NAME OF **STUDENT**: _____

MARANATHA HIGH SCHOOL ACADEMY

2021 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK EXAMINATIONS

CHEMISTRY

Subject Number: M038/I

July 2021 **Time Allowed: 2 hours**

1:30 – 3:30 pm

PAPER I
THEORY

(100 Marks)

Instructions:

1. **This paper contains 12 printed pages. Please check.**
2. Write 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 is allowed.
6. In the table provided on this page, **tick** against the question number you have answered

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

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Section A: (70 marks)

Answer **all** the questions in this section.

1. a). What is a "compound"?

_____

_____

(1 mark)

b). **Figure 1** below shows the allotropes of carbon A and B.

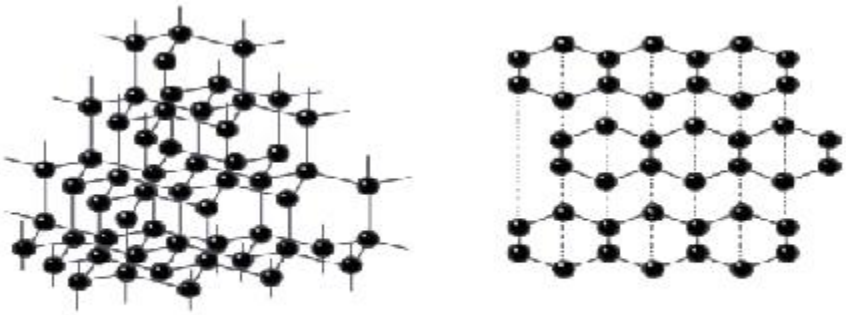

Figure 1

i) Define the term allotropy.

_____

_____

(1 mark)

ii) Name the allotropes **A** and **B.**

A _____

B _____

(2 marks)

iii) Mention **two** physical properties of allotrope **B**.

_____

_____

(2 marks)

iv) Describe **one** use of allotrope **A** in relation to its structure.

_____

_____

(2 marks)

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2. a). What is a "salt"?

_____

_____

(1 mark)

b). Mention any **two** methods that are used in the preparation of salts.

_____

_____

(2 marks)

c). Explain how the pH is regulated in the stomach.

_____

_____

_____

_____

(2 marks)

3. a). State any **one** way of determining the strength of an acid.

_____

(1 mark)

b). List any **two** examples of amphoteric oxides.

_____

_____

(2 marks)

c). Differentiate between a "weak acid" and a "strong acid".

_____

_____

_____

_____

(2 marks)

d). The conjugate acid-base pairs for the reaction between ethanoic acid and water are: CH_3COOH/CH_3COO^- and $H_2O\ /H_3O^+$.

(i). Write an equation for the reaction.

_____

(3 marks)

(ii). Explain how the H_3O^+ ion is formed.

_____

_____

_____

_____

(3 marks)

4. a). Mention any **two** chemical properties of alkanals.

_____

_____

(2 marks)

b). Write down the condensed formula of hexan-2-one.

(2 marks)

5. **Figure 2** shows molecular formulas of some organic compounds.

A: C_2H_6

B: C_2H_5OH

C: C_6H_{12}

D: $C_3H_7COOCH_3$

Figure 2

a). Classify the compounds as soluble or insoluble in water.

Soluble: _____

Insoluble: _____

(4 marks)

b). Which of the compounds would undergo addition reaction with chlorine gas.

_____

(1 mark)

c). Give a reason for the answer in **5 b).**

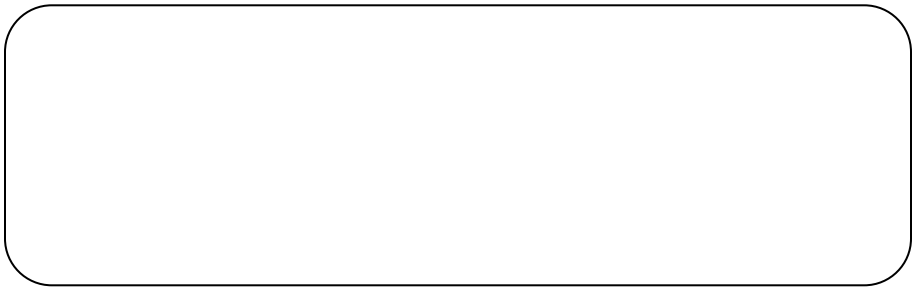
_____

_____

_____

(2 marks)

d). Draw the structure for compound **D**.



(2 marks)

e) Write down a balanced chemical equation for the reaction that produced compound **D**.

_____

(3 marks)

6. Describe how fermentation of sugar by yeast occurs.

_____

_____

_____

_____

(3 marks)

7. a). Differentiate a "pure covalent bond" from a "dative covalent bond".

_____

_____

_____

_____

(2 marks)

b). Calculate the molecular formula of a compound if its empirical formula is CH_2O and has a molar mass of 180g. RAM: C=12, H=1, O=16.

(4 marks)

8. **Figure 3** is an energy level diagram for the dissolving of sodium hydroxide (NaOH) in water.

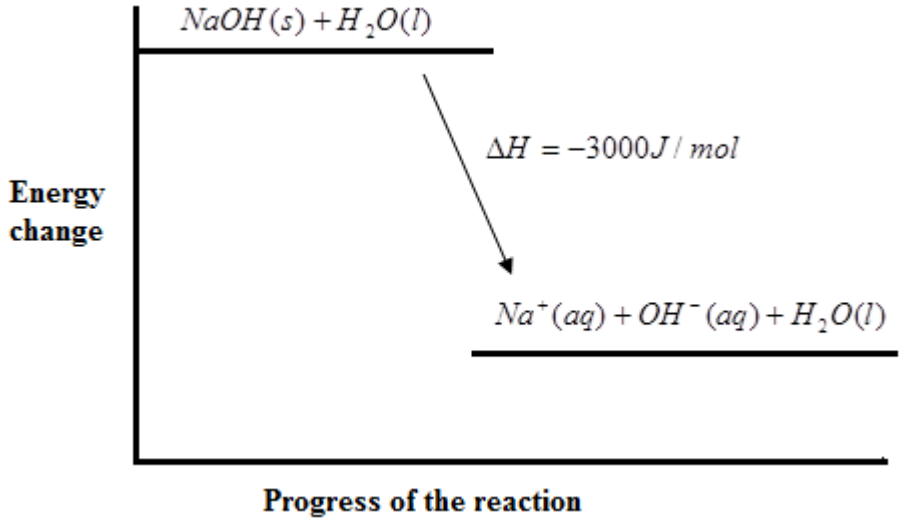


Figure 3

a). What type of change is shown by the energy level diagram?

_____

(1 mark)

b). Give a reason for the answer in **8 a)**.

_____

_____

(1 marks)

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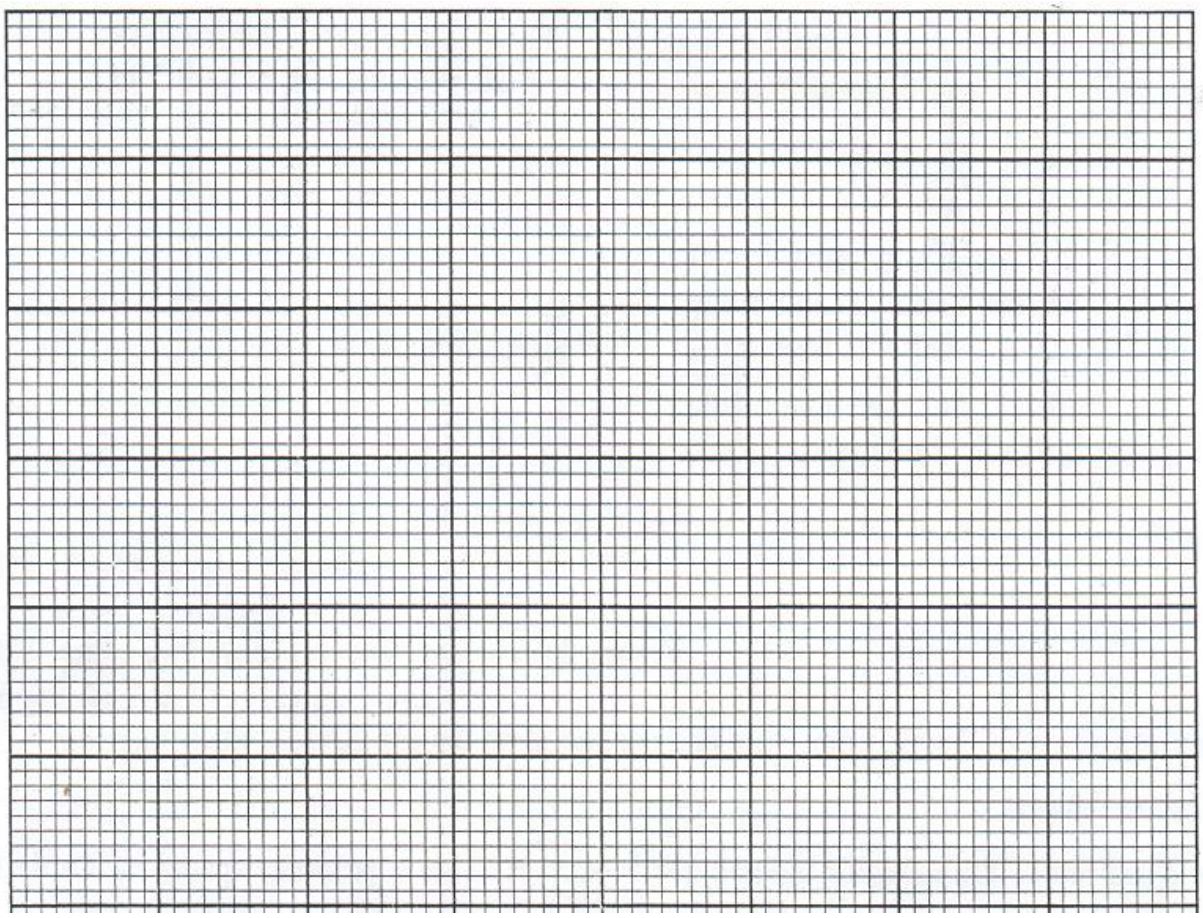
9. The table below shows results of an experiment for the reaction between magnesium and excess dilute hydrochloric acid. The volume of hydrogen produced was recorded every minute.

Time (minutes)	**Volume of hydrogen (cm^3)**
0	0
1	14
2	26
3	33
4	37
5	40
6	40

a). Plot a graph of volume of hydrogen (cm^3) against time (mins).



(5 marks)

b). Calculate the average rate of reaction.

(3 marks)

c). If this reaction is reversible, mention any **two** changes which can be effected to shift the chemical equilibrium to the left.

_____

_____

(2 marks)

10. a). Define "electron affinity".

_____

_____

(1 mark)

b). **Figure 4** is a graph of atomic radius across the period against atomic number for some elements in the periodic table.

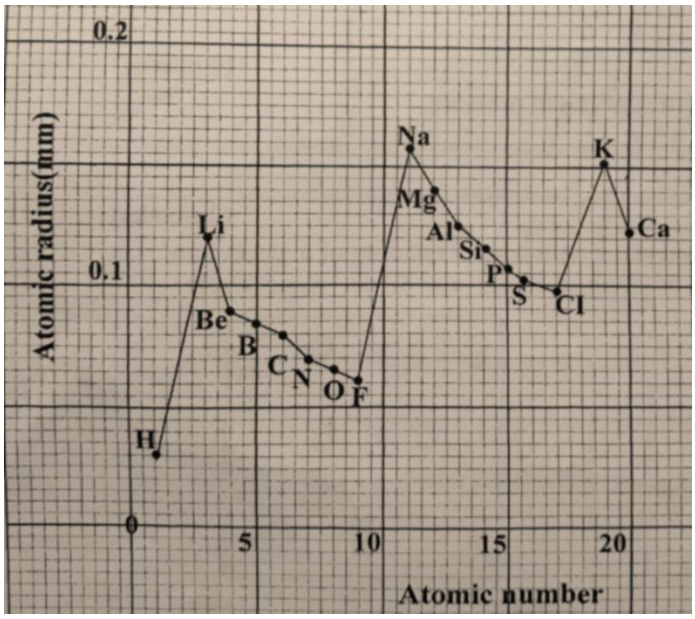


Figure 4

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(i). Which Group **2** element has the largest atomic radius?

_____

(1 mark)

(ii). Explain the trend in the atomic radius across the period.

_____

_____

_____

_____

_____

(2 marks)

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

_____

_____

_____

(2 marks)

(iv). Draw electron dot and cross diagrams for the reaction between Sodium (Na) and Chlorine (Cl) to form Sodium Chloride (NaCl).

(3 marks)

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Section B: (30 marks)

Answer **all** the questions in this section.

11. a). Describe **two** methods that can be used to remove permanent hardness in water.

(4 marks)

b). Using examples, describe the **two** types of polymerization.

(6 marks)

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12. With the aid of a well labelled diagram, describe an experiment that can be done to show that ionic compounds conduct electricity only in aqueous state and not in solid state.

(10 marks)

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13. Explain in terms of collision theory how reaction rate is affected by the following factors.

a) Concentration

_____

_____

_____

_____

_____

_____

(4 marks)

b) Temperature

_____

_____

_____

_____

_____

_____

(3 marks)

c) Surface area of the reactants or particle size.

_____

_____

_____

_____

_____

_____

(3 marks)

END OF QUESTION PAPER

N.B: This paper contains 12 printed pages.