CHEMISTRY MS

SECTION A (16 marks).

1. @ 1 mark = 10 marks

i	ii	iii	iv	v	vi	vii	viii	ix	x
C	B	C	B	B	C	D	D	C	B

2. @ 1 mark = 6marks

i	ii	iii	iv	v	vi
II	E	I	D	B	G

3 SECTION B (54 marks).

3. a). i). Rusting
ii). Burning.
iii). Rotting
iv). Fermentation of fruits
v). Souring of milk
vi). Decaying.
Any three points @ 1 mark = 3 marks

b). Muddy water is a mixture.
Justification.
i). The components of mixture can be separated from one another by physical method.
ii). Mixture may vary widely composition. The components are mixed in any proportions
iii). No chemical change occur when mixture are formed.
iv). The properties of mixture are those of the individual components.
v). Components of mixture may be separated
Any three points @ 1 mark = 3 marks

c). i). Mole of ions.

$FeCl_2(aq) \longrightarrow Fe^{3+} + 3Cl^-$

Total Ions $= 1Fe^{3+} + 3Cl^- = (1+3) = 4$ moles of ions.

∴ The number of moles of ions when Iron (III) Chloride ionize in water completely = 4. 1.5 mark

ii). Number of ion (N).

Given

n = 4 moles (number of moles)

$L_A = 6.02 \times 10^{23}$ ions/mol

N = ? (Number of particles (ions)) } - - 0.5 mark

From Avogadrous

$\frac{n}{1} = \frac{N}{L_A}$ - -

$N = nL_A$ - - - - - 0.5 mark

$N = 4 \text{ moles} \times 6.02 \times 10^{23} \text{ ions/mol}$

$N = 2.408 \times 10^{24}$ ions.

∴ The number of ions (N) when Iron (III) chloride completely ionize in water $N = 2.408 \times 10^{24}$ ions 0.5 mark

4 a). i). Name: Water and chemical formula H_2O 1 mark

ii). Hydrate copper (ii) Sulphate which turns blue upon addition of an unknown compound. 1 mark

iii). - Pure water is neutral at room temperature. It is neither acidic nor basic.

- Cold water reacts with some metals to form metal hydroxide and Liberate hydrogen gas.

eg. $Na + H_2O \longrightarrow NaOH + H_2$.

- Steam can react with some metals to give the respective metal oxides and hydrogen gas.

eg. $Mg + \text{steam } (H_2O) \longrightarrow MgO + H_2$ @1 mark = 3 marks

b). Given

5.34g Carbon, 0.44g Hydrogen, 14.22g Oxygen.

Total masses = 5.34 + 0.44 + 14.22 = 20g

% composition of carbon = (5.34 ÷ 20) × 100%

= 26.70%

hydrogen = (0.44 ÷ 20) × 100% = 2.20%

Oxygen = (14.22 ÷ 20) × 100% = 71.10% 01 mark

Now.

Method	C	H	O
% composition	26.70	2.20	71.10.
R.A.M	12	1	16
% comp ÷ R.A.M	26.70 ÷ 12 = 2.225	2.2 ÷ 1 = 2.2	71.10 ÷ 16 = 4.443.
Divide by smallest number	2.225 ÷ 2.22 = 1.002	2.2 ÷ 2.2 = 1	4.443 ÷ 2.2 = 2.01
Ratio	1	1	2

2 marks

∴ Empirical formula is CHO_2. 1 mark

5. a). (i). Enfocement of Laws and regulations.

(ii). Recycling. @1 mark = 3 marks

(iii). Controlling chemicals before release.

b). i). $2FeSO_4(s) \longrightarrow Fe_2O_3(s) + SO_2(g) + SO_3(g)$.

ii). $Ca(HCO_3)_2(aq) \longrightarrow CaCO_3(s) + H_2O(l) + CO_2(g)$.

iii). $NH_4NO_3(s) \longrightarrow N_2O(g) + 2H_2O(l)$

@2 marks = 6 marks

6. a) It is a stable element its outermost shell is fullfill with electron in such a way that does not contribute any electron during bond formation. Thus does not react with Sodium. 3 marks

b). i). $Na_2S_2O_3(aq) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O_{(l)} + S_{(s)} + SO_2(g)$ 2 marks

ii). $Na_2S_2O_3(aq) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O(l) + S_{(s)} + SO_2(g)$

$2Na^+_{(aq)} + S_2O_3^{2-}(aq) + 2H^+_{(aq)} + 2Cl^-_{(aq)} \longrightarrow 2Na^+_{(aq)} + 2Cl^-_{(aq)} + H_2O_{(l)} + S_{(s)} + SO_2(g)$.

$S_2O_3^{2-}(aq) + 2H^+_{(aq)} \longrightarrow H_2O(l) + S(s) + SO_2(g)$.

Net ionic eqn: $S_2O_3^{2-}(aq) + 2H^+_{(aq)} \longrightarrow H_2O_{(l)} + S_{(s)} + SO_2(g)$

The spectactor ions are Cl^- and Na^+. 4 marks

7. a). Data given.

Volume of gas (v) = $288cm^3 = 0.288dm^3$

Molar volume (GMV) = $22.4\ dm^3$

Mass of metal = required ~~from b~~ } - - - 0.5 mark

From balanced chemical reaction

$Mg_{(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_2(g)$ - - - - 0.5 mark

But

$n = \frac{\text{Volume of } H_2}{\text{Molar volume}}$ - - - - - 0.5 mark

$n = \frac{0.288\ dm^3}{22.4\ dm^3/mol}$.

$n = 0.013$ moles of H_2 - - - - 0.5 mark

Then;

1mol of mg = 1mol of H_2

$x = 0.013$ mol of H_2

$x = 0.013$ mol of metal - - - - 0.5 mark

Recall.

$n = \frac{\text{Mass of metal}}{\text{Molar mass}}$

n. Molar mass = Mass. - - - - 0·5 mark

Mass = 0·013 × 24

Mass = 0·31g

∴ The mass of metal = 0·31g. - - - - - 1 mark

b) i). Gas x is Hydrogen gas (H_2) - - - 1 mark

Gas z is Oxygen gas (O_2) - - - - 1 mark

ii). Gas z is collected by downward delivery or upward displacement because it is denser than air. 1 mark

iii). Uses of gas x are

- Used in environment, to that the sewage plant.
- Used in manufacturing of steel from Iron metal cutting and Glass making.
- Used in chemical process. for example manufacture of synthesis fuels and manufacture of chemicals such as acid and oxides. Any two points @ 1 mark = 2 marks

8. a). $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$

The role played by catalyst is to speed up the rate of formation of ammonia. ∴ 3 marks

b). $2H_2S_{(g)} + SO_{2(g)} \longrightarrow 2H_2O_{(l)} + 3S_{(s)}$ - 3 marks

c) i. Sodium / Potassium.

ii. Calcium. @ 01 mark = 03 mark

iii. Lead

SECTION C (30 marks).

9. a). i). Element A is Sulphur
Catalyst B is Vanadium penta oxide (V_2O_5)
Acid C is conc. H_2SO_4 (@ 2 marks = 6 marks

ii). Balanced chemical equation for the formation of sulphuric trioxide.

$$3SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g).$$ 4 marks

b). i). $CaCO_3(s) + HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O(g)$

ii). - Calcium chloride
- Carbondioxide gas.
- Water. (@ 2·5 marks = 5 marks

10. a) The First Faraday's Law states that the mass of element deposited at the electrode varies proportional to the quantity of electricity passed through the electrolytes. While Faraday's second Law states that if the same amount of electricity is passed through different electrolytes, the mass of ions deposited at the electrode are direct proportional to the chemical equivalent. 5 marks

b). Ionization of silver at the cathode.

$$Ag^+(aq) + e^- \longrightarrow Ag(s)$$ ---- 02 mark

From:
1F = 96500c
x = 9650c } 1 mark

By cross multiplication = $\frac{1F \times 9650c}{96500c}$

= 0·1F ---- 02 mark

From the Ionization equation:

$1F = 108 g/mol$

$0.1F = x$

$$\text{Mass of Ag} = \frac{0.1F \times 108 g/mol}{1F}$$

$= 10.8 g$ — 2 marks

01 mark Volume of Oxygen $4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O^{2+}_{(g)} + 4e^-$

$4F = 22.4\ dm^3$

$0.1F = x$

By cross Multiplication

$$\frac{0.1F \times 22.4\ dm^3}{4F}$$ } 01 mark

$= 0.56 dm^3$ or $560 cm^3$

∴ The volume of oxygen gas is $0.56 dm^3$ or $560 cm^3$ 01 mark

II According to Le-Chatelier's principle, the rate of production of I can be altered by either of the following facts:

i). Change in concentration of reactants.

ii). Change in pressure

iii). Change in temperature.

iv). Addition of a catalyst.

15 marks