PRIME MINISTER'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
DAR ES SALAAM AND GEITA REGIONS
FORM FOUR INTERSCHOOL PRE – MOCK EXAMINATION APRIL 2026

032/1 **CHEMISTRY 1 – MARKING GUIDE**

SECTION A (16 MARKS)

Q1. **[01 mark @ = 10 marks]**

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

Q2. **[01 mark @ = 6 marks]**

LIST A	i	ii	iii	iv	v	vi
LIST B	F	H	B	G	C	E

SECTION B (54 MARKS)

3. **a).** Although Sulphur dioxide is an oxide it can be further oxidized.

(i) Equations and conditions for further oxidation of SO_2 $2SO_{2(g)} + O_{2(g)} \xrightarrow{\Delta} \mathbf{V_2O_5}$ $2SO_{3\,(s)}$ + heat

Then $2SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7 + H_2O$

Its usefulness is in preparation of Sulphuric acid. **[02 marks]**

b). Hydrogen is the most abundant element in the universe but it is highly flammable such that it can be used as source of energy**.** But it is not Considered feasible due to challenges in;

(i) **Production**: It requires too much energy input as it must be separated from its Compound Such as H_2O and natural gas

(ii) **Storage**: It is very light and takes up space, it has to be compressed at high pressure

(iii) Transport and Safety: due to its property of light and Flammable it makes it impossible as it ignites more easily and can burn with an almost invisible Flame **[02 marks]**

c). When Concentrated Sulphuric acid is added to ethanol at temperatures between 170°C and 180°C it hydrates ethanol to give ETHENE and WATER.

$C_2H_5OH_{(aq)} \xrightarrow[\mathbf{170^oC}]{\mathbf{H_2SO_4}} CH_2 = CH_{2(g)} + H_2O_{(l)}$ **[01½ Marks]**

d). Some oxides are called Amphoteric oxides as they possess both acidic and basic properties. They can react with acid as a base to produce salt and water, also they can react with base as an acid to produce salt and water

Example – Al_2O_3, ZnO **[02 Marks]**

c). If a Copper anode is used, Copper will be deposited and transferred from Anode to Cathode and the electrolyte will remain unchanged.

At Anode;

$CuO_{(s)} \rightarrow Cu^2 + 2e$

At Cathode;

$Cu^2 + 2e \rightarrow Cu_{(s)}$ **[01½ Marks]**

4. a).

(i) **[01 mark]**

Mole	Stoichiometry ratio
Is the amount of Substance which contains as many particles entities as there are 12g in 12g of Carbon 12 Isotope	Is the relationship between the ratio of moles in reactant side and ratio of moles in a product side

(ii) **Data**

Mass of $Al_2(SO_4)_3$ = 15g

Molar Mass = 342g/mol **[01 mark]**

Equation of ionization

$Al_2(SO_4)_3 \rightarrow 2Al^{3+}_{(aq)} + 3SO^{2-}_{(aq)}$ **[01½ mark]**

1mole 2 moles 3 moles = 5moles

Number of moles in 15g = Mass given / Molar mass

= 15g / 342g/mol **[01 mark]**

= 0.0438 ≅ 0.044 Moles **[01½ mark]**

1 Mole of $Al_2(SO_4)_3 \rightarrow$ 5 ions

0.044 moles → ?

0.044 moles x 5 ion **[01½ mark]**

= 0.219 ions

But number of Ions = N_A = nL

N = 0.219 ions x $6.02X10^{23}$ mole

= $1.32\ X10^{23}$ mole of Ions **[01 Mark]**

Number of Ions Present in 15g of $Al_2(SO_4)_3$ is $1.32\ X10^{23}$ Ions

b). Data given

Number of moles of alum = 0.125 moles

Molar mass of $(NH_4)_2\ SO_4\ .\ Fe_2(SO_4)_3$ = 532g/mol **[01 mark]**

Formula

Number of moles = Mass given / Molar Mass **[01 Mark]**

Mass = Molar Mass × number of moles

= 0.125 Mole × 532g/mol **[01½ mark]**

The mass of Alum = 66.59g **[½ Mark]**

5. a). **[01 ½ @ = 3 marks]**

(i) It is yellow in color So it is easy to brighten the room

(ii) It burns quietly and is not very hot

b). **[Any 3 @ 2 = 06 Marks]**

(i) It is very hot

(ii) Does not produce soot

(iii) It has a blue flame and burns with noise

(iv) It has three zones

6. a). **[3 marks]**

Substitution reaction	Addition reaction
Is the reaction in which an atom or atoms are replaced by another atom or group of atoms. Example $CH_3\text{-}CH_{3(g)} + Br_2 \rightarrow CH_2Br\text{-}CH_2Br + H_{2(g)}$	Is the reaction that an atom is added to another, a new bond across double or triple bonds. Example $CH_2{=}CH_2 + H_{2(g)} \rightarrow CH_3CH_3$

b). Addition reaction in alkenes

(i) Hydrogenation reaction or Halogenation

e.g. $CH_2{=}\ CH_2 + H_{2(g)} \rightarrow CH_3CH_3$

$CH_2{=}CH_2 + Br_2 \rightarrow CH_2BrCH_2Br$ **[01½ mark]**

Halo hydrogenation (Halo halides)

e.g. $CH_2{=}CH_2 + HBr \rightarrow CH_3CH_2Br$ **[01½ mark]**

(ii) Alkynes

Halogenation of Ethyne

$CH \equiv CH_{(g)} + Br_{(g)} \rightarrow CHBr = CHBr_{(g)}$

$CHBr = CHBr + Br_2 \rightarrow CHBr_2 - CHBr_2$ **[01½ mark]**

Reaction with Hydrogen Halides

$CH \equiv CH + HBr \rightarrow CH_2 = CHBr$

$CH_2 = CHBr + HBr \rightarrow CH_3CHBr_2$ **[01½ mark]**

7. a). Atomic Radius (radii) **[½ mark]**
This is the distance between the nucleus of an atom the outermost stable shell.
Down the group **[01 mark]**
It increases due to increase in the number of shells
Across the period **[01 mark]**
It decreases due to Increase in number of electrons on the same shell causing by electron shielding.

b). Electronegativity **[½ mark]**
This is the ability of atom to attract electrons towards itself. Nonmetals have the ability to attract electron.
Down the group **[01 mark]**
It decreases due to increase in number of shells causing weak attraction of nucleus to weaken due to distance.
Across the Period **[01 mark]**
It increases due to increasing number of electrons on the same shell nearing the octate state (Noble gas).

c) Ionization Energy **[½ mark]**
Is the energy required to remove electron completely from the outer shell.
Down the group **[01 mark]**
It decreases down the group due to distance from the nucleus. The nucleus loses ability to hold electrons that are far example electrons in Shell number 4 or 5 are easily lost due to large distance between the nucleus and the outer shell.
Across the Period **[01 mark]**

Increases due to increase in number of electrons in the same shell causing nucleus to hold electron close as their nuclear charge and electron shield exerting the force to hold electrons together

d). Electro positivity **[½ mark]**
This is the ability of atom to lose electrons to other atoms from the outermost shell.
Down the group **[½ mark]**
It increases due to increase in number of shells causing weak nuclear attraction due to distance between the nucleus and outer stable shell.
Across the Period **[½ mark]**
It decreases due to increase in the ability to attract electron towards itself (electronegativity).

8. **a).** (i) Metals which are highly reactive Such as K, Na and Ca are extracted by electrolytic reduction as electrons are being added directly to the Metal ions at the Cathode**.**
[01½ mark] Also, they have a g high affinity for Oxygen, so they cannot be reduced by Carbon.

(ii) While Moderate reactive metals are extracted by reduction through reducing their oxides using Carbon**.** **[01 ½ mark]**

b). The difference in the Methods **[Any 3 difference 2@ = 6 marks]**

Key difference	Moderate reactive metals	Highly reactive metals
Extraction method	Reduced using Carbon or more reactive metal (Al)	Electrolytic reduction of molten ores
Reducing agent	Uses Carbon as a reducing agent	They require electrolysis at the Cathode for reduction
Ore type	Often found as Sulphides or Carbonates requiring roasting into oxides	Often extracted from Halides e.g. NaCl or oxide ores
Energy requirement	It requires heat	High electrical energy is required to break the bond

SECTION C (30 MARKS)

9. a). Four types of organic manures: **[01½ @ = 6 Marks]**
(i) Farmyard manure - Animal waste
(ii) Compost - decomposed waste

(iii) Green manure - Plowed-in cover crops
(iv) Vermicompost - worm processed waste

b). Most important effect of manure application are: **[Any 4 @ 01½ = 06 Marks]**
(i) Improves Soil Structure by increasing aeration and drainage between soil particles
(ii) They are not easily leached as they are released slowly into the soil
(iii) Humus from organic manure gives the soil characteristic black (dark coloration) hence maintaining of soil temperature
(iv) They provide food and shelter to soil Micro-organisms responsible for decomposition of organic matters

c). Minerals fertilizers commonly used in Tanzania: **[Any 3 @ ½ = 01½ Marks]**
(i) Nitrogenous fertilizers
(ii) Phosphatic fertilizer
(iii) Potassic fertilizer

Nutrient Provided are: **[Any 3 @ ½ = 01½ Marks]**
(i) Phosphorus
(ii) Nitrogen
(iii) Potassium

10. a).

Destructive distillation of Coal is the process whereby Coal is decomposed by heating in the absence of air to obtain Coke, gas and get rid of volatile matter. This can only be achieved in a furnace or kiln. **[01½ Marks]**

The coal is spread over the base through Charging floor, then Air is supplied through to ignite the coal. **[02 marks]**

The volatile matter escapes and bursts out inside the Stile door. This process takes 3-4 days to complete. The coke produced is cooled with water and taken out, and is used in extraction of Iron in the blast furnace. **[02 marks]**

The iron ore mixed with Coke and $CaCO_3$ are introduced into the furnace from the top. The Coke is burnt in hot air to form CO_2. The temperature in the furnace is between 200-800°C

$$C(s) + O_{2(g)} \rightarrow CO_{2(g)}$$ **[02 marks]**

The CO_2 formed react with more Coke to produce 2CO

$$CO_{2(g)} + C_{(s)} \rightarrow 2CO_{(g)}$$ **[02 marks]**

The CO formed is used to reduce Ferric oxide to Spongy iron. Therefore, Coke is the major reducing agent in Iron fusion

b). (I) Impurities found during extraction are: **[Any 3 @ 01½ = 4½ marks]**

(i) Sand
(ii) Lime stone
(iii) Quartz and Silicates
(iv) Carbonoxide
(v) Sulphur dioxide

(II) Impurities Should be Removed to Prevent Contamination. **[01mark]**

11. a). Definitions:

(i) Molar Solution

Is a solution which contains 1mole of a solute dissolved to Make 1 litre of the solution or 1 dm^3 of a solution **[01 mark]**

(ii) Molarity

Is the Concentration (g/dm^3) Per Molar Mass

OR

Is the number of moles of solute dissolved in a Certain volume of a solution. **[01 mark]**

(iii) Standard Solution

This is a solution of known Concentration and is expressed in Mole/Litre (Mol/dm^3) **[01 mark]**

b). Data given:

Concentration of acid = 2M
Volume of dilute acid =
250cm^3 Molarity of dilute acid
= 0.5M Formula: Mc Vc = Md
Vd **Where:**
Mc = Concentration or Molarity of concentrated acid
Vc = volume of concentrated acid
Md = Molarity of dilute acid
Vd = volume of dilute acid

Calculation:

Vc = Md Vd / Mc **[01 mark]**

= 0.5 X 250 / 2 **[01 mark]**

= 62.5 cm^3

Volume of concentrated acid = 62.5 cm^3 **[01 mark]**

c). Data given:

Density = 1.42g/cm^3

% Purity = 63

Molarity of dilution = 0.2M

Volume of dilution = 250 cm^3

(i) Molarity of Concentration

1.42g → 1cm^3

? → 1000cm^3 **[01mark]**

= 1,420/cm^3 **[01mark]**

= 63/100 x 1420

= 894.6g/cm^3 **[01mark]**

But Molar mass of Nitric acid = 63.01g/mol

Molarity = Concentration (g/dm^3) / Molar Mass **[01 mark]**

= 894.6g/dm^3/ 63.01g/mol **[01mark]**

Molarity of Concentrated Acid = 14.19mol/dm^3 **[01mark]**

(ii) Volume of acid required to Prepare 250cm^3 of 0.2M acid solution

Formula:

Vc = M V d / Mc **[01mark]**

Calculation:

V = 0.5M X 250cm^3 / 14.19 **[01mark]**

= 8.809 cm^3

Volume of Concentrated Nitric acid required to dilute IS 8.81cm^3 **[01mark]**