

PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
KAGERA REGION
FORM FOUR MOCK EXAMINATIONS -2023
CHEMISTRY 1- MARKING SCHEME

032/1

YEAR 2023

SECTION A (15 Marks)

1.

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

1@10=10 Marks

2. Matching items

(06 marks @01mark)

- i. B
- ii. C
- iii. A
- iv. D
- v. G
- vi. E

3. a)
- i. Problem identification
 - ii. Asking questions
 - iii. Hypothesis formulation
 - iv. Experimentation
 - v. Drawing conclusion

(05 mark @ 1 mark)

- b)
- (i) Physical change
 - (ii) Chemical change
 - (iii) Physical change
 - (iv) Chemical change

(4 marks @ 1 mark)

4. ⇒Faraday's first law of Electrolysis state that "The mass of a substance deposited or Liberated during electrolysis is directly proportional to the quantity of electricity passed through the electrolyte" **(1.5 Mark)**

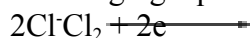
⇒Faraday's second law of electrolysis state that "When the same quantity of electricity is passed through solutions of different electrolytes, the mass of the substance liberated or deposited at the electrodes are directly proportional to the chemical equivalents of the substances" **(1.5 Mark)**

(b) Soln.

Data given.

Volume of chlorine gas produced during electrolysis = 5dm³

Discharging equation of Cl.



2F of Cl₂ = 22.4dm³ at STP

$$? = 5 \text{ dm}^3$$

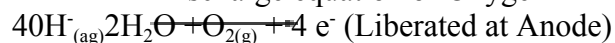
$$= \frac{2 F \times 5 \text{ dm}^3}{22.4 \text{ dm}^3}$$

$$= 0.4464F \text{ (02 Mark)}$$

Required:

(i) Volume of O_2

Discharge equation of Oxygen



$$4F = 22.4 \text{ dm}^3 \text{ of } \text{O}_2 \text{ At STP}$$

$$0.4464F = ?$$

$$= \frac{0.4464 F \times 22.4 \text{ dm}^3}{4 F}$$

$$= 2.49984 \text{ dm}^3$$

$$= 2.5 \text{ dm}^3 \text{ (02 Mark)}$$

The volume of O_2 produced = 2.5 dm^3

(ii) Mass of Cu

Discharge equation of Cu



$$2F = 64 \text{ g of Cu}$$

$$0.4464F = ?$$

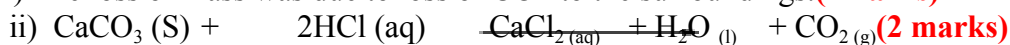
$$= \frac{0.4464 F \times 64 \text{ g}}{2 F}$$

$$= 14.28 \text{ g}$$

(02 Mark)

Mass of Copper = 14.28g

5.(a) i) The loss of mass was due to loss of CO_2 to the surroundings. **(1marks)**



iii) Mass remained constant because the reaction ended since the marble was finished. **(1 marks)**

(b) i) Water cycle

(ii) Steam engines

(iii) Refrigeration / Air condition

(iv) Refinery

(v) Drying of materials

(vi) Metallurgy **any 5 points (1 @ marks)**

6. (i) Ammonia gas **(2 marks)**

(ii) $\text{NH}_4\text{Cl (s)} + \text{Ca(OH)}_2 \text{ (s)} \xrightarrow{\text{heat}} \text{CaCl}_2\text{(aq)} + 2\text{H}_2\text{O (l)} + 2\text{NH}_3\text{(g)}$ **(2 marks)**

(iii) Because is soluble in water **(1 marks)**

(iv) When a glass rod is dipped in concentrated Hydrochloric acid is placed at the mouth of a gas jar
Containing Ammonia dense white fumes of Ammonium chloride are formed **(2 marks)**



(v) When ammonia gas is passed over heated copper (II) oxide the gas is oxidized to Nitrogen while the copper (II) Oxide is reduced to copper.



7. (a) i) The brand of Uhai is more hard **(1 mark)**

Because; it contains high amount of Ca^{2+} ions, Mg^{2+} ions and SO_4^{2-} ions **(1 mark)**

ii) Calcium makes the teeth and bones hard **(1 mark)**

iii) Chlorine **(1 mark)**

(b)

Symbol	Mn	O
% Composition by mass	49.5	50.5
Its relative atomic mass	55	16
Dividing % composition by its R.A.M	$\frac{49.5}{55} = 0.9$	$\frac{50.5}{16} = 3.156$
Dividing by smallest value	$\frac{0.9}{0.9} = 1$	$\frac{3.156}{0.9} = 3.5$
Converting to whole number	$1 \times 2 = 2$	$3.5 \times 2 = 7$

The empirical ratio of Mn: O is 2:7

Therefore, the empirical formula is Mn_2O_7 **(5 marks)**

8. (a) (i) Because when sodium is exposed in air react vigorously with water and air. **(1 mark)**

(ii) Because is slightly soluble in water / less denser than air. **(1 mark)**

(b) (i) solution

Data given

Mass of $\text{FeCl}_3 = 16.25\text{g}$

Molar mass of FeCl_3

Given Fe = 56 Cl = 35.5

Molar mass of $\text{FeCl}_3 = (56 + 35.5 \times 3)$

$= (56 + 106.5) \text{ g/mol}$

$= 162.5 \text{ g/mol}$

$$\text{Number of moles of } \text{FeCl}_3 = \frac{\text{Mass}}{\text{Molar mass}} = \frac{16.25\text{g}}{162.5\text{g/mol}}$$

$$= 0.1 \text{ mol of } \text{FeCl}_3$$

Then $\text{FeCl}_3 \longrightarrow \text{Fe}^{3+} + 3\text{Cl}^-$

Number of ions $= (1 + 3) = 4$

1 mole of $\text{FeCl}_3 = 4 \text{ mol of Ions}$

0.1 mol of $\text{FeCl}_3 = ?$

$$= \frac{4 \text{ moles of Ion} \times 0.1 \text{ mol}}{1 \text{ mol}}$$

= 0.4 mol of ions

$$L_A = 6.02 \times 10^{23}$$

$$\begin{aligned} \text{Number of particles} &= n \times L_A \\ &= 0.4 \text{ mol} \times 6.02 \times 10^{23} \\ &= 2.408 \times 10^{23} \text{ ions} \quad (3.5 \text{ mark}) \end{aligned}$$

$$\underline{\text{Number of ions present} = 2.408 \times 10^{23} \text{ ions}}$$

(ii) Solution

Mass of H_2O = 1.8g

Molar mass of H_2O = ?

Given H = 1 O = 16

$$\begin{aligned} \text{Molar mass of } \text{H}_2\text{O} &= 1 \times 2 + 16 \\ &= 2 + 16 \\ &= 18 \text{ g/mol} \end{aligned}$$

$$\begin{aligned} \text{Number of moles } \text{H}_2\text{O} &= \frac{\text{Mass}}{\text{Molar mass}} = \frac{1.8 \text{ g}}{18 \text{ g/mol}} \\ &= 0.1 \text{ mol} \end{aligned}$$

$$L_A = 6.02 \times 10^{23}$$

$$\begin{aligned} \text{Number of particles (molecules)} &= n \times L_A \\ &= 0.1 \text{ mol} \times 6.02 \times 10^{23} \text{ molecules} \\ &= 0.602 \times 10^{23} \text{ molecules} \end{aligned}$$

(3.5 mark)

$$\underline{\text{Number of molecules present} = 6.02 \times 10^{22} \text{ molecules}}$$

9. (a) The type of pollution shown in the figure is water pollution. (2 marks)

(b) Causes of this type of pollution.

- i. Pesticides
- ii. Fertilizer
- iii. Oil spills
- iv. Mining
- v. Sediments
- vi. Industrial processes
- vii. Sewage
- viii. Poisonous gases and metals
- ix. Marine debris

Any four (4) points (1@= 4marks)

(c) The effects of this type of pollution.

- i. Spread of water born disease
- ii. Eutrophication due to nutrient pollution
- iii. Death of underwater organisms
- iv. Loss of quality of water.
- v. Exposure to oil or its constituent chemicals can alter the ecology of aquatic habitats and physiology of marine organisms
- vi. Mercury has serious effects on human health, especially young children and unborn babies

Any three (3) points (1.5 @ = 4.5 marks)

(d) Measures that should be taken to prevent this type of pollution

- i. Reducing the use of fertilizers and pesticides
- ii. Treating sewage and industrial waste

- iii. Stopping deforestation
- iv. Controlling coastal development
- v. Reducing pollution from oil spills
- vi. Reducing the use of mercury
- vii. Cleaning up existing and abandoned mines
- viii. Cleaning up pollutants.

Any three (3) points (1.5 @ = 4.5 marks)

10. (a) stages in the extraction of less reactive metals includes: **(1.5@= 6 marks)**

- i. Mining and concentration of ore
- ii. Roasting the ore in air
- iii. Reduction
- iv. Purification

(b) The ores that are commonly used in the extraction of iron metals include: **(0.5@= 02marks)**

- i. Haematite (Fe_2O_3)
- ii. Magnetite (Fe_3O_4)
- iii. Spatic iron (FeS)
- iv. Iron pyrite (FeCO_3)

(c) i) Two reducing agents in the blast furnace include;

- Carbon monoxide (CO)
- Carbon (coke)**(01@= 02 marks)**

ii. Step 1: $\text{C} + \text{O}_2 \longrightarrow \text{CO}_2$

It is of great importance because it leads to production of carbon dioxide which later combines with carbon to form carbon monoxide, which the acts as a reducing agent.

Step 2: $\text{CO}_2 + \text{C} \longrightarrow 2\text{CO}$

It is important since it leads to production of CO (carbon monoxide) which later reduces Fe_2O_3 to form Fe .

Step 3: $\text{Fe}_2\text{O}_3 + 3\text{C} \longrightarrow 2\text{Fe} + 3\text{CO}$

It is important since carbon acts as a reducing agent where it reacts with Fe_2O_3 to form iron**(03 marks)**

iii. Substance L is Limestone (CaCO_3)**(1 mark)**

iv. $\text{CaCO}_3 + \text{CaO} \longrightarrow \text{CaO} + \text{SiO}_2 + \text{CaSiO}_3$ (Slag)**(1 mark)**

11. Introduction

- ✓ Good introduction by giving out the meaning of plant nutrients, the nutrients that are required in large quantity**(2 marks)**
- ✓ Maize plant may lose its nutrients from the soil in any of the following ways;
 - i. Soil erosion
 - ii. Monocropping
 - iii. Overgrazing and overstocking
 - iv. Deforestation
 - v. Burning of vegetation
 - vi. Leaching
 - vii. Poor farming methods

Six point with good explanations(12 @ 2 marks)

- ✓ Any good conclusion **(1 mark)**