

THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE - REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

SIMIYU REGION

MISAN ACADEMIC DEVELOPMENT PROGRAM

FORM THREE JOINT ROUTE TO ANNUAL EXAMINATIONS, OCTOBER-2019

032

CHEMISTRY - MARKING SCHEME

1.	Qr No	i	ii	iii	iv	v	vi	vii	viii	ix	x
	Answers	D	B	A	A	E	A	B	B	C	A

@ 1 marks = 10 marks

2.	LIST A	i	ii	iii	iv	v	vi	vii	viii	ix	x
	LIST B	F	A	B	H	C	/	/	/	/	/

@ 0.5 marks = 0.5 marks

3. @ (i) Empirical formula is the simplest formula which express its composition by mass. (0.1 marks)

(ii) Molecular formula - is the chemical formula which show the actual number of each atoms of each element in the compound or molecule. (0.1 marks)

(b) Given

Molecular weight = 303 g/mol.

Asked the Simplest formula and molecular formula

Solution

Elements	Lead	Sulphur	Oxygen
Symbols	Pb	S	O
% composition	8.32	1.28	2.56
Ar of elements	207	32	16
% comp ÷ Ar	$\frac{8.32}{207}$	$\frac{1.28}{32}$	$\frac{2.56}{16}$
Divide by smallest	$\frac{0.04}{0.04}$	$\frac{0.04}{0.04}$	$\frac{0.16}{0.04}$
whole value	1	1	3.8

(03 marks)

3 (b) Molecular formula = (Empirical formula)_n

but

$$(E.F)_n = \text{Molecular weight}$$

$$(PbSO_4)_n = 303$$

$$(207 + 32 + 64)n = 303$$

$$(207 + 96)n = 303$$

$$303n = 30n$$

$$n = 1$$

∴ Molecular formula = $(PbSO_4)_1$

(0.2 marks)

∴ Molecular formula of compound Z is $PbSO_4$.

4. (a) i) Potassium ~~Na~~ K

ii) Calcium = Ca

iii) Sodium = Na (@ 1 mols = 0.4 mols)

(iv) Lead = Pb

(b) Electronic configuration of:

(i) $Cl^- = 2:8:8$

(ii) $Ca^{2+} = 2:8:8$ (@ 1 mols = 0.3 mols)

(iii) Na = 2:8:1

5. (a) (i) Metals are used as reducing agents because they lose or supply electrons to other element hence reduce their oxidation state (0.5 marks)

(ii) Metals are used as conductors of electricity because their smallest particles are electrons which carry electric charges of electricity (0.5 marks)

(b) (i) Sodium

(ii) Calcium

(iii) Copper

(iv) Zinc (@ 0.1 mols = 0.4 mols)

6. (i) M is Hydrogen gas (01 marks)
 (ii) Gas M is tested by burning it in air to produce POP sound (01 marks)
 (iii) Gas M is collected by downward displacement of water because
 \Rightarrow it is less dense than water and slightly soluble (01 marks)

(iv) - Delivery tube - Thistle funnel
 - Flat bottomed flask - Gas jar (6 points @ $\frac{2}{2}$ marks = 3 marks)
 - Bee hiveshelf - Trough

(v) - It is used in weather balloons
 - It is used in manufacture of ammonia
 - It act as a source of fuel. (any 1 point = 1 mark)

7. (i) Mole is the amount of substance which contains as many elementary particles as there are ^{atoms} in 12g of carbon-12 isotope.
 (ii) Molar solution - Is the solution contains one mole of solute in 1 dm³ (01 marks = 02 marks)

(b) (i) Data:

mass of Oxygen atom = 16g
 molar mass of Oxygen atom (O) = 16g/mol
 Asked number of moles

Formula

$$n = \frac{m}{M}$$

$$= \frac{1.6g}{16g/mol} = 0.1 mol$$

\therefore Mole of Oxygen atom = 0.1 mol (01 marks)

(ii) Data:

mass of Cl₂ = 7.1g
 M(Cl₂) = 71g/mol

Asked n = ?

Formula

$$n = \frac{m}{M} = \frac{7.1g}{71g/mol} = 0.1 mol$$

\therefore Mole of Cl₂ = 0.1 mol (01 marks)

(iii) Data

mass of Carbon = 6g
 M. mass of carbon = 12g/mol

Asked n = ?

Formula

$$n = \frac{m}{M}$$

$$= \frac{6g}{12g/mol}$$

$$= 0.5 mol$$

\therefore Mole of carbon = 0.5 mol (01 marks)

7 (i) Date

Mass of Na = 0.23g

Molar mass of Na = 23g/mol

$N_A = 6.02 \times 10^{23}$ molecules/mol

Asked number of particles (N)

From

$$N = n N_A$$

but $n = \frac{m}{M}$

$$N = \frac{m}{M} \cdot N_A$$

$$= \frac{0.23}{23} \times 6.02 \times 10^{23}$$

$$= 0.01 \times 6.02 \times 10^{23}$$

$$\therefore = 6.02 \times 10^{21} \text{ atoms (0.1 mol)}$$

(ii) Date

Number of moles (n) of HCl = 5mol

$N_A = 6.02 \times 10^{23}$ atoms/mol

Asked $N = ?$

from

$$N = n N_A$$

$$= 5 \text{ mol} \times 6.02 \times 10^{23} \text{ atoms/mol}$$

$$= 30.1 \times 10^{23} \text{ atoms}$$

$$= 3.01 \times 10^{24} \text{ atoms}$$

(0.1 moles)

8. @ Given

elements - atomic numbers

- A - 6
- B - 8
- C - 17
- D - 20

@. Electronic configuration/structure of

A = 2:4, B = 2:6, C = 2:8:7 and D = 2:8:8:2

(@ $\frac{1}{2}$ mols = 0.2 mols)

(b) (i) AB_2 (0.1 mols)

(ii) DC_2 (0.2 mols)

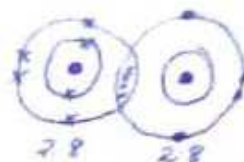
(c) Before combination

Atom B + Atom B



After combination

A molecule of B_2



(0.2 mols)

9 @ (i) Base is the chemical compound of an oxide or hydroxide of metals
 or
 is the chemical substance which when dissolved in water forms hydroxide (OH⁻) as the negative ion.

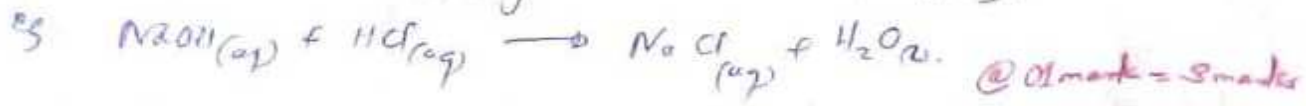
(ii) Acid is the chemical compound which when dissolved in water forms hydrogen (H⁺) as the positive ion. @ 01 mark = 2 marks

(b) Acid react with metal to form salt and hydrogen gas.



- Acid react with carbonates to form salt, water and carbon dioxide gas.
 eg. $H_2SO_4(aq) + CaCO_3(s) \rightarrow CaSO_4 + H_2O + CO_2(g)$

- Acid react with bases to form salt and water only.



- (c) - Treatment of insect stings and bites
- It is applied in relieving indigestion
- it is used in soil treatment

any 2 points @ 1 mark = 2 marks

10 @ Data

- $M_a = 0.1M$
- $V_a = 25cm^3$
- $V_b = 23cm^3$

$M_b = ?$
 from Equations



- $N_a = 1$
- $N_b = 1$

Then

from $\frac{M_a V_a}{M_b V_b} = \frac{N_a}{N_b}$

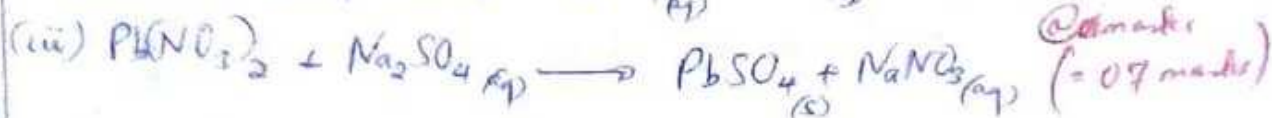
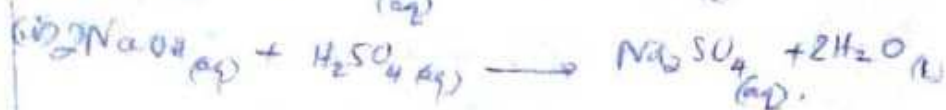
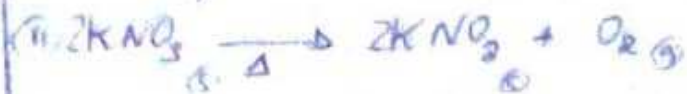
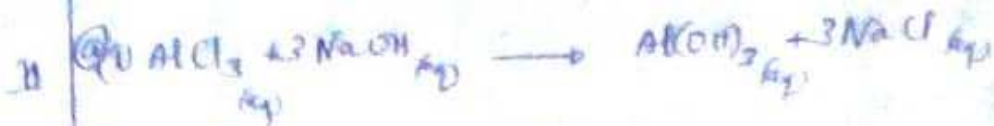
$M_b = \frac{M_a V_a N_b}{V_b N_a}$

$= \frac{0.1M \times 25 \times 1}{23 \times 1} = 0.108M$

but in v/d = ...

10. (b)

- (i) methyl orange (MO)
- (ii) Any indicator
- (iii) Phenolphthalein (POP)



12. (a) Faraday's first law states that "When the quantity of an electricity is passed through an electrolyte, the mass of an element deposited or liberated is directly proportional to the quantity of electricity." (0.1 marks)
 i.e. $m \propto Q$.

(b) Data

$A_r = 88$

$I = 0.5\text{A}$

$t = (32 \times 60) + 10 = 1930\text{sec}$ (0.5 marks)

Actual mass = 0.44g

(i) Asked the charge of Faradays = $V = ?$

From

$m = \frac{A_r I t}{V \cdot F}$ (0.5 marks)

$V = \frac{A_r \cdot I t}{m \cdot F} = \frac{88 \times 0.5 \times 1930}{0.44 \times 96500}$

$= 2$

∴ Number of faraday needed = 2F (0.1 marks)

(c) Formula of hydroxide of X = X(OH)_2 . (0.1 marks)

(ii) Three uses of electrolysis -
 = In electroplating
 = Purification of metals
 = Production of gases
 = Manufacture of elements
 (any 3 @ 0.1 marks)
 = 3 marks

13.

Essay: HARD WATER.

(i) Meaning:

Hard water is the water which does not form lather when washing with soap. (02 marks)

(ii) Types:

→ Temporary hard water: Causes: dissolved hydrogen carbonate of Magnesium and Calcium. (02 marks)

→ Permanent hard water: Causes: Soluble sulphates of Calcium and Magnesium. (02 marks)

(iii) Two methods:

⇒ Heating/Boiling

⇒ Addition of Calcium hydroxide (Lime water) (any 2 points @ 01 marks)

⇒ Distillation process

⇒ Addition of Washing soda (Na_2CO_3) for permanent hardness water.

(iv) Advantages of hard water:

⇒ It provides useful calcium for growth and development of bones and teeth. (any 3 points @ 01 marks)

⇒ It tastes better

⇒ It is used in formation of strong shells and eggs in aquatic animals.

⇒ It forms limestone which acts as insulators for corrosion.

(v) Disadvantage of hard water

- Wastage of soap

- Scum deposition on utensils and clothes

- Marks on clothes

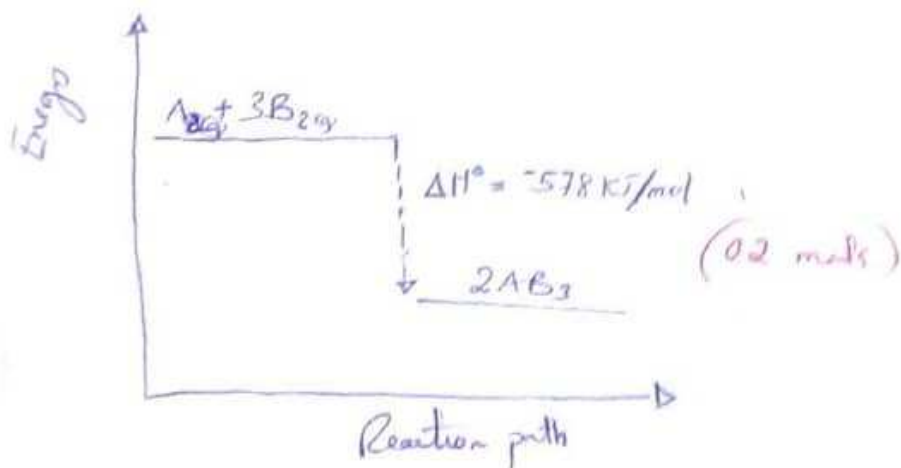
- Formation of fur on kettles and pans

(any 2 points @ 01 marks)

14. @ (i) Rate of chemical reaction is the measure or extent to which the reaction occurs per unit time (01 marks)
 (ii) Reversible reaction - is the reaction which proceeds either direction. (01 marks)

- (b) The reaction will shift from RHS to LHS (Backward reaction)
 (ii) The reaction will shift from RHS to LHS (Backward reaction)
 (iii) No change in equilibrium position (@ 1 marks) = 04 marks
 (iv) The reaction is exothermic reaction

(c) ENERGY LEVEL DIAGRAM FOR EXOTHERMIC REACTION (01 marks)



(d) Le Chatelier principle states that "If a system is in equilibrium and one of the factors affecting it altered, the position of the equilibrium will shift so as to counteract that effect" (02 marks)

- (e) (i) Catalyst - speeds up the rate of reaction
 (ii) Temperature: Increase in temp increases the rate of reaction.
 (iii) Concentration of reactants: Increase in concentration increases the rate of reaction.
 (iv) Surface area of the reactant powder increases the rate of the reaction. (@ 01 marks) = 04 marks

