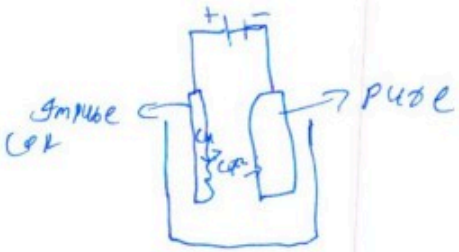
Metal + steam

$Fe + H_2O \longrightarrow Fe_3O_4 + H_2$

$Mg + O_2 \longrightarrow$ Metal oxide
MgO



$2CuO + H_2O \rightarrow 2CuOH$

mass of Zn = 150 g

H_2SO_4 = 200 g

1 n 1 × 2.36

molar mass of Zn = 63.5 g/mol

moles of Zn = ? $\text{moles} = \frac{\text{mass}}{\text{molar mass}} = \frac{150}{63.5}$

moles of H_2SO_4 = ? Zn = 2.36 mol

Compare HCl $\text{moles} = \frac{\text{mass}}{m} = \frac{200}{98}_{H_2SO_4} = 2.04$

Zn $Zn = 2\ ZnSO_4$

H_2SO_4 $= 2 \times 2.36 = 4.72$

(2) $Al_2O_3 + HCl \rightarrow AlCl_3 + H_2O$ (Lin)

2 1 4.08 ↓ H_2SO_4

moles of H = ? Zn

1 mol of Zn = 1 mol of H_2

= 2 1 × 2.36

= 2.36 moles

mass = moles × molar

= 2.36 × 2

Use for rough work

conc. mol/dm³

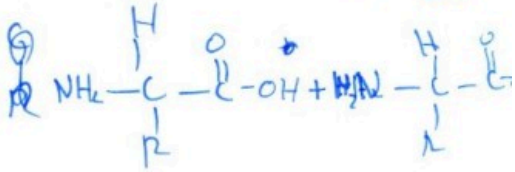
m = 20g V = 1 dm³

moles = mass / molar mass

$Zn \rightarrow Zn^{+2} + 2e^-$

$Cu^{+2} + 2e^- \rightarrow Cu$

$CH_2=CH_2 + Br_2 \rightarrow CH_2(Br)-CH_2(Br)$



$CH_3CH_2OH + [O] \rightarrow CH_3CHO$

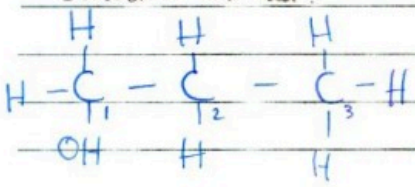
$CH_3-C(=O)-H$

$CH_2=CH_2 + H_2O \xrightarrow[60atm,\ 300^\circ C]{H_3PO_4} CH_3CH_2OH$ releases



Q. No. 2 Part (i) Propan-1-ol

Structural Formula:



Displayed Formula:

$CH_3-OH-CH_2-CH_3$

Or

$CH-CH_2-CH_3$

(OH)

(a) Zinc metal (−0.76V) is more reactive than copper (+0.34V).

$Zn > Cu$

(b) This is because 'negative electrode potential values' has greater potential to be oxidized, and are active metals, whereas 'positive values' of 'electrode potential' indicates higher potential to be reduced, being less active metals.

Q. No. 2 Part (ii) Given data:-

mass of NaOH = 20 g

Volume in dm^3 = 1 dm^3

concentration in mol/dm^3 = molarity = ?

Sol:- First will find moles of NaOH:

moles = $\frac{\text{mass}}{\text{molar mass}}$

$\therefore$ molar mass = 23 x 1 + 16 x 1 + 1 x 1

= 40 g/mol

putting values

moles = $\frac{20}{40}$ = 0.5 moles

Now,

Molarity = $\frac{\text{moles in solute}}{\text{Volume in } dm^3}$

= $\frac{0.5}{1}$

= 0.5 mol.dm^{-3}

Hence, the concentration of solution in mol/dm^3 = 0.5 mol.dm^{-3}

Q. No. 2 Part (iii) **Fossil fuels:**

Fossil fuels are the ~~(remains)~~ remains of living organisms that are used as a source of energy.

- It is a non-renewable energy source.

Three Fossil fuels:

1.) Coal

2.) Natural Gas

3.) Petroleum

Q. No. 2 Part (iv) **Polymers:** Polymers are large molecules formed by small repeating units called monomers.

Examples:

1.) ~~Polychloroet~~ Polyethene or Polyethylene:

- Monomer: $CH_2 = CH_2$ (Ethene)
- Polymer: $(-CH_2-CH_2-)_n$ (Polyethene)
- Repeating unit: $-CH_2-CH_2-$

2.) Polychloroethene or Polyvinyl chloride:

Polymer: $(-CH_2-CHCl-)_n$

Monomer: $CH_2 = CHCl$

Repeating unit: $-CH_2-CHCl-$

Q. No. 2 Part (v) When a reactive metal reacts with dilute acid it forms a salt and hydrogen gas (H_2).

Metal + dilute acid ⟶ Salt + H_2

$Mg + 2HCl \longrightarrow MgCl_2 + H_2$

Magnesium — Hydrochloric acid — Magnesium chloride — Hydrogen gas

Hence, when a dilute acid reacts with metal a salt ($MgCl_2$) is formed with H_2.

Metals like potassium, sodium react vigorously
Metals like magnesium, zinc react steadily producing bubbles.
Metals like Gold, silve doesn't react

Q. No. 2 Part (vi) Under **normal conditions**, ionic compounds are at **solid state** with a well-defined lattice structure.

Reasons:

1) This is due to the nature of ionic bonds present within the **ions**.

2) Also, ionic compounds are formed through strong electrostatic force of attraction between the oppositely charged ions.

3) These forces requires significant energy to be breakdown.

Q. No. 2 Part (vii) **Advantages of Hydrogen-Oxygen fuel cell:**

1) It is a renewable energy source.

2) It is very reliable and it's moving parts continue to work for long time.

3) It produces clean energy and reduces greenhouse gases emissions such as CO_2, NO_x etc.

4) It produces large amount of energy.

Q. No. 2 Part (viii) Empirical Formula: CH_2O

Molecular Formula = ?

molar mass = 180 g/mol

Sol:

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

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

$= 30$ g/mol

putting values

$n = \frac{180}{30} = 6$ $\boxed{n = 6}$

Molecular Formula: $(CH_2O)_n$

$= (CH_2O)_6$

Molecular formula = $C_6H_{12}O_6$ ⇒

Q. No. 2 Part (ix) Given: moles of $KNO_3 = 0.25$ mol

Volume in $dm^3 = 1\ dm^3$

Concentration in g/dm^3 = strength of solution = ?

∵ First will convert moles into grams:

mass = moles × molar mass

∵ molar mass of $KNO_3 = 39 \times 1 + 14 \times 1 + 16 \times 3$

$= 101$ g/mol

putting values

$= 0.25 \times 101 = 25.25$ g

mass = 25.25 g ∵ Strength = $\frac{\text{mass of solute}}{\text{Volume in } dm^3}$

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

Strength = 25.25 g/dm^3

Q. No. 2 Part (x) Sources of Vitamin A:

1.) Carrots 3.) Broccoli

2.) Eggs 4.) Apples

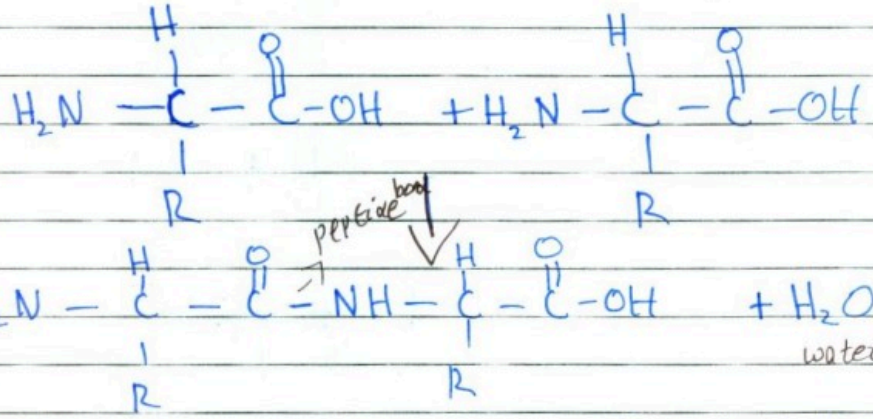
Functions:

1.) Improves vision of eyes

2.) Improves immune functions

Q. No. 2 Part (xi)

Amino acid + amino acid → Dipeptide bond + H_2O



Dipeptite bond : we can see that at the left and right there is still an amino group and carboxyl group which reacts further and form large molecules called proteins.

Q. No. 3 (Page 1)

a) **Steam**

When a metal reacts with steam it produces a 'Metal oxide' and hydrogen gas (H_2) which produces bubbles.

Metal + steam ⟶ Metal oxide + Hydrogen gas

Example: (Iron)

$$Fe_{(s)} + H_2O_{(g)} \longrightarrow Fe_3O_{4(s)} + H_{2(g)}$$

Iron oxide Hydrogen gas

b) **Oxygen:**

When a metal reacts with oxygen (O_2) it produces metal oxide.

Metal + oxygen ⟶ Metal oxide

Example: (Magnesium)

$$2Mg + O_2 \longrightarrow 2MgO$$

Magnesium oxide

Q. No. 3 (Page 2)

Q. No. 4 (Page 1) Data:- mass of Zn = 150g, mass of H_2SO_4 = 200g, molar mass of Zn = 63.5 g/mol,

a) Limiting reactant:

- moles of Zn = ?, moles = $\frac{\text{mass}}{\text{molar mass}}$

moles of Zn = $\frac{150}{63.5}$ = 2.36 mol

moles of H_2SO_4:

molar mass of H_2SO_4 = 1x2 + 32x1 + 16x4

molar mass of H_2SO_4 = 98 g/mol

moles = $\frac{\text{mass}}{\text{molar mass}}$

moles of H_2SO_4 = $\frac{200\text{g}}{98}$ = 2.04

moles of Zn = 2.36 mol, moles of H_2SO_4 = 2.04

Now,

For Zn According to balanced chemical eq

1 mol of Zn = 2 mol of $ZnSO_4$

= 2 x 2.36

1 mol of Zn = 4.72 mol of $ZnSO_4$ →

For H_2SO_4:

1 mol of H_2SO_4 = 2 mol of $ZnSO_4$

= 2 x 2.04

= 4.08 mole of $ZnSO_4$ →

As 1 mol of H_2SO_4 produces 4.08 moles of $ZnSO_4$ which are less than produce by Zn So,

Q. No. 4 (Page 2) H_2SO_4 is the limiting reactant.

*Mass of H_2 moles = ?

1 mol of Zn = 1 mol of H_2

= 2.36 × 1

= 2.36 mol of H_2

Mass = moles × molar mass

= 2.36 × 2 *molar mass of H_2 = 2 × 1 = 2 g/mol

Mass of H = 4.72 g

a) Acidic oxide: (SO_2), because it 'reacts' with 'water' to produce 'acid', and it is a non-metal.

$SO_2 + H_2O \longrightarrow H_2SO_3$

Sulphurous acid

b) Basic oxides (CuO): They react with water to form base. They are metals.

$CuO + H_2O \longrightarrow Cu(OH)_2$ → copper oxide

They also react with acids to form salt and water.

$CuO + HCl \longrightarrow CuCl + H_2O$

c) Amphoteric oxides: (Al_2O_3): They react with acids to form salt and water

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

Aluminium chloride water

They react with bases to form aluminates

$Al_2O_3 + 4NaOH \xrightarrow{+3H_2O} 2Na_2Al(OH)_4 + H_2O$

Sodium Aluminate water

Q. No. 5 (Page 1)

Data:-

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

molar mass of compound = 62 g/mol

Sol:- First, will find moles

$C = \frac{38.71}{12}$, $H = \frac{9.68}{1}$, $O = \frac{51.61}{16}$

C = 3.22 mol , H = 9.68 mol, O = 3.22 mol

Now, will find Mole ratio

C : H : O

3.22 : 9.68 : 3.22

Divide all ratio by '3.22'

1 : 3 : 1

Hence,

Empirical Formula = CH_3O

Now, to calculate molecular formula we have to find molar mass of this compound:

molar mass of CH_3O = 12 x 1 + 3 x 1 + 16 x 1

= 31 g/mol

Q. No. 5 (Page 2)

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

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

$n = 2$

Now,

Molecular formula $= (CH_3O)_n$

$= (CH_3O)_2$

Molecular Formula $= C_2H_6O_2$ →

Q. No. 6 (Page 1) **Electrolysis of dilute copper sulphate using copper electrodes:**

1.) **Introduction:**

Copper obtained from it's 'ore' is usually impure containing impurities like zinc, silver etc.

2.) **Electrolyte:**

A solution containing $CuSO_4$ solution with little dilute H_2SO_4 dissolved in it.

3) **Electrodes:**

- Impure copper bar acts as anode.
- Pure copper bar acts as cathode.

4.) **Ions:**

$$CuSO_4 \longrightarrow Cu^{+2} + SO_4^{-2}$$

$$H_2O \longrightarrow H^+ + OH^-$$

5.) **Working:**

1.) When electricity is passed 'copper atoms' gives it's electrons to anode and falls into the solution as Cu^{+2} ions.

Q. No. 6 (Page 2)

2.) These electrons are passed through external circuit to the copper cathode.

3.) The Cu^{+2} ions that falls into the solution moves to copper cathode and are reduced into copper metal.

4.) Thus impure copper "anode" is "consumed gradually" and pure copper cathode, gains mass.

5.) The impurities move down at bottom.

6.) And at last, after evaporation pure copper is obtained which is 99.5% pure.

At Anode: (Oxidation) $Cu_{(s)} \longrightarrow Cu^{+2}_{(aq)} + 2e^-$

At cathode: (Reduction) $Cu^{+2}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$

