CANDIDATE NAME _____ CLASS _____

MZUZU DIOCESE

2019 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK EXAMINATION

CHEMISTRY
PAPER I
(100 marks)

DATE: 3 APRIL 2019

Time Allowed: 2hrs
07:30 – 09:30 am

Instructions:

1. **This paper contains 14 pages. Please check.**
2. Fill in your **Name** at the top of each page.
3. This paper contains two sections A and B. In section A there are ten short answer questions while in section B there are three restricted Essay questions..
4. Answer all the thirteen questions in the spaces provided.
5. Use of electronic calculators are allowed
6. The maximum number of marks for each answer is indicated against each question.
7. In the table provided on this page, **tick** against the question number you have answered.
8. Hand in your paper to the invigilator when time is called to stop writing.

Question Number	Tick if Answered	Do not write in these columns	
1			
2			
3			
4			
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8			
9			
10			
11			
12			
13			

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SECTION 70 MARKS

Answer all the 10 questions in this section in the spaces provided below

1. a. State any one branch of chemistry.

_____ (1 mark)

b. **Figure 1** is a graph of atomic radius across the periods against atomic number for the first 20 element in the periodic table

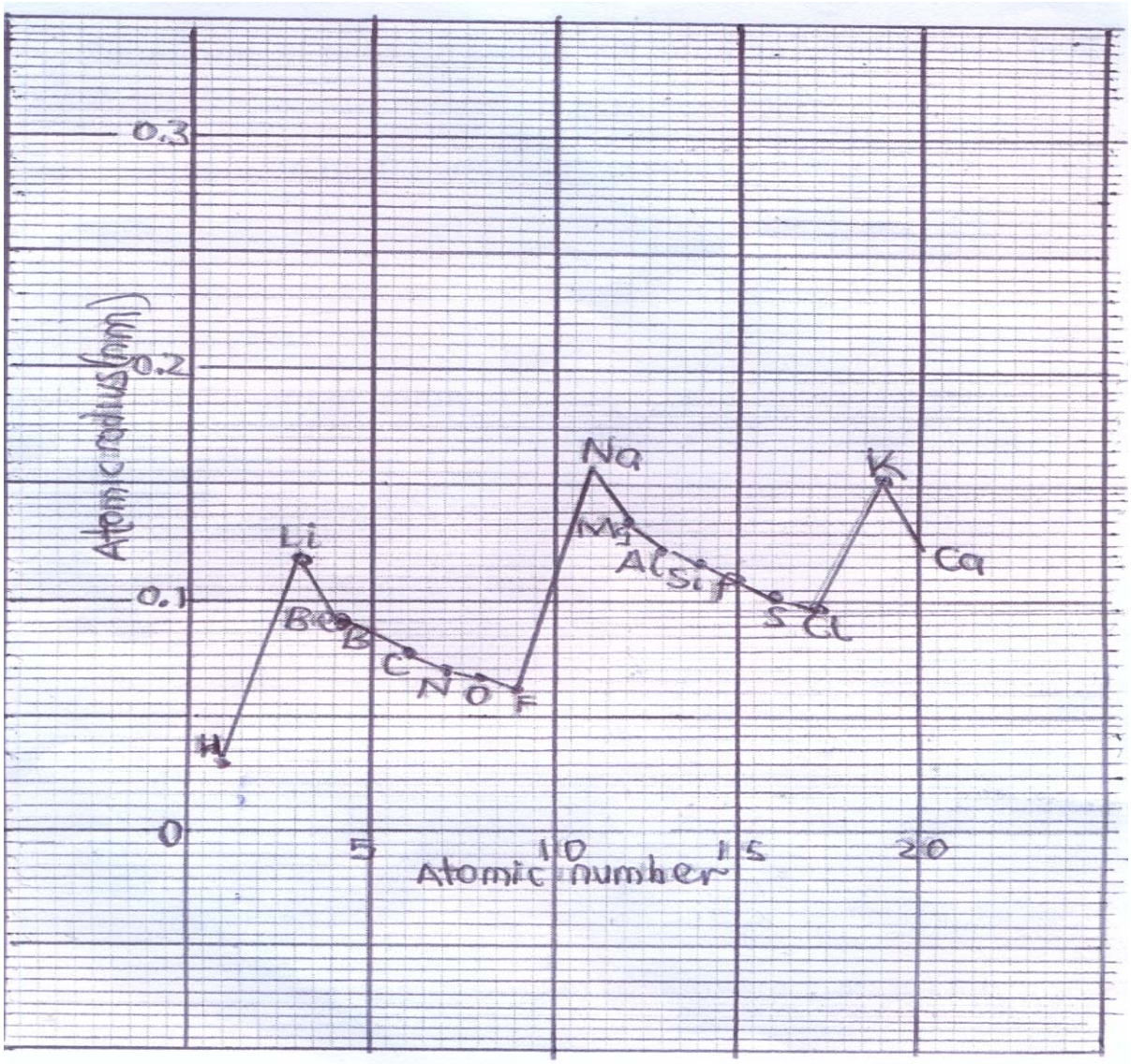


Figure 1

(i) Identify the atomic radius of Cl

_____1 mark

(ii) Why is there a sudden increase in atomic radius from Cl to K?

_____

_____(1 mark)

(iii) In terms of the periodic table explain why an atomic radius is different from an ionic size of the same element

_____

_____ (1marks)

c. Neon has natural isotopes with relative masses of 20amu, 21amu and 22amu and percentage abundances of 90.51%, 0.28% and 9.21%.

3 marks

d. Element X has a mass number of 24amu and atomic number 12.

i. To which group does element **X** belong

_____ (1 mark)

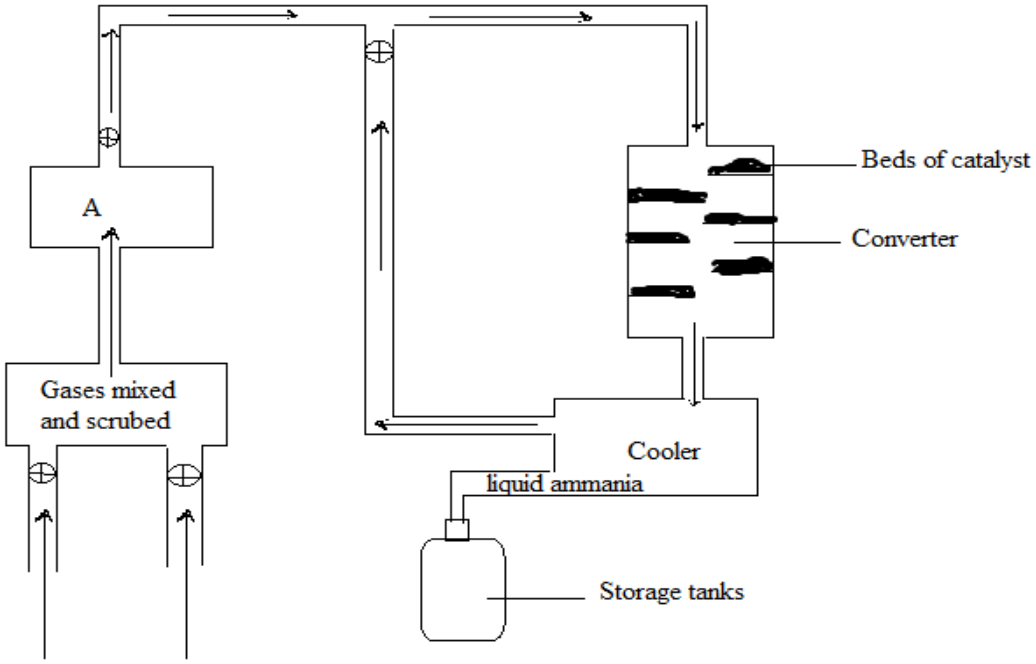
ii. Identify element **X** in the periodic table

_____ (1 mark)

iii. Derive a chemical formula of compound formed between element **X** and oxygen atom

(2 mark)

2. **Figure 2** below shows production of ammonia



a. i. Identify the process in **figure 2** above.

_____ (1 mark)

ii. List the **two** gases which are pumped into the system

_____

_____ (2 marks)

b. i. Give **any one** source of phosphorous

_____ (1 mark)

c. State any **one** product that is manufactured using phosphorous apart from fertilisers.

_____

_____ (1 mark)

d. Diamond and graphite are allotropes of carbon; explain why graphite conducts electricity while diamond does not.

_____

_____

_____ (2 marks)

3. a.i. Give any **two** metals used to form stainless steel

_____

_____ (2 marks)

Continued: /…

ii. Why is stainless steel used to make surgical instruments?

_____

_____

_____ (1 marks)

b. **Table 1** below shows bond energies of some elements. Use it to answer the questions below.

bond	**Energy(kj/mol)**
C-H	413
O=O	498
O-H	464
C=O	805

Methane reacts with oxygen to produce carbon dioxide and water according to the equation below.

$CH_{4(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(l)}$

i. Use the table of bond enthalpies to calculate bond breaking energy and bond making energy.

(3 marks)

ii. Identify the type of reaction

_____ (1 mark)

4. a. In a titration, 25cm^3 of hydrochloric acid (HCl) of an unknown concentration was titrated against 20cm^3 of 2m sodium hydroxide (2M NaOH) to which phenolphthalein was added.

i. Name the standard solution in the titration.

_____ (1 mark)

ii. Give a reason for the answer in 4a(i)

_____

_____ (1 mark)

b. When 2.34g of aluminium reacted with excess copper (II) sulphate solution 3.89g of copper were formed according to the equation

$$2Al_{(s)} + 3CuSO_{4(g)} \longrightarrow Al_2(SO_4)_3 + 3Cu_{(s)}$$

Calculate the percentage yield of copper in the reaction ,(Al = 27, Cu = 63.5)

(4 marks)

5. a. A 300 mg tablet of a drug was completely dissolved in 10ml of water. The molecular formula of the drug is $C_9H_8O_4$

i. Calculate the number of moles in the tablet (RAM: C 12, H = 1 and O = 16)

(3 marks)

ii. Calculate the molarity of the solution.

(2 marks)

6. **a. Given below are** formulae of some organic compounds **A**, **B**, **C** and **D.**

A. C_2H_5OH **B**. C_3H_6 **C**. C_2H_5COOH **D.** CH_3CHO

i. What kind of reaction process occurs between compound **A** and **C**.

_____ (1 mark)

ii. Name the product formed from the reaction in **a. (i).**

_____ (1 mark)

iii. Which compound has a general formula of RCHO?

_____ (1 mark)

b. i. Draw **any two** isomers of butene (C_4H_8)

(2 marks)

ii. Name the isomers in **6.b.i** above

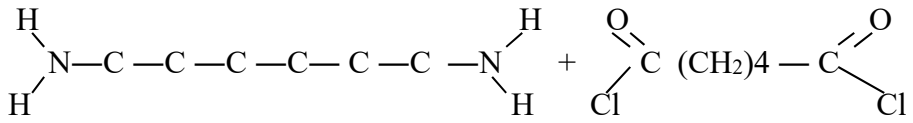
_____

_____

_____

(2 marks)

c. Polymerization of 1 – 6 diaminohexane and hexane 1 – 6 dioyl – dichloride takes place as follows



1 – 6 diamino hexane 1 – 6 dioyl - dichloride

i. Identify the type of polymerization in the reaction

_____1 mark

ii. Name the polymer

_____ (1 mark)

7. a. i. Describe any **two** social and economic benefits of recycling plastic wastes.

_____

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_____

_____(2 marks)

b. List down any **two** common pollutants of air

_____

_____ (2 marks)

c. Explain the term **'ion exchange'** in relation to the removal of permanent water hardness.

_____

_____

_____

_____ (3 marks)

d. State any **two** mitigation measures taken to reduce CFC_s

_____

_____ (2 marks)

8. Ammonia is an example of a strong base.

a. What is a "strong base"

_____

_____ (1 mark)

b. Write a chemical equation to show the ionisation of ammonia in water

_____ (2 marks)

c. Identify one conjugate acid – base pair from the equation in **8.b.**

_____

_____ (1 mark)

9. Given the following information, use it to answer the questions that follows

		E^o/Volts
$Cu^{2+}_{(aq)} + 2e^-$	$Cu_{(s)}$	+0.34
$O_{2(g)} + 4H^+_{(aq)} + 4e^-$	$2H_2O_{(l)}$	+1.23
$Ag^+_{(aq)} + e^-$	$Ag_{(s)}$	+0.80
$F_{2(g)} + 2e^-$	$2F^-_{(aq)}$	+2.87
$I_{2(g)} + 2e^-$	$2I^-_{(aq)}$	+0.54
$Mg^{2+}_{(aq)} + 2e^-$	$Mg_{(s)}$	-2.36

i. Show whether the reaction of Magnesium metal with copper nitrate solution will occur or not

(2 marks)

ii. Write the overall equation for the cell between magnesium and silver.

_____ (1 mark)

10. a. Work out the oxidation number of Mn in $KMnO_4$

(2 marks)

b. The following is an overall equation for the reaction of zinc metal and silver ions

$$Zn°(s) + 2Ag^{+}(aq) \longrightarrow 2Ag°(s) + Zn^{+2}(aq)$$

i. Identify

1) An oxidizing agent

_____ (1 mark)

2) A reducing agent

_____ (1 mark)

ii. What is the meaning of (+2) on $zn^{+2}(aq)$

_____ (1 mark)

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SECTION B 30 MARKS

Answer all the three questions in this section using the spaces provided

11. With the aid of a well labelled diagram explain how a mixture of ink or dye can be separated using chromatography.

_____

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_____ (10 marks)

12. With the aid of a well labelled diagram explain how the electrolysis of dilute sodium chloride solution occurs.(**hint**: the explanation should include type of reaction and discharge on each electrode and half equations)

_____

_____

_____

_____

_____ (10 marks)

13. Describe an experiment that you would conduct to determine the rate of a reaction by change in mass using calcium carbonate chips and hydrochloric acid solution.

(10 marks)

End of question!