



EXAMINATION NO.: _____

THE MALAWI NATIONAL EXAMINATIONS BOARD

2022 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

CHEMISTRY

Subject Number: M038/I

Tuesday, 13 September

Time Allowed: 2 hours

2:00 – 4:00 pm

PAPER I

(100 marks)

Theory

Instructions

1. This paper contains 12 printed pages. Please check.
2. Write your Examination Number at the top of each page of this paper.
3. This paper contains two sections, A and B.
4. Answer all the thirteen questions in the spaces provided on each question.
5. Use of electronic calculators is 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 number of the question you have answered.
8. Hand in your question 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			
5			
6			
7			
8			
9			
10			
11			
12			
13			
Total			

Section A (70 marks)**Answer all the questions in this section.**

1. a. **Table 1** shows formulae and the boiling points of isomeric alkanes.

Table 1

Isomer	Formula	Boiling point (°C)
A	CH ₃ CH ₂ CH ₂ CH ₃	- 0.5
B	CH ₃ CH(CH ₃)CH ₃	- 10

- (i) Name the isomers A and B.

A

B

(2 marks)

- (ii) Explain why isomer B has a lower boiling than A.

(2 marks)

- b. Give any three natural sources of water.

(3 marks)

2. a. Give any two disadvantages of landfills as a way of disposing waste.

(2 marks)

Continued/...

2. (Continued)

- b. Figure 1 is a graph showing results of heating of a pure substance.

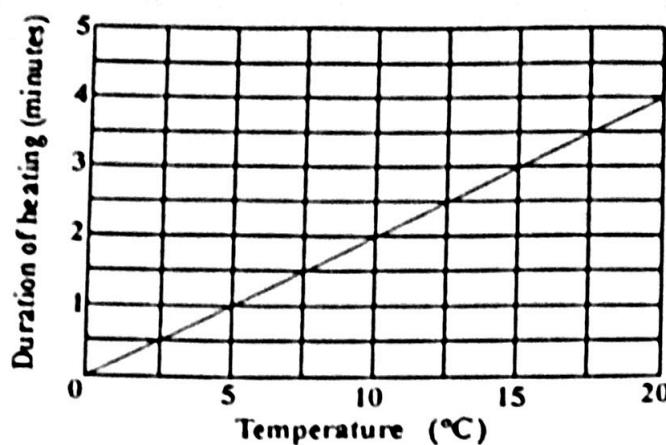


Figure 1

- (i) What was the temperature when the time was 3 minutes?

(1 mark)

- (ii) Identify the dependent variable in the experiment.

(1 mark)

- (iii) What relationship can be drawn from the results on the graph?

(2 marks)

3. a. Why is phosphorus stored under water?

(1 mark)

- b. Give any four uses of phosphoric acid.

(4 marks)

Continued/...

3. (Continued)

- c. Give any **three** differences between ionic and covalent compounds.

(3 marks)

4. a. Explain the depletion of ozone layer.

(4 marks)

- b. **Figure 2** is a diagram showing a covalent bond.

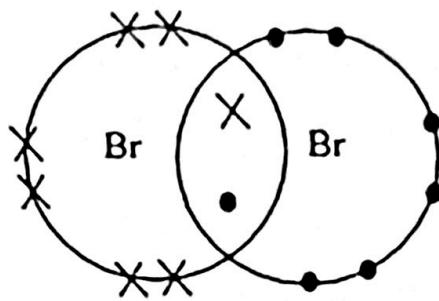


Figure 2

Why is the bond called a non-polar covalent bond? Give any **two** reasons.

(2 marks)

Continued/...

5. a. Define the term "polymerization".

(1 mark)

- b. Complete the equation in Figure 3.

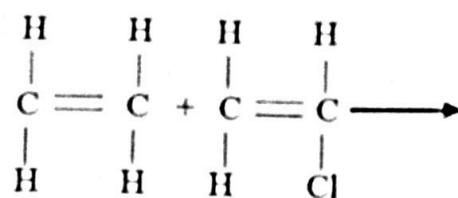


Figure 3

(1 mark)

- c. Name the polymer formed in 5.b.

(1 mark)

- d. Draw the structure of 2-methylpropan -2- ol.

(3 marks)

Continued/...

6. Figure 4 shows different structures of organic compounds.

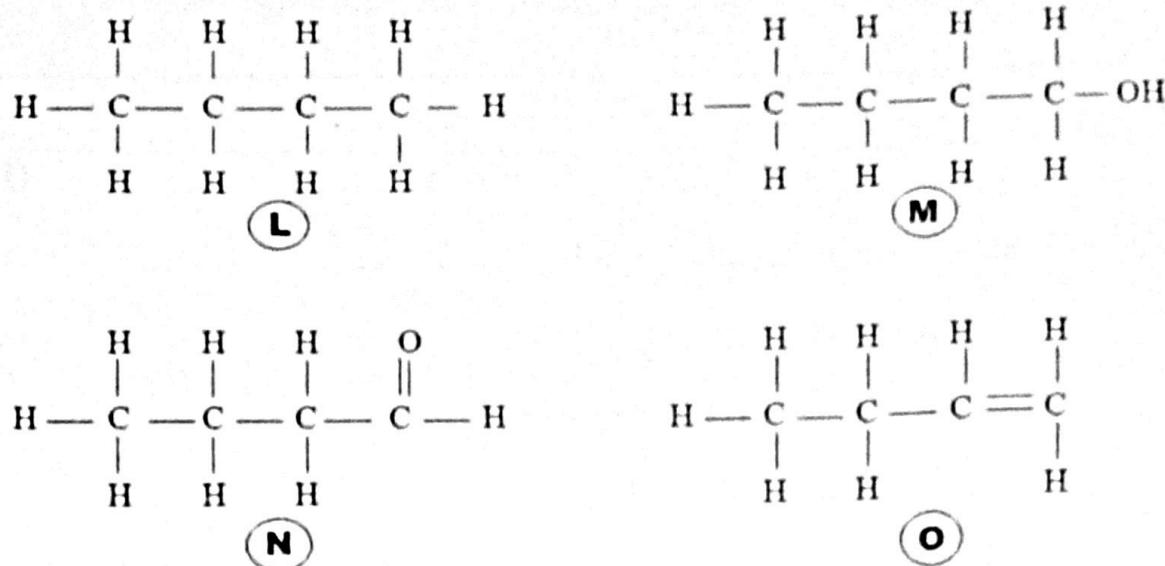


Figure 4

- a. Which compounds are hydrocarbons?

(2 marks)

- b. Explain why compound M has a higher boiling point than L?

(3 marks)

Continued/...

6. (Continued)

- c. Describe how compound N can be distinguished from compound L.

(5 marks)

7. a. Mention the type of oxide that is formed when metals react with oxygen.

(1 mark)

- b. Calculate the empirical formula of a compound that has the following composition: Na = 37.1%, C = 9.7%, O = 38.7%, H₂O = 14.5%.
(RAM: Na = 23, C = 12, O = 16, H = 1)

(5 marks)

Continued/...

8. a. Define the term "displacement reaction".

(1 mark)

- b. State any two applications of electroplating.

(2 marks)

- c. (i) How can purity of a substance be determined using standardized chromatography?

(3 marks)

- (ii) How does a person smell perfume from a neighbouring friend?

(3 marks)

9. a. Define the term "standard solution".

(1 mark)

Continued...

9. (Continued)

- b. In a titration, 10 cm^3 of sulphuric acid (H_2SO_4) was required to neutralize 10 cm^3 of a 0.05M sodium hydroxide (NaOH) solution mixed with phenolphthalein solution.

(i) What is the function of phenolphthalein solution in the reaction?

(1 mark)

(ii) Write a balanced chemical equation for the reaction.

(2 marks)

(iii) Calculate the molarity of the sulphuric acid (H_2SO_4) solution.

(2 marks)

10. a. A student gently heated 250 g of hydrate copper sulphate crystals until she got a constant mass of 160 g of the copper sulphate.

(i) Calculate the number of moles of water found in the hydrated copper sulphate crystals (RAM: H = 1, O = 16)

(3 marks)

(ii) Write the chemical formula of the hydrated copper sulphate.

(1 mark)

Continued/...

10. (Continued)

- b. Give any two sources of alkanoates.

(2 marks)

Section B (30 marks)

Answer all the questions in this section.

11. a. Describe how water hardness can be removed using distillation.

(5 marks)

- b. Describe an experiment that can be carried out to show that the dissolving of ammonium chloride in water is an endothermic reaction.

(5 marks)

- 12.** Describe how butanal can be distinguished from 2-butanone using Fehling test.

(10 marks)

Continued/...

- 13.** Explain how an acid-base indicator can be prepared from hibiscus flowers.

(10 marks)

END OF QUESTION PAPER

NB: This paper contains 12 printed pages