EXAMINATION NO.: _____

THE MALAWI NATIONAL EXAMINATIONS BOARD

2025 JUNIOR CERTIFICATE EXAMINATION

CHEMISTRY

(100 marks)

Subject Number: J038

Monday, 9 June

Time Allowed: 2 hours
8:00 – 10:00 am

Instructions

1. **This paper contains 15 printed pages. Please check.**
2. Write your **Examination Number** in the spaces provided on top of each page of this question paper.
3. This paper contains Sections **A**, **B** and **C**. Answer **all** the questions in **all** the sections.
4. Use of scientific calculators is allowed.
5. In the table provided on this page, **tick** against the question number you have answered.
6. Hand in your paper to the invigilator when time is called to stop writing.

Question Number	Tick Qns 21 to 33 if answered	Do not write in these columns	
1 - 5			
6 - 10			
11 - 15			
16 - 20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
Total			

Section A (20 marks)

There are **twenty** questions in this section. **Encircle** the letter corresponding to the correct answer.

1. Which of the following gases causes acidic rains?

A. oxygen
B. nitrogen
C. carbon dioxide
D. chlorine

2. Which of the following is the percentage composition of oxygen in air?

A. 84%
B. 42%
C. 21%
D. 20%

3. Which of the following are sources of alkenes?

1. Dehydration of alcohols
2. Fractional distillation of petroleum
3. Cracking of long chain alkanes
4. Combustion reactions

A. 1, 2 and 3
B. 1, 3 and 4
C. 2, 3 and 4
D. 1, 2 and 4

4. Which of the following is a chemical symbol for potassium?

A. B
B. F
C. K
D. P

5. Which of the following correctly describes a chemical change?

1. new substances are formed
2. difficult to reverse
3. involves melting
4. involves energy change

A. 1, 2 and 3
B. 1, 2 and 4
C. 2, 3 and 4
D. 1, 3 and 4

Table 1 shows different solutions labelled **P, Q, R** and **S** with their corresponding pH values. Use it to answer questions **6** and **7**.

Table 1

Solution	P	Q	R	S
pH	2	7	10	14

6. Which solution is a strong base?

A. P
B. Q
C. R
D. S

7. What reason can be given to show that solution **Q** is sodium chloride?

A. It is a neutral solution.
B. It conducts electricity.
C. It does not change colour of indicators.
D. It is a kitchen salt.

Continued/...

An atom is denoted as $^{19}_{9}X$. Use this information to answer questions **8** and **9**.

8. How many electrons does the atom have?
A. 9
B. 10
C. 19
D. 28

9. What is the mass number of the atom?
A. 9
B. 10
C. 19
D. 28

10. Which step of scientific investigations comes after formulating the hypothesis?
A. recording data
B. selecting variables
C. analysing data
D. evaluating hypothesis

11. What is the ordinary notation of writing 4.56×10^{-2}?
A. 456
B. 45.6
C. 0.0456
D. 0.456

12. Which of the following is a solid-in-liquid solution?
A. sugar and water
B. iron and chromium
C. salt and oxygen
D. ethanol and oil

Figure 1 shows an apparatus for separating mixtures. Use it to answer questions **13** and **14**.

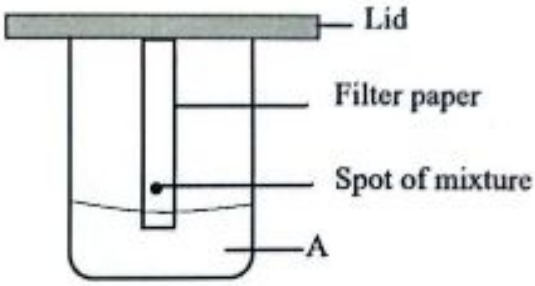


Figure 1

13. What method of separating mixtures uses this apparatus?
A. filtration
B. sieving
C. evaporation
D. chromatography

14. What is the name of the liquid labelled **A**?
A. ink
B. solvent
C. solute
D. solution

15. Which of the following sets of measurements shows the highest precision?
A. 5.2cm, 5.1cm, 5.0cm
B. 6.0cm, 10.0cm, 12.0cm
C. 2.5cm, 3.5cm, 4.5cm
D. 10.2cm, 10.4cm, 10.6cm

Continued/...

16. Which of the following instruments is used to find volume of a liquid?
    A. beaker
    B. measuring cylinder
    C. conical flask
    D. volumetric flask

17. Which of the following correctly describes an ionic bonding?
    A. It exists between metals only.
    B. It exists between metals and non-metals
    C. It is formed between non-metals.
    D. It is formed between metals and metalloids.

18. Which of the following is a natural source of organic compounds?
    A. water
    B. plants
    C. soil
    D. air

19. Which of the following fuels is used in making floor polish?
    A. petrol
    B. oil
    C. wax
    D. grease

20. Which of the following names is for a compound whose chemical formula is $CH_2=CHCH_3$?
    A. propane
    B. butene
    C. butane
    D. propene

Continued/...

Section B (50 marks)

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

21. a. Define accuracy as used in analytical chemistry.

_____

_____

(1 mark)

b. **Figure 2** shows a graph of temperature against time during the heating water.

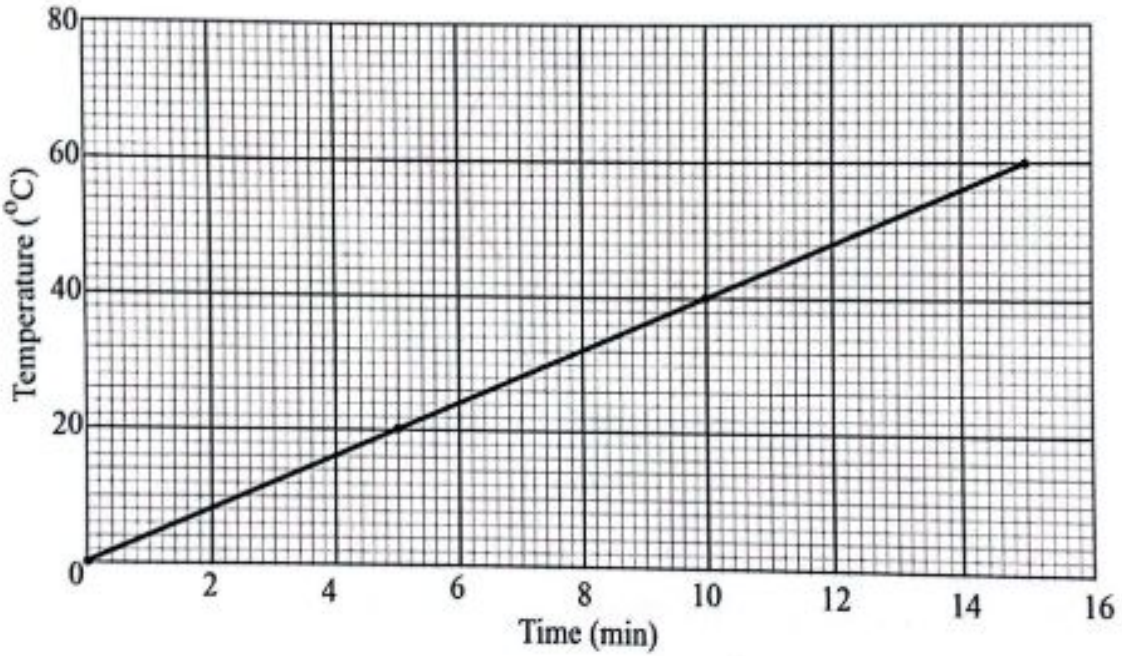


Figure 2

(i) State the relationship between temperature and time.

_____

_____

(1 mark)

(ii) What was the temperature when the time was 7 minutes?

_____

(1 mark)

(iii) Give any **two** advantages of presenting data using graphs.

_____

_____

(2 marks)

Continued/...

22. a. Give any **two** ways in which atoms attain stability.

_____

_____

(2 marks)

b. **Figure 3** shows a compound formed from the bonding between nitrogen and hydrogen atoms.

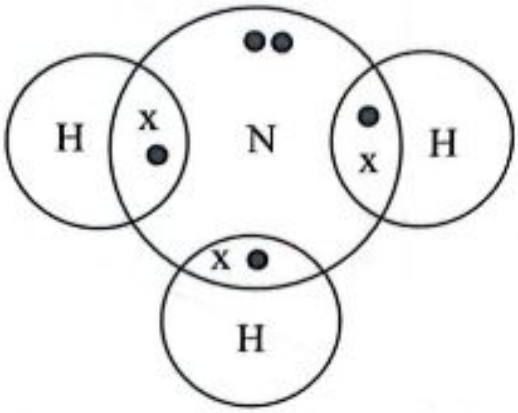


Figure 3

(i) Give the chemical formula for the compound.

_____

(1 mark)

(ii) What is the name of the compound?

_____

(1 mark)

(iii) State the type of bonding in the compound.

_____

(1 mark)

Continued/...

23. a. Element **X** has 29 electrons and an atomic mass of 65.

(i) Write the nuclide symbol of element **X.**

(2 marks)

(ii) Find the number of neutrons for the element.

(2 marks)

b. The following are elements with their atomic numbers:

Q : 12 **R** : 17 **S** : 20

(i) Which element is a halogen?

_____

(1 mark)

(ii) Identify elements which are in the same group of the periodic table.

_____

(1 mark)

(iii) Draw the atomic structure of element **S.**

(1 mark)

Continued/…

24. a. Give any **two** fractions of petroleum that are used as fuel.

_____

_____

(2 marks)

b. **Table 2** shows the boiling points of some fractions of petroleum:

Table 2

Fraction of petroleum	Boiling point (0°C)
Petrol	70
Paraffin	170
Diesel	230

(i) Identify the fraction of petroleum that would be separated first from crude oil in a fractioning column.

_____

(1 mark)

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

_____

_____

(2 marks)

25. a. Give any **three** uses of carbon dioxide gas.

_____

_____

_____

(3 marks)

b. Explain how the burning of fossil fuels causes air pollution.

_____

_____

_____

(2 marks)

Continued/...

26. a. (i) Draw the safety symbol for a harmful substance.

(1 mark)

(ii) Give any **two** safety measures when handling a poisonous substance.

_____

_____

_____

(2 marks)

b. State any **one** use of the following protective equipment in the laboratory:

(i) goggles

_____

(1 mark)

(ii) gas mask

_____

(1 mark)

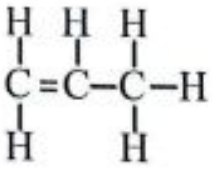
Continued/...

27. a. State any **one** chemical property of butane.

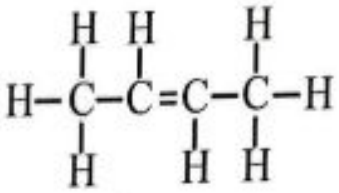
_____

(1 mark)

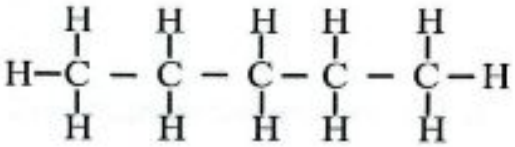
b. **Figure 4** shows structural formulae of organic compounds **Q**, **R** and **S**.



Q



R



S

Figure 4

(i) Which structures represent alkenes?

_____

(2 marks)

(ii) Write the molecular formula of compound **S**.

_____

(1 mark)

(iii) Write down the general formula of compound **R**.

_____

(1 mark)

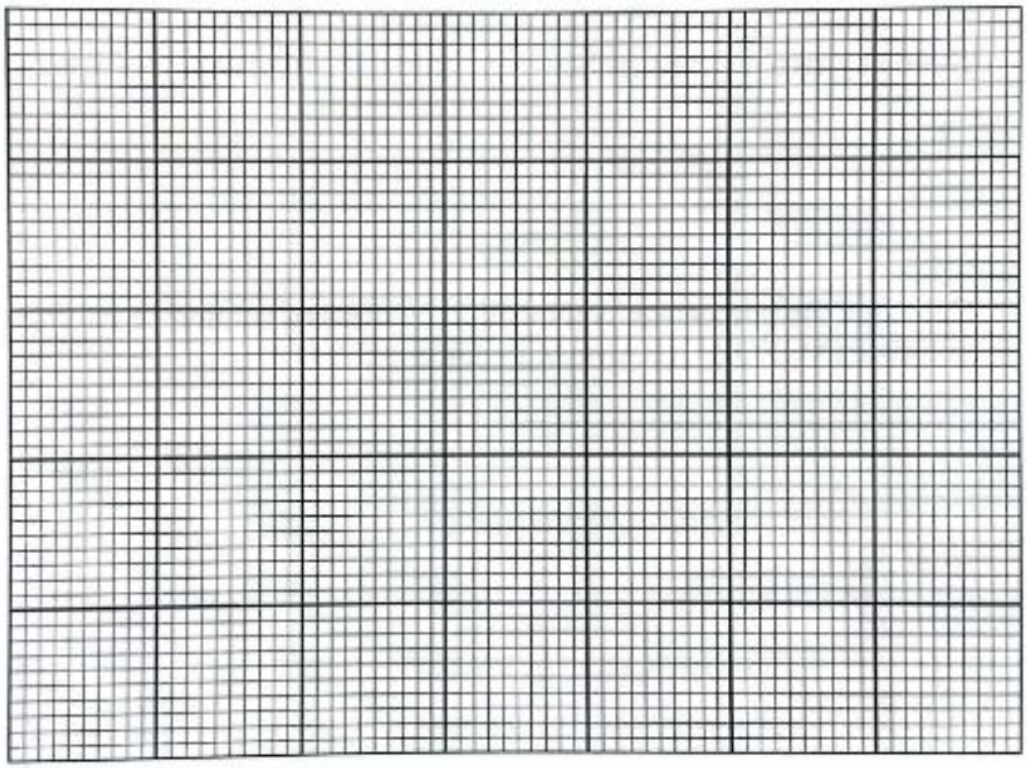
Continued/...

28. **Table 3** shows results of an investigation conducted to find the relationship between mass and volume of an object.

Table 3

Mass (g)	Volume (cm^3)
10	5
20	10
30	15
40	20

a. Draw a bar graph from the information in **Table 3.**



(4 marks)

b. What is the relationship between mass and volume shown by the bar graph in **(a)** ?

_____

_____

(1 mark)

Continued/...

29. a. Define the term "organic compound".

_____

_____

(1 mark)

b. Identify hydrocarbons from the following compounds:

CO_2 C_2H_4 C_2H_6 C_2H_5OH

_____

(2 marks)

c. State any **two** differences between saturated and unsaturated hydrocarbons.

_____

_____

(2 marks)

30. a. Calculate the percentage composition by mass of sulphur in magnesium sulphate ($MgSO_4$). (RAM: Mg = 24, S = 32, O = 16).

(2 marks)

b. How many atoms are there in $NaHCO_3$?

_____

(1 mark)

Continued/…

Section C (30 marks)

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

31. With the aid of a well labelled diagram, explain how a mixture of water and ethanol can be separated.

(10 marks)

Continued/…

32. Describe an experiment that could be carried out to compare the strength of a weak acid and a strong acid using two identical pieces of magnesium ribbon.

(10 marks)

Continued/...

33. a. Describe the way in which trends in reactivity of alkaline earth metals could be determined using water.

(5 marks)

b. Describe an experiment that could be carried out to identify oxygen and carbon dioxide gases using a glowing splint.

(5 marks)

END OF QUESTION PAPER

NB: This paper contains 15 printed pages.