PRESIDENT'S OFFICE, REGIONAL ADMINISTRATIVE AND LOCAL GOVERNMENT.

KILOMBERO DISTRICT FORM IV- PRE-NATIONAL.

CHEMISTRY MARKING SCHEME.

SECTION A:

1.
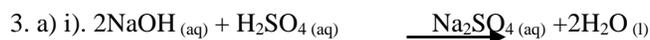
I	ii	Iii	iv	v	Vi	vii	viii	ix	x
C	C	C	B	B	B	A	A	A	D

1 Mark @   Total 10 marks

2.

i	ii	Iii	iv	v
E	F	I	C	H

1Mark@ Total 5 marks

SECTION B:

3. a) i). $2NaOH_{(aq)} + H_2SO_4_{(aq)} \longrightarrow Na_2SO_4_{(aq)} + 2H_2O_{(l)}$

1Mark

ii). $CaCO_{3(s)} \longrightarrow CaO_{(s)} + CO_{2(g)}$
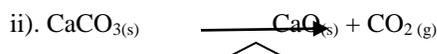
1Mark

b) i). Potassium nitrate decomposes to give potassium nitrate and oxygen. That is;

$2KNO_{3(S)} \xrightarrow{\text{heat}} 2KNO_{2(s)} + O_{2(g)}$

1.5 Marks

.Zinc nitrate decompose by heat to give zinc oxide, nitrogen dioxide and oxygen. That is;

$2Zn(NO_3)_{2(s)} \xrightarrow{\text{heat}} 2ZnO_{(s)} + 4NO_{2(s)} + O_{2(g)}$

1.5 Marks

ii) The nitrate of zinc and potassium behave different on heating because of their different position in the reactivity series of metals.

Potassium is very reactive metal compared to zinc and it never found as free element. (2 Marks)

4.a) i) Wood ashes contain calcium carbonate which is in alkaline compound that neutralizes acid.   (2 marks).

ii) . Potassium carbonate (K2CO3)

. Sodium carbonate (Na_2CO_2)

.Magnesium carbonate $(MgCO_3)$ (Any four, Total 2marks

.Calcium carbonate $(CaCO_3)$ 0.5 mark @.)

.Magnesium sulphate $(MgSO_4)$
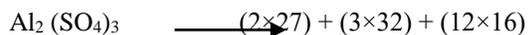
b)   Solution

From the formula

$$N = n.L_A \ldots\ldots\ldots (i)$$

- The dissociation of salt;

$$Al_2(SO_4)_3 \longrightarrow 2Al^{3+} + 3SO_4^{2-}$$

From ionization equation of the salts, the total number of ions = 5 (this 2 from positive and 3 from negative ions.)

- The molar mass of the salt.

$$Al_2(SO_4)_3 \longrightarrow (2\times27) + (3\times32) + (12\times16)$$

Molar mass = 342 g/mol.

- Amount of salt (n) = $\frac{Mass\ of\ salt}{Molar\ mass\ of\ salt}$

$$n = \frac{10g}{342g/mol}$$

n= 0.029mol.

Now if 1mol of $Al_2(SO_4)_3$ = 5 mol of ions.

0.029mol of $Al_2(SO_4)_3$ = ? moles of ions.

$$X = \frac{0.029mol \times 5 moles\ of\ ions}{1mol}$$

Moles of ions = 0.145mol   (1 marks)

Now from equation (i) above

$N = n.L_A$

$N = 0.145mol \times 6.02\times10^{23}ions/mol$

$N = 0.87 \times10^{23}ions$ OR 8.7×10^{22} ions. (2 marks)

: The number of ions in 10g of $Al_2(SO_4)_3$ = $0.87 \times10^{23}ions$ or 8.7×10^{22} ions. (2 marks)

Qn5. (a)

Elements	A	B	C	D
Atomic number	6	11	19	16
Number of protons	6	11	19	16
Number of neutrons	6	12	20	16
Mass number	12	23	39	32
Electronic configuration	2:4	2:8:1	2:8:8:1	2:8:6

(3 marks)

(b) (i) valence of element

A $\longrightarrow$ 4   (1.5 Marks) where @0.5 mark

B $\longrightarrow$ 1

D $\longrightarrow$ 2

(ii) chemical equation for reaction B and D

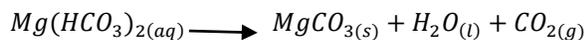$$2B + D \longrightarrow B_2D \quad \text{(1.5 Marks)}$$

(iii) C_2D (01 mark)

Qn 6. (i) Sample A because it is soften by boiling (1.5 marks)

(ii) Sample D because it does not soften by boiling (1.5 mark)

(iii) The hydrogen carbonates of calcium and magnesium ($CaCO_3 + MgCO_3$) (01 mark)

(iv) (a) $Ca(HCO_3)_{2(aq)} \longrightarrow CaCO_{3(aq)} + H_2O_{(l)} + CO_{2(g)}$ (1.5 marks)

OR

$$Mg(HCO_3)_{2(aq)} \longrightarrow MgCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$$

(b) $CaSO_{4(aq)} + Na_2CO_{3(aq)} \longrightarrow CaCO_{3(s)} + Na_2SO_{4(aq)}$ (1.5 marks)

Qn7. a) i) Faraday's first law states that, "The mass of the substance liberated or dissolved at electrode during electrolysis is directly proportional to the quantity of electricity passing through the electrolyte" (1 mark)

ii) Mathematical derivation

From Faraday 1st law:

Thus to say

M α Q

Where M = Mass of substance liberated (discharged)

Q = Quantity of electricity pass through electrolyte

But Q = It

Where I = magnitude of current supplied

t = the time of passing the steady current

Now, M α It…………(i)

By removing the proportional sign we introduce the proportional constant Z.

M = ZIt…………(ii)

But also from definition of 'Z'

$$Z = \frac{RAM}{V.F}$$

Now from equation (ii) above,
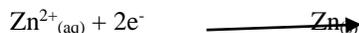
$$M = \frac{RAM.I.t}{V.F} \quad \text{(3 marks)}$$

b) Solution

Given that,

- Mass of metal = 28.86g
- Current (I) = 14.23A
- Time (t) = 8.0 hrs (1/2 marks)
- Required moles = ?

NB: The number of moles of electrons transferred during electrolysis to discharge one mole of an element is exactly the same as the valency of discharged element.

Now discharged equation:

$Zn^{2+}_{(aq)} + 2e^-$ ⟶ $Zn_{(s)}$

From faraday's first law.

$M = \frac{RAM.I.t}{V.F}$

Make V the subject.

$V = \frac{RAM.I.t}{M.F}$

$V = \frac{65 \times 14.23 \times \times 8.0 \times 60 \times \times 60}{28.86 \times 96500C}$

V = 9.56v ≈ 10 moles

<u>10 moles of electrons will be required.</u>   (2.5 marks)

8. i) $HCl_{(aq)} + \times_2CO_{3(aq)}$ ⟶ $2\times Cl_{(aq)} + H_2O_{(l)} + CO_{2(g)}$ (1 marks)

ii) a) Given that,

- Molarity of acid (ma) = 0.2 M
- Volume of acid (va) = 50.0 cm^3
- Number of mole of acid (na) 2
- Volume of base (Alkali) (vb) = 70.0 cm^3
- Number of mole of base (nb) = 1
- Required (mb) Molarity of base = ?

From the formula,

$\frac{MaVa}{MbVb} = \frac{na}{nb}$

$Mb = \frac{MaVa.nb}{Vb.na}$

$Mb = \frac{0.2m \times 50.0cm \times 1}{70.0 \times 2}$ (1.5 marks)

Mb = 0.07M ≈ 0.1M

<u>Concentration of $\times_2CO_3$ in moldm^{-3} = 0.1M</u>

8) b) In gdm^{-3}

From

$$\text{Molarity} = \frac{Concentration}{Molar\ mass}$$

Concentration = Molarity× Molar mass

Concentration = 01M×106g/mol

$\qquad$ = 0.1mol/dm^3× 106g/mol

Concentration = 10.6 g/dm^3

$\qquad$ OR

For those who use 0.07M

Concentration = 7.42g/dm^3 (1.5 marks)

iii) Molar mass = (Sum of RAM of compound)

Molar mass = (Sum of ×$_2$CO$_3$)

106 = 2x+12+48

106 = 2x+60

2x + 60 = 106

2x = 106- 60

2x = 46

$$\frac{2x}{x} = \frac{46}{2}$$

X = 23.

Relative atomic mass of x = 23 (1 mark)

iv)

Name	Symbol
Sodium (0.5 mark)	Na (0.5 mark)

v)

Period	Group
3 (0.5 mark)	I (mark)

9) a) i) Solid fuel

- Fire wood
- Charcoal (Any two of these, 0.5 mark @)
- Coal
- Coke

ii) Gaseous fuel

- Biogas
- Producer gas   (Any two of these, 0.5mark@)
- Water gas
- Natural gas

b)i) Because according to Le chatelier's principle , if a system involving gaseous reactant and product in equilibrium and pressure is increased, the system will readjust itself by shifting the equilibrium to the side that produces less gas molecules thus from left to right hence favoring a greater yield of methanol.   (2 marks)

ii) All is negative this means that this reactions is exothermic. (2 marks)

iii) A low temperature will give a better yield of methanol because for an exothermic reaction lowering temperature favour the reaction that produces heat. (2 marks)

10. LABORATORY PREPARATION OF OYGEN.
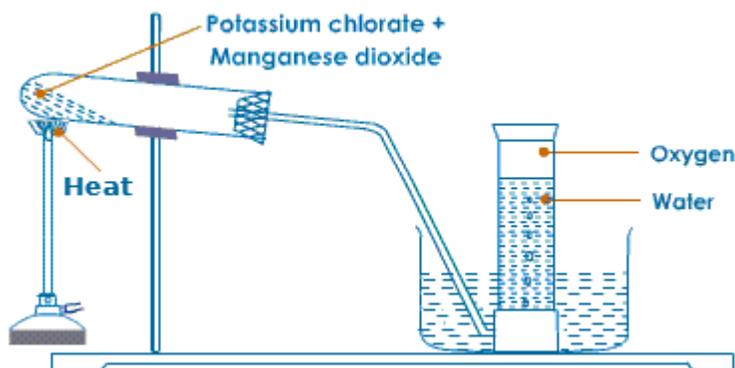
11. a) Oxidation state is the number of electrons a particular element has lost, gained or shared on forming a compound (1 mark)

b) i) $NH_4\underline{Cl} = 0$

    $-3 + (^+1 \times 4) + Cl = 0$

    $-3 + 4 + Cl = 0$

Cl = +3-4

<u>Cl = -1</u> (2 marks)

ii) $Al_2\underline{O}_3 = 0$

$(+3\times2) + 3O = 0$

$+6 + 3O = 0$

$\frac{3O}{3} = \frac{-6}{3}$

<u>O = -2</u> (2marks)

Iii)$Na\underline{S}O_4 = 0$

$(+1\times2) + S + (-2\times4) = 0$

$+2 + S + (-8) = 0$

$+2+ S = +8$

$S = +8-2$

<u>S = +6</u> (2marks)

12. a) i) A homologous series is a series of compounds related to each other by showing similar chemical reaction.

   ii) Hydrocarbons Are organic compounds composed of carbon and hydrogen only.

   iii) Isomerism is the existence of two or more compounds with the same molecular formula but different structural formula.   (total of 3 marks, 1 mark @)

   b) i) $H_3C-CH_2-CH_2-CH_3$ Butane.

                              (1mark)

12 b)   CH$_3$

ii) $H_3C-C-CH_3$ 2-methyl methane.   (1mark)

            H
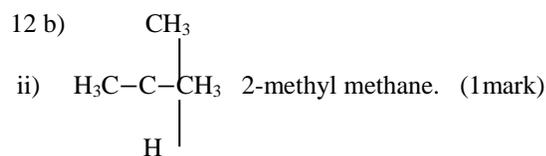
 c) A – Ethane

    B – Ethene

    C – Ethanol   (1mark @, total 4 marks)

    D – Ethyne

              SECTION C

13. The stages or process involve in the extraction of metal

    a) Concentration of ore

    b) Roasting of the ore   (Any four with description 3 marks @)

    c) Reduction

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d) Purification/ refining

No. the extraction of gold is done only through the last procedures (purification of metal) because gold is very unreactive metal hence occur as free element.(2marks)

14. Introduction (2marks)

Water pollution: Is addition of substance in the water bodies that make it harmful for livingthings.

Causes

- Agricultural wastes
- Oil spills
- Industrial process
- Sediments   (Any four point, 4 marks)
- Mining
- Sewages
- Heat

Effect of water pollution.

- Water bone disease.
- Nutrient pollution
- Damage to the nerves and reproductive system   (any four point 4marks, 1 mark@)
- Thermal pollution

Remedial measure and protective.

- Reducing nutrient pesticides pollution
- Treating sewage and industrial waste   (Any four points 4 marks, 1 mark @)
- Controlling coastal development
- Stopping deforestation
- Reducing pollution from oil spills.

Conclusion. (1 mark)