PROPOSED MARKING GUIDE

Name..... Signature.....

School..... Index No..... 0701-853468

545/2
CHEMISTRY
Paper 2
2 hours

WAKISSHA

Uganda Certificate of Education

CHEMISTRY

Paper 2

2 hours

INSTRUCTIONS TO CANDIDATES;

- *Section* **A** *consists of* **10** *structured questions. Answer* **all** *questions in this section.*

  Answers to these questions **must** *be written in the spaces provided.*

- *Section* **B** *consists of 4 semi – structured questions. Answer any* **two** *questions from this section.*

  Answers to section **B** *must be written in the answer booklet/sheets provided and stapled at the back of the question paper.*

- *Show all your working clearly in both sections.*
  Where necessary use;
  [Ca = 40, K=39, C = 12, O = 16, H = 1, Molar gas volume at s.t.p = 22.4dm^3]

For examiner's use only														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

SECTION A

Answer all questions in this section.

1. (a) Name the physical method by which a mixture of Iron and Sulphur can be separated. (1 mark)

Use of a magnet ✓✓ (01) Accept; Filtration (since sulphur can dissolve in Carbon disulphide while iron doesn't)

Reject; Magnetism

(b) A mixture of Iron and Sulphur was strongly heated,

(i) Write equation for the reaction that took place. (1½marks)

$Fe_{(s)} + S_{(s)} \longrightarrow FeS_{(s)}$ ✓✓ (01½)

- Deduct ½ for missing state symbol.
- Deny marks for unbalanced equation.
- Check for chemical symbols.

(ii) State the differences between the mixture of Iron and Sulphur and the compound formed in (b) (1mark)

- The mixture can be separated by physical means while the compound by chemical means. (01)
- Iron and sulphur components in a mixture are physically combined while in a compound they are chemically combined
- No change in mass as a mixture is formed while in a compound there is a change in mass when being formed.

accept any equivalent.

2. (a) Hydrogen gas burns in air to form a colourless liquid Z

(i) State how colourless liquid can be identified in the laboratory. (1½marks)

By adding anhydrous Copper(II) sulphate to the colourless liquid.

Observation; The white powder of anhydrous copper(II) sulphate turns blue. (01½)

Accept; anhydrous Cobalt(II) Chloride.

(b) The colourless liquid was added to an hydrious iron (II) chloride.

(i) State what was observed. (1mark)

The white (crystals) solid dissolved forming a green solution. (01)

Accept; Dirty yellow crystals dissolve forming a green solution.

(ii) Write ionic equation for the reaction that took place. (1mark)

$Fe^{2+}_{(aq)} + 6H_2O_{(l)} \longrightarrow Fe(H_2O)_6^{2+}{}_{(aq)}$ ✓✓ (01)

Accept; $FeCl_{2(s)} + 6H_2O_{(l)} \longrightarrow FeCl_2 \cdot 6H_2O_{(s)}$. (Pale green)

3. (a) State two non – crystalline allotropes of carbon. (2marks)

Wood charcoal. ✓
Animal charcoal ✓ (02)

any equivalent
- Sugar charcoal.
- Lamp black.
- Coke

(b) Which property of carbon is put to use when making

(i) Leads of pencil (½mark)

Graphite is black and opeque (01½)

(ii) Gas masks (½mark)

Wood charcoal is a porous solid and a good absorbent of gases. (01½)

(c) Name the oxides of carbon that is used in

(i) bread making (½mark)

Carbon dioxide (01½)

Reject; Carbondioxide

(ii) reduction phase in the extraction of iron. (½mark)

Carbon monoxide (01½)

Reject; Carbonmonoxide

Part of the periodic table is shown below.

I	II	III	IV	V	VI	VII	VIII
X							
Z			E		F		
U	P			R		T	

(a) (i) Write down the electronic configuration of element F and R (2marks)

Element F 2,6 ✓ (01) Accept: 2:6 or 2)6 Rej: 2;6

Element R 2,8,5 ✓ (01) Accept: 2:8:5 or 2)8)5 Rej: 2:8

(b) Formula of the compound formed between

(i) P and T (1mark)

PT_2 ✓ (01)

(ii) E and F (1mark)

EF_2 ✓ (01)

(c) How does the process of bond formation in the compounds formed between P and T and E and F differ? (1mark)

In formation of PT_2, there is electron transfer (01) of valence electrons from P to T

In formation of EF_2, there is sharing of valence electrons among E and F atom

(d) Which element in group 1 is most reactive? (½mark)

U ✓ (01/2)

5. A stream of carbon monoxide was passed over 40g of heated oxide of iron. The residue weighted 28g (O = 16 Fe = 56)

(a) Calculate the number of moles of the

(i) Iron (1½mark)

56g of Iron contain 1 mole ✓

28g of Iron Contain $\left(\frac{1 \times 28}{56}\right)$ moles ✓ (01½)

$= 0.5$ moles ✓ (1½mark)

Accept; Use of formula

(ii) Oxygen in the oxide. (2marks)

Mass of Oxygen in the oxide = (40 − 28) g

= 12g ✓

16g of Oxygen Contain 1 mole ✓

12g of Oxygen Contain $\left(\frac{1 \times 12}{16}\right)$ moles ✓ (01½)

$= 0.75$ moles

(iii) the empirical formula of the oxide of iron.

Elements	Fe	O
Moles	0.5	0.75
Mole ratio	$\frac{0.5}{0.5}$ ✓	$\frac{0.75}{0.5}$
	$\frac{0.5}{2 \times 0}$	1.5 ✓

Simplest ratio 2 : 3 ✓

Empirical formula of oxide is Fe_2O_3 ✓ (02)

(b) Write equation for the reaction that took place between the Iron and Carbon monoxide. (1½marks)

$Fe_2O_3(s) + 3CO(g) \longrightarrow 2Fe(s) + 3CO_2(g)$ ✓ (01½)

Accept (↓)

6. (a) Define reduction in terms of electrons. (1mark)

Is the gaining of electrons (01) from another specie / substa

Turn Over

(b) Complete the following half reactions and in each case state whether the reaction is a reduction or an oxidation reaction.

(i) $O_{(g)} + 2e \longrightarrow$ $O^{2-}_{(g)}$ ✓ (01) Reduction ✓ (1mark)

(ii) $Mg_{(s)} +$ 2e ✓ $\longrightarrow Mg^{2+}$ (01) Oxidation ✓ (1mark)

Reject; 2e⁻

(iii) $2Cl^- + 2e \longrightarrow$ $2Cl^-_{(g)}$ ✓ (01) Reduction ✓ (1½marks)

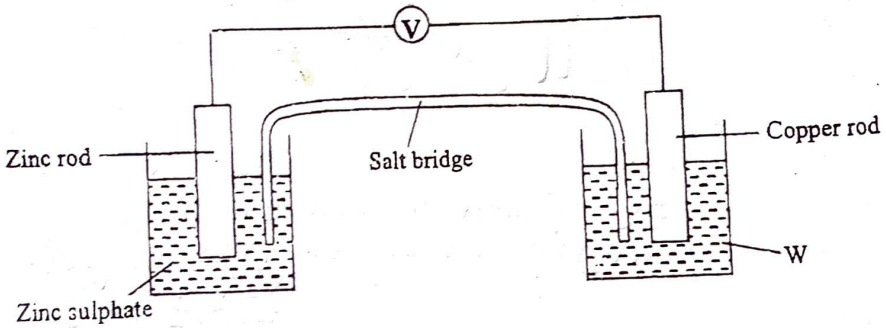
(2 marks)

7. (a) Differentiate between the terms Anode and Cathode. (02)

Anode is a Carbon or metal rod at which electrons leave the electrolyte while Cathode is a Carbon or Metal rod at which electrons enter the electrolyte ✓

Accept; Anode is a positively charged electrode while cathode is negatively charged electrode.

(b) Figure below shows a simple Daniel cell.



Which rod is acting as the

(i) Cathode; (1 mark)

Copper rod. ✓ (01)

(ii) Anode (1 mark)

Zinc rod ✓ (01) ✓ (0½)

(c) (i) Name the electrolyte W Copper(II) Sulphate solution (½ mark)

Accept; Any Soluble salt / solution of copper.

Reject; if solution is missing

(ii) State the role of the salt bridge in the cell. (1 mark)

To complete the circuit ✓ (01)

Accept; To allow exchange/flow of ions

(d) Write the equation for the overall cell reaction. (1½ marks)

$Zn_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$ ✓✓ 01½

8. Burning magnesium was separately lowered into gas jars of Nitrogen and carbon dioxide.

(a) Write equations for the reactions that took place between magnesium and (1½ marks)

(i) Carbon dioxide

$2Mg_{(s)} + CO_{2(g)} \longrightarrow 2MgO_{(s)} + C_{(s)}$ ✓✓ 01½

(ii) Nitrogen
$3Mg_{(s)} + N_{2(g)} \rightleftharpoons Mg_3N_{2(s)}$ (1½ marks) 01½

(b) State the property of magnesium demonstrated in a(i) above. (1mark)
Magnesium is a reducing agent. 01

(c) The solid product in a (ii) was dissolved in water and gas x was produced.

(i) Name the gas produced. (1 mark)
Ammonia gas. 01

(ii) State how gas x can identified in the laboratory. (1½ marks) 01½
Gas X forms dense white fumes with Concentrated hydrochloric acid.

9. (a) What is meant by the term permanent hardness in water? 01 (1mark)
Is the type of hardwater containing magnesium sulphate or Calcium sulphate

(b) Addition of washing soda is a simple chemical method of removing hardness from water.

(i) What is the chemical name for washing soda? (1mark)
Hydrated Sodium Carbonate 01 Accept; Sodium Carbonate decahy

(ii) Write ionic equation for the action of washing soda on permanent hardness of water. (1½ marks)
$Mg^{2+}_{(aq)} + CO_3^{2-}_{(aq)} \rightarrow MgCO_{3(s)}$ 01½
Accept; $Ca^{2+}_{(aq)} + CO_3^{2-}_{(aq)} \rightarrow CaCO_{3(s)}$

(iii) Name one physical method that can be used to remove permanent hardness. (1mark)
Distillation. 01

10. (a) (i) Name one substance that is reacted with sulphuric acid to produce sulphur dioxide gas in the laboratory. (1mark)
Sodium sulphite crystals. 01

(ii) Write equation for the reaction leading to the formation of sulphur dioxide. (1½ marks) 01½
$Na_2SO_{3(s)} + H_2SO_{4(aq)} \rightarrow Na_2SO_{4(aq)} + SO_{2(g)} + H_2O$
Accept; Ionic equation

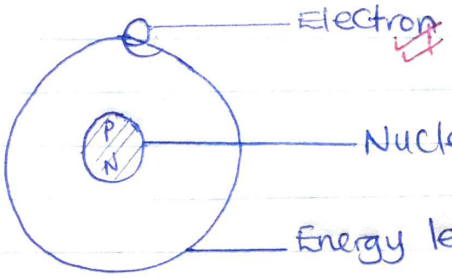
(b) Sulphur dioxide was passed through a solution containing acidified potassium dichromate.

(i) State what was observed. (1mark) 01
Orange solution turned into a green solution.

(ii) Name the property of sulphur dioxide demonstrated by the reaction in (b) above. (1mark)
Sulphur dioxide is a reducing agent. 01

QUESTION 11.

(a)



02

P- Protons , N- Neutrons.

(b) (i) Isotopes. 01

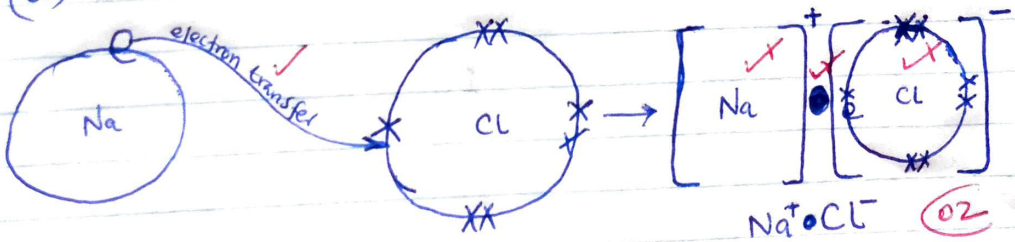
(ii) Similarity; Both have the same atomic number 02
Difference; X and W have different mass number.

(iii) X and W have different number of neutrons but same number of protons. 01

(iv) Chlorine 01
Accept; Oxygen, Carbon, Bromine

(c) For Chlorine 2, 8, 7 02
For Sodium 2, 8, 1
Accept; 2:8:7 or 2)8)7, 2:8:1 or 2)8)1

(ii)



$Na^+ Cl^-$ 02

Sodium Chloride	Chlorine molecule.
- formed by ionic bonding	- formed by covalent bonding.
- Has a relatively high melting point and boiling point	- Has a relatively low Boiling and melting point
- occurs as a giant ionic structure	- occur as simple molecular structure.
- solid at room temperature	- Gas at room temperature
- Conduct electricity in molten or aqueous state	- Does not conduct electricity.
- Has a relatively high density	

accept any one or equivalent

02

15 MARKS.

QUESTION 12.

(a)

(i) X ; Photosynthesis. ✓ 01

(ii) M ; Fermentation ✓ 01

(iii) Z ; Dehydration ✓ 01

(iv) U ; Hydrogenation ✓ 01

(v) O ; Complete combustion ✓ 01

(b) (i) M

$$C_6H_{12}O_{6(aq)} \xrightarrow{\text{Zymase}} 2C_2H_5OH_{(l)} + 2CO_{2(g)} + \text{heat}$$

✓✓ 01½

(ii) Z

$$C_2H_5OH_{(l)} \xrightarrow[170^\circ C]{\text{Excess. Conc. } H_2SO_4} C_2H_{4(g)} + H_2O_{(l)}$$

Accept; Even without conditions.

✓✓ 01½

(iii) O

$$C_2H_{6(g)} + \tfrac{7}{2}O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(g)} + \text{heat}$$

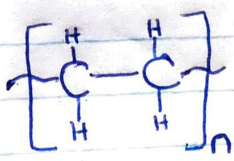
Accept unbalanced equation

✓✓ 01½

(c) (i) Hardening of margarine/oils. ✓ 01

(ii) Zymase enzyme. ✓ 01

(d) Polymerisation is the repeated combination/joining together of many small units (monomers) to form a large complex molecule (polymer). 01½

(ii) $n H_2C=CH_2 \xrightarrow[\text{High pressure, High temperature}]{O_2}$  ✓ 01

Accept; Even without conditions

(iii) Used as a packaging material ✓

OR / Used as a wrapping material

Used in manufacture of polyethene plastics. ✓ 02

15 MARKS.

QUESTION 13.

(a) A salt is a compound formed when part or all the ionisable hydrogen of an acid are replaced by a metal or ammonium radical. (01)

(b) (i) Neutralisation
Example; Zinc sulphate (from Zinc oxide as a base and warm dilute sulphuric acid) (01½)
Accept Equivalent

(ii) Double decomposition (01½) Accept; Precipitation
Example Lead(II) chloride.
Accept Equivalent

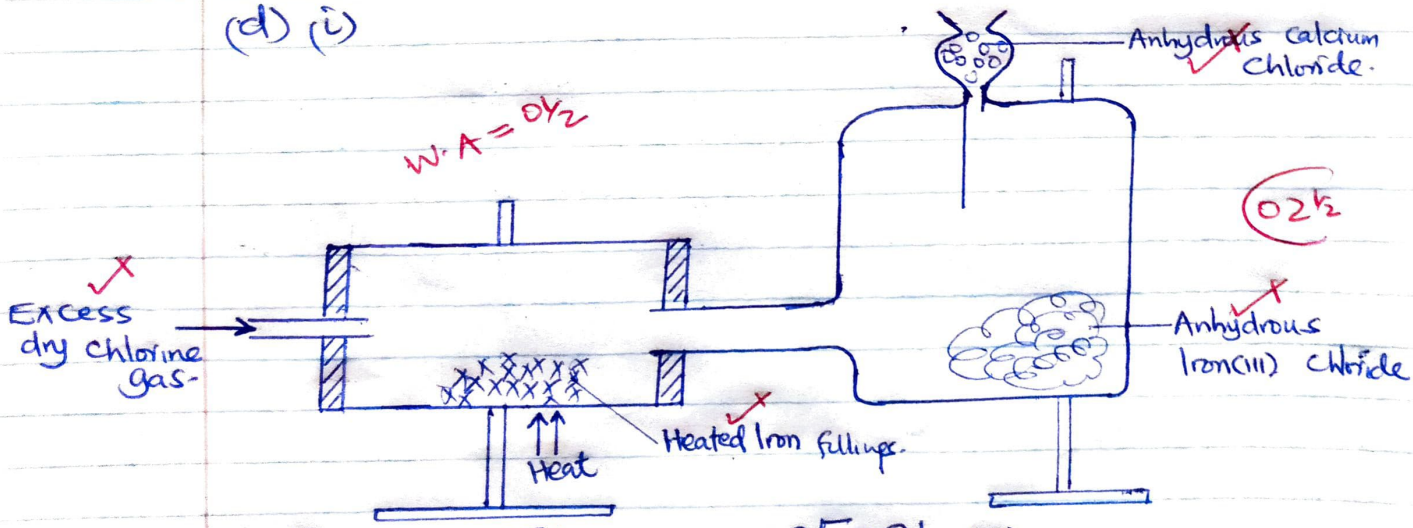
(c) Warm dilute sulphuric acid is put in a beaker.
Copper(II) oxide is added to the acid in a beaker little at a time while stirring until in excess.

$$CuO_{(s)} + H_2SO_{4(aq)} \longrightarrow CuSO_{4(aq)} + H_2O_{(l)}$$

The excess copper(II) oxide is filtered off.
The filtrate is evaporated to saturation until crystals form
The crystals are then cooled, washed with little cold distilled water.
The crystals are finally dried between two filter papers. (08)

$$CuSO_{4(s)} + 5H_2O_{(l)} \longrightarrow CuSO_4 \cdot 5H_2O_{(s)}$$

(d) (i)



(ii) $2Fe_{(s)} + 3Cl_{2(g)} \longrightarrow 2FeCl_{3(s)}$

15 MARKS.