



EXAMINATION NO.: _____

THE MALAWI NATIONAL EXAMINATIONS BOARD

2023 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

CHEMISTRY

Subject Number: M038/I

Wednesday, 12 July

Time Allowed: 2 hours

8:00 – 10:00 am

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 question paper.
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.
5. Use of scientific calculator 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			

Section A (70 marks)

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

1. a. Table 1 shows the formulae and boiling points of two compounds: A and B.

Table 1

Compound	Formula	Boiling point ($^{\circ}\text{C}$)
A	MgCl_2	1418
B	CH_4	-161

- (i) In which form does compound A and B exist at room temperature?

A: _____ (1 mark)

B: _____ (1 mark)

- (ii) Give a reason for your answer in 1 a. (i).

(1 mark)

- b. Give any **three** reasons why the boiling point of compound A is very high than the boiling point of compound B.

(3 marks)

- c. (i) Which compound would dissolve in a polar solvent?

(1 mark)

- (ii) Explain your answer in 1 c. (i).

(2 marks)

Continued/...

2. a. State any **two** major sources of wastes.
- _____
- _____
- (2 marks)
- b. Give any **two** advantages of incineration.
- _____
- _____
- (2 marks)
- c. Describe a test that can be done to show the presence of oxygen gas.
- _____
- _____
- _____
- _____
- (4 marks)
3. a. Give any **one** source of sulphur.
- _____
- (1 mark)
- b. Why is it that nitrogen:
- (i) reacts with burning magnesium?
- _____
- _____
- (2 marks)
- (ii) do not react with burning sulphur?
- _____
- _____
- (2 marks)
- c. Give any **three** uses of phosphorous.
- _____
- _____
- _____
- (3 marks)

4. a. Describe any **two** chemical properties of alkanals.

(4 marks)

- b. Give any **two** uses of alkanals.

(2 marks)

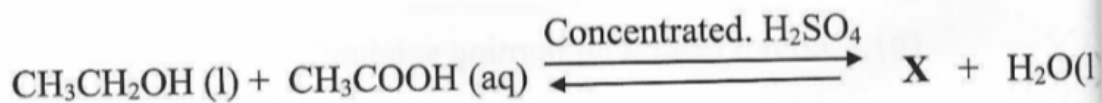
- c. Mention any **three** tests that can be used to distinguish propanal from propanol.

(3 marks)

5. a. Define the term esterification.

(1 mark)

- b. Given the following equation of a chemical reaction:



- (i) Identify product **X**.

(1 mark)

- (ii) What is the role of the concentrated H_2SO_4 ?

(1 mark)

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6. Figure 1 shows a structure of an organic compound.

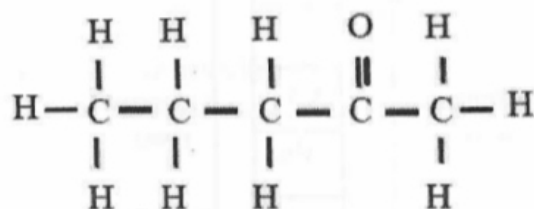


Figure 1

- a Name the organic compound shown in Figure 1.

(1 mark)

- b Draw any **one** structure of isomers of the compound.

(2 marks)

- c Explain the difference between conformers and isomers.

(2 marks)

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7. a. **Figure 2** shows an activity series table. Use it to answer questions that follow.

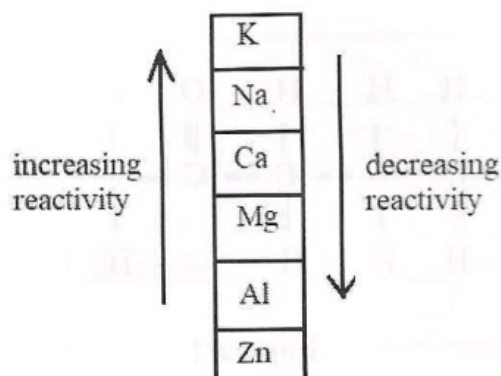


Figure 2

- (i) Why is potassium more reactive than zinc?

(2 marks)

- (ii) Identify any **two** metals that can displace magnesium from its chloride solution.

(2 marks)

- b. (i) Give any **two** examples of endothermic processes.

(2 marks)

- (ii) Given the following equation:



1. conjugate acid _____ (1 mark)

2. conjugate base _____ (1 mark)

Continued/.

8. a. Sodium metal reacts with copper (II) sulphate solution to give sodium sulphate solution and a precipitate of copper according to the following equation:



- (i) Write down an oxidation half equation for the reaction.

(2 marks)

- (ii) Identify a reducing and oxidising agent for the reaction.

Reducing agent: _____ (1 mark)

Oxidising agent: _____ (1 mark)

- b. Table 2 shows bond energies for some chemical bonds.

Table 2

Bond	Bond energy (KJ/mol)
C = C	611
C – H	413
C – C	346
H - H	436

Calculate the enthalpy change for the following reaction:



(5 marks)

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9. a. Give any **one** health benefit of hard water.

(1 mark)

- b. Write any **two** effects of water pollution.

(2 marks)

- c. Explain any **two** effective measures of controlling water pollution.

(4 marks)

10. a. State any **two** problems associated with the depletion of ozone layer.

(2 marks)

- b. Give any **two** uses of chambers in the laboratory.

(2 marks)

Continued/..

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- 11.** With the aid of well labelled diagrams, describe the difference between thermosoftening plastics and thermosetting plastics.

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(10 marks)

Continued/...



12. a. Describe the process of removing water hardness using distillation.

(5 marks)

- b. With the aid of a well labelled diagram, describe the procedure of refining impure copper using electrolysis.

(5 marks)

Continued/..

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13. a. With the aid of well-balanced chemical equations, describe the **Ostwald process** of preparing nitric acid, HNO_3 .

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(6 marks)
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