V) which is less reactive than zinc's electrode potential (-0.76V). Zinc loses electrons much more easily, hence it is more reactive.

Q. No. 2 Part (ii)

Volume = $1 dm^3$

mass = 20g

Molar mass of NaOH = 23 + 16 + 1

= 40g/mol

Moles of NaOH = $\frac{\text{mass}}{\text{molar mass}} = \frac{20}{40} = 0.5 mol$

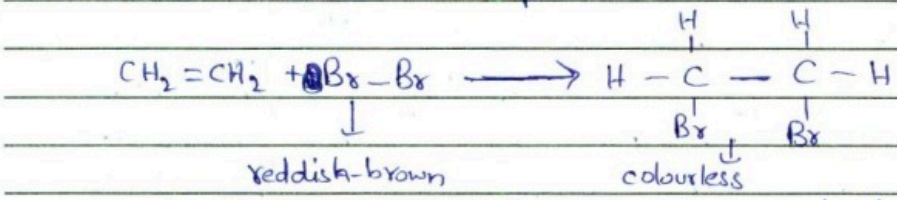
Concentration in mol/dm^3 (Molarity) = $\frac{\text{Moles}}{\text{Volume}}$

Molarity = $\frac{0.5}{1}$

Molarity = 0.5M or Molarity = $0.5\ mol/dm^3$

Q. No. 2 Part (iii)

Bromine has a reddish-brown color. When it reacts with an unsaturated hydrocarbon the resulting molecule is colorless. For example:



This change is also used to test for unsaturated hydrocarbon.

Q. No. 2 Part (iv)

Polymer:

Polymer's are long chain molecules made up of repeating units called monomers. Monomers join covalently during polymerization to form polymers.

For example:

1) Polyethene, Repeating unit: $-\{CH_2-CH_2\}_n-$

2) Nylon 6 6, Repeating unit: $-\{NH-(CH_2)_6-NH-OC-(CH_2)_4-CO\}_n-$

Q. No. 2 Part (v)

Reaction of metal with a dilute acid creates a salt and hydrogen gas.

metal + dilute acid $\longrightarrow$ Salt + H_2

For example:

$Mg + 2HCl \longrightarrow MgCl_2 + H_2$

Q. No. 2 Part (vi)

Esterification :

When carboxylic acid reacts with alcohol in the ~~presence~~ presence of concentrated H_2SO_4 as catalyst, an ester is formed. This reaction is called "esterification" reaction.

$$R-COOH + HO-R' \longrightarrow R-COO-R' + H_2O$$

For example:

$$CH_3COOH + CH_3CH_2OH \longrightarrow CH_3COOCH_2CH_3$$

Q. No. 2 Part (vii)

CaO is considered basic oxide because it dissolves in water to form base. It also react with acid to make salt and water.

Chemical equations:

$$CaO + H_2O \longrightarrow Ca(OH)_2$$

$$CaO + 2HCl \longrightarrow CaCl_2 + H_2O$$

Q. No. 2 Part (viii)

Empirical formula = CH_2O

molar mass of CH_2O = $12 + (1 \times 2) + 16$

= 30 g/mol

molar mass of molecular formula = 180 g/mol

$n = \frac{180}{30}$

$n = 6$

Molecular formula = $(CH_2O)_n$

= $(CH_2O)_6$

= $C_6H_{12}O_6$

Q. No. 2 Part (ix)

Moles of KNO_3 = 0.25

concentration = $1 dm^3$

molar mass of KNO_3 = $39 + 14 + (16 \times 3)$

= 101 g/mol

mass of KNO_3 = moles × molar mass

= 0.25×101

= 25.25 g

Strength in (g/dm^3) = $\frac{\text{mass}}{\text{concentration}}$

= $\frac{25.25 g}{1 dm^3}$

Strength in (g/dm^3) = $25.25 g/dm^3$

Q. No. 2 Part (x)

When an alcohol ~~reacts~~ combusts in presence of oxygen CO_2 H_2O and heat are released.

Example equation:

$$CH_3CH_2OH + 2O_2 \longrightarrow 2CO_2 + 3H_2O + heat$$

Q. No. 2 Part (xi)

When steam is added to ethene at 300°C, 6atm in the presence of phosphoric acid as catalyst, ethanol is formed. Chemical equation:

$$CH_2 = CH_2 + H_2O \xrightarrow[300°C,\ 6atm]{H_3PO_4} CH_3CH_2OH$$

Q. No. 3 (Page 1)

Reaction with Steam:

Metals react with steam to form metal oxide and hydrogen gas.

Metal + Steam $\longrightarrow$ Metal oxide + H_2

Example equation:

$Mg + H_2O \longrightarrow MgO + H_2$

$2Fe + 3H_2O \longrightarrow Fe_2O_3 + 3H_2$

Reaction with oxygen:

Metals react with oxygen to form a metal oxide.

Metal + oxygen $\longrightarrow$ Metal oxide

Example equation:

$Mg + O \longrightarrow MgO$

Q. No. 3 (Page 2)

Q. No. 4 (Page 1)

SO_2 :

SO_2 is acidic oxide because it react with water to form acid. It is also an oxide of a non-metal so it is acidic. Chemical equation:

$$SO_2 + H_2O \longrightarrow H_2SO_3$$

(Sulphurous acid)

CuO:

CuO is basic oxide because it is an oxide of a metal. CuO reacts with water to form base and it reacts with acid to form salt and water showing its basic nature. Chemical equation:

Reaction with water:

$$CuO + H_2O \longrightarrow Cu(OH)_2$$

Reaction with acid:

$$CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$$

Al_2O_3:

Al_2O_3 is ampholeric oxide, because it reacts with acid to form salt and water and it reacts with bases to form aluminates.

Reaction with acid:

$$Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$$

Reaction with base:

$$Al_2O_3 + 2NaOH + 3H_2O \longrightarrow 2NaAl(OH)_4$$

Q. No. 4 (Page 2)

Q. No. 5 (Page 1)

Empirical formula:

C = 38.71%, H = 9.68%, O = 51.61%

C = 38.71 / 12 = 3.2268

H = 9.68 / 1 = 9.68

O = 51.61 / 16 = 3.226

Mole ratios:

C : H : O

3.226 : 9.68 : 3.226

$\frac{3.226}{3.226} : \frac{9.68}{3.226} : \frac{3.226}{3.226}$

1 : 3 : 0

Empirical formula = CH_3O

Molecular formula:

Empirical formula = CH_3O

Molar mass of CH_3O = 12 + (1 × 3) + 16

= 31 g/mol

Molar mass of molecular formula = 62 g/mol

~~molar~~ molecular formula = $(CH_3O)_n$

$n = \frac{\text{molar mass of molecular formula}}{\text{molar mass of empirical formula}}$

$n = \frac{62}{31}$

$n = 2$

Molecular formula = $(CH_3O)_2$

$= C_2H_6O_2$

Q. No. 5 (Page 2)

15 (Section C)

Q. No. 6 (Page 1)

During the electrolysis of $CuSO_4$ using copper electrodes. Copper from anode breaks off and moves towards cathode. At cathode it is reduced to pure copper. At anode copper loses electrons to form Cu^{+2} and moves towards cathode. At cathode it reduces to form Cu metal.

At anode:

$$Cu \longrightarrow Cu^{+2} + 2\bar{e}$$

At cathode:

$$Cu^{+2} + 2\bar{e} \longrightarrow Cu$$

This electrolysis is used to purify copper and create pure copper metal. Anode consists of impure copper electrode containing impurities like Zn, Fe etc. Once copper breaks from anode pure copper move towards cathode while remaining impurities sink to bottom of electrolytic tank.

Q. No. 6 (Page 2)