

Candidate Name: _____

Centre Number		Candidate Number												

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Science
Paper 3 (Chemistry)

5124/3

Tuesday

12 JULY 2016

Additional materials:
Answer Booklet
Mathematical tables or
Electronic Calculator (non-programmable)

Time: 1 hour 15 minutes

Instructions to Candidates

Write your **name, centre number** and **candidate number** at the top of this page and all separate Answer Booklets used.

There are **11 questions** in this question paper.

Section A

Answer **all** the questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.

Write your answers on the separate Answer Booklet provided.

- 1 Fasten the separate Answer Booklet securely to the question paper.
- 2 Enter the numbers of the **Section B** questions you have answered in the grid.

Information for Candidates

The number of marks is given in brackets [] at the end of each question or part question.

The **Periodic Table** is on page 11.

Cell phones are not allowed in the Examination room.

Candidate's Use	Examiner's Use
Section A	
Section B	
Total	

Section A

[45 MARKS]

Answer all the questions in this section.

Write your answers in the spaces provided

1 All matter is made up of small particles which are referred to as the basic units of matter. The small particles of matter are always in random motion.

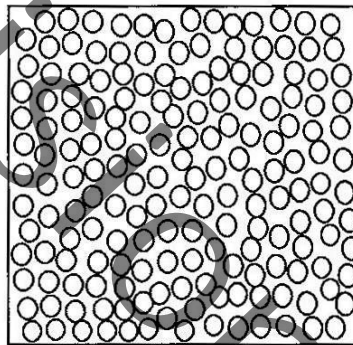
(a) State any **two** basic units of matter.

..... [2]

(b) Suggest **two** pieces of evidence which show that matter is made up of tiny, randomly moving particles.

..... [2]

(c) The diagram below represents one of the physical states of matter.



Name this physical state of matter and explain why it has a fixed volume.

Name:

Explanation:..... [2]

[Total 6]

2 Each of the following statements is incorrect. But if one scientific term is replaced by a correct one, the statement then becomes true. Identify the wrong word (term), underline it and in the space provided write the correct word.

(a) Condensation is the change of state of matter from solid to liquid.

..... [1]

(b) The basic units of matter that exist in sodium chloride are molecules.

..... [1]

(c) Isotopes are compounds with the same molecular formula but different structural formulae.

..... [1]

(d) Calcium hydroxide is classified as an amphoteric substance because it dissolves in sodium hydroxide solution.

..... [1]

(e) Zinc and chlorine bond covalently.

..... [1]

[Total 5]

3 Two elements **A** and **D** are represented by the notations shown below



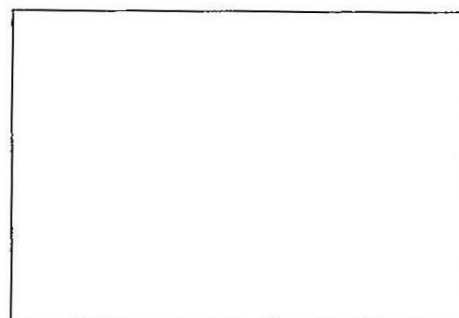
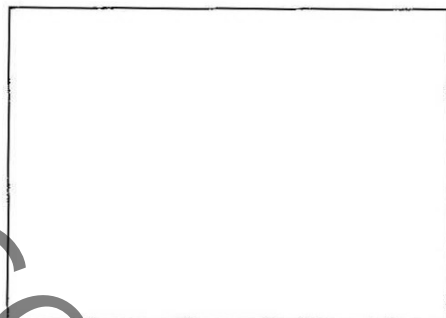
(a) Draw electron-shell diagrams to show the arrangement of electrons in the atoms of **A** and **D**.

Atom of element

Atom of element

A

D



[2]

(b) (i) When atoms of element **A** and atoms of element **D** react together, what type of bonding occurs?

Type of bonding: _____ [1]

(ii) Using the dot and cross diagrams, show the structure of the compound formed between **A** and **D** showing all the electron shells.



[2]

(c) State any **two** physical properties of the compound formed between **A** and **D**.

(i) [1]

(ii) [1]

[Total 7]

4 When carbon dioxide gas is bubbled through aqueous calcium hydroxide (lime water), the following reaction occurs:



(a) Write a word equation for this reaction.

.....

..... [1]

(b) If 1.2dm³ of carbon dioxide gas measured at r.t.p was bubbled through excess calcium hydroxide solution.

Calculate the:

(i) mass of calcium hydroxide solution which reacted.

(ii) mass of calcium carbonate formed.

[2]

[2]

(iii) Describe what would be seen as the carbon dioxide gas is bubbled through aqueous calcium hydroxide.

.....

..... [1]

[Total 6]

- 5 The following table shows some information about the **second** member in the respective homologous series. Complete the table by filling in the correct information.

Name of the homologous series	Name of the member	Displayed full structural formula
Alkenes		
	Ethanol	
		$ \begin{array}{c} \text{H} \quad \text{O} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array} $

[Total 6]

- 6 The diagram below shows part of the Periodic Table.

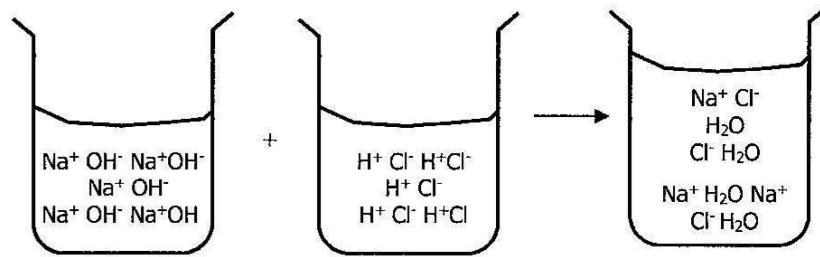
														H	He				
Li	Be													B	C	N	O	F	Ne
Na	Mg													Al	Si	P	S	C	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn								Kr

State the name of an element from this part of the Periodic Table which

- (a) forms univalent cations.
 [1]
- (b) reacts most vigorously with cold water.
 [1]
- (c) forms oxides of formulae XO and X_2O , where X represents the chemical symbol of the element.
 [1]
- (d) does **not** react with oxygen.
 [1]

[Total 4]

- 7 Solutions of hydrochloric acid and sodium hydroxide are mixed together and they react as shown below.



- (a) Write a balanced chemical equation for this reaction.

..... [1]

- (b) State the name for this type of reaction and write an ionic equation for it.

Type of reaction: [1]

Ionic equation: [1]

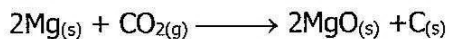
- (c) Describe how crystals of sodium chloride can be obtained from the solution formed during the reaction.

.....

 [2]

[Total 5]

- 8 When hot magnesium metal is introduced in a gas jar containing carbon dioxide gas, the carbon dioxide is decomposed and the following reaction occurs.



In this reaction, both oxidation and reduction occur.

- (a) What name is used to describe a reaction in which both reduction and oxidation occur?

..... [1]

- (b) State, with reason, which substance is oxidised and which substance is reduced.

(i) Substance oxidised:.....

Reason: [1]

(ii) Substance reduced.....

Reason [1]

- (c) Which substance is the reducing agent?

..... [1]

- (d) Classify the **two** types of oxides from the equation above.

(i)

(ii) [2]

[Total: 6]

Section B

[20 MARKS]

Answer any two questions

- 9** Copper is extracted from one of the ores, copper pyrites, CuFeS_2 . The copper pyrites is first converted to copper (I) sulphide before copper metal is produced.
- (a) Write down the equations leading to the formation of copper metal from copper pyrites. [2]
 - (b) Explain why this extraction leads to air pollution. [1]
 - (c) State the process used to purify copper. [1]
 - (d) State any **two** large scale uses of copper and give reasons why copper is used in that way. [4]
 - (e) (i) Copper occurs 'native' in some countries such as Zambia. Explain what is meant by the word 'native'. [1]
(ii) Name **one** alloy made from copper metal. [1]

[Total 10]

- 10** When a mixture of ammonium sulphate and sodium hydroxide is heated, the reaction represented by the word equation below occurs.

Ammonium sulphate + sodium hydroxide \longrightarrow sodium sulphate + water + ammonia.

- (a) Write a balanced chemical equation for the above reaction. [2]
- (b) Describe a chemical test you can carry out to show that ammonia is formed. [2]
- (c) On a large scale, ammonia is produced by the Haber process:
 - (i) What are the reactants used in the Haber process? [2]
 - (ii) Write a balanced chemical equation for the Haber process. [2]
 - (iii) State the essential conditions used in order to obtain an economical yield of the ammonia gas. [2]

[Total 10]

- 11** Propene ($\text{CH}_3 - \text{CH} = \text{CH}_2$) reacts with steam to give a major product propan-2-ol.
- (a) State the essential conditions in this reaction. [2]
- (b) State the kind of reaction that occurs between propene and steam. [1]
- (c) However, there is also a minor by-product formed in such a reaction. [1]
- (i) Give the full (displayed) structural formula and the systematic name of this by-product. [2]
- (ii) How is the major product separated from the minor product? [1]
- (iii) If 2.1kg of propene is fully reacted with steam. Calculate the mass of propan-2-ol that would be formed. [2]
- (d) State the general formula for alkenes. [1]

[Total 10]

DATA SHEET
The Periodic Table of the Elements

Group		I	II	III	IV	V	VI	VII	0
1	1	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> ¹ H Hydrogen 1 </div> </div>							
7	9	3	4	5	6	7	8	9	10
Li Lithium	Be Beryllium	B Boron	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon		
23	24	11	12	13	14	15	16	17	18
Na Sodium	Mg Magnesium	Al Aluminium	Si Silicon	P Phosphorus	S Sulphur	Cl Chlorine	Ar Argon		
39	40	19	20	27	28	29	30	35	36
K Potassium	Ca Calcium	Ga Gallium	Ge Germanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton		
85	88	37	38	43	44	45	46	51	54
Rb Rubidium	Sr Strontium	In Indium	Sn Tin	Sb Antimony	Te Tellurium	I Iodine	Xe Xenon		
133	137	55	56	61	62	63	64	69	72
Cs Caesium	Ba Barium	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	At Astatine	Rn Radon		
227	226	81	82	83	84	85	86		
Fr Francium	Ra Radium	Po Polonium	At Astatine	Rn Radon					

140	144	150	157	162	165	167	169	173	175
Ce Cerium	Nd Neodymium	Sm Samarium	Eu Europium	Dy Dysprosium	Ho Holmium	Er Erbium	Tm Thulium	Yb Ytterbium	Lu Lutetium
58	60	62	63	66	67	68	69	70	71
Th Thorium	U Uranium	Pu Plutonium	Am Americium	Cf Californium	Es Einsteinium	Fm Fermium	Md Mendelevium	No Nobelium	Lr Lawrencium
90	92	94	95	98	99	100	101	102	103

*58-71 Lanthanoid series
+90-103 Actinoid series

Key
 a = relative atomic mass
 X = atomic symbol
 b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).