

EXAMINATION NO.: _____



THE MALAWI NATIONAL EXAMINATIONS BOARD

2022 JUNIOR CERTIFICATE EXAMINATION

CHEMISTRY

(100 marks)

Subject Number: J038

Tuesday, 9 August

Time Allowed: 2 hours
8:00 – 10:00 am

Instructions

1. This paper contains 14 printed pages. Please check.
2. Write your Examination Number in the spaces provided on every page of the question paper.
3. Answer all the 33 questions.
4. This paper contains Sections A, B and C. For Section A, encircle the letter representing the right answer to each question. Sections B and C should be answered in the spaces provided.
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	
1-10			
11-20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			

Section A (20 marks)

Answer all the **twenty** questions in this section. **Encircle** the letter of your choice representing the right answer.

1. Which of the following gases is removed first during separation of components of air?
A. argon
B. oxygen
C. nitrogen
D. carbon dioxide
2. Which branch of Chemistry involves the study of properties of substances from non-biological origins?
A. analytical Chemistry
B. inorganic Chemistry
C. environmental Chemistry
D. physical Chemistry
3. Which of the following is the SI unit of temperature?
A. Fahrenheit
B. Joules
C. Kelvin
D. Celsius
4. Which of the following substances are elements?
 1. H_2
 2. NH_3
 3. Cl_2
 4. N_2
A. 1, 2 and 3
B. 1, 3 and 4
C. 1, 2 and 4
D. 2, 3 and 4

5. Which of the following is a chemical change?
A. heating candle wax
B. burning wood
C. dissolving sugar
D. heating metal
6. The correct condensed formula of propene (C_3H_6) is
A. $CH_2=CH_2CH_2$.
B. $CH_2=C_2H_4$.
C. $CH_2CH_2=CH_2$.
D. $CH_2=CHCH_3$.

Ethane reacts with oxygen as shown in the following chemical equation:
 $2 C_2H_6(g) + XO_2(g) \rightarrow 4CO_2(g) + 6H_2O(l)$. Use it to answer questions 7 to 9.

7. What type of chemical reaction is represented in the equation?
A. neutralisation
B. addition
C. combustion
D. substitution
8. Which substances are products of the reaction?
A. O_2 and H_2O
B. C_2H_6 and CO_2
C. CO_2 and H_2O
D. C_2H_6 and O_2
9. The value of X in the equation is
A. 14.
B. 8.
C. 5.
D. 7.

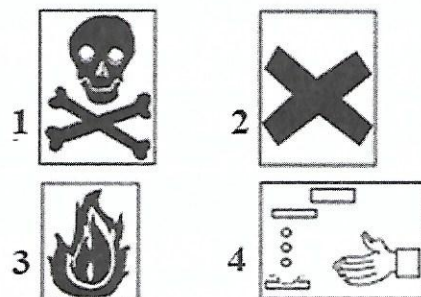
Table 1 shows part of the periodic table. Use it to answer questions 10 to 12.

Table 1

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca						

10. Which elements are alkaline earth metals?
- A. Li and Na
B. Be and Mg
C. Be and B
D. Na and Mg
11. Identify an element in the periodic table with atomic number 9.
- A. K
B. F
C. Ne
D. Li
12. Which of the following elements in the periodic table are metalloids?
- A. B and Si
B. C and N
C. Si and P
D. C and Al
13. Identify a gas used when preparing fizzy drinks?
- A. nitrogen
B. oxygen
C. carbon dioxide
D. argon

14. **Figure 1** shows hazard symbols.

**Figure 1**

Which symbol represents a toxic and poisonous substance?

- A. 1
B. 2
C. 3
D. 4

Table 2 shows pH values of solutions W, X, Y and Z. Use it to answer questions 15 and 16.

Table 2

Solution	pH
W	6
X	7
Y	14
Z	12

15. Which of the following pairs can react to form salt and water?
- A. W and X
B. X and Z
C. W and Y
D. Y and Z
16. Which of the following solutions is the least basic?
- A. W
B. X
C. Y
D. Z

17. Name a gas that is used in combustion.
- A. oxygen
 - B. carbon dioxide
 - C. nitrogen
 - D. helium
18. Which of the following gases is produced when an acid reacts with a metal?
- A. oxygen
 - B. nitrogen
 - C. chlorine
 - D. hydrogen
19. Which of the following is the percentage composition of nitrogen (N) in Ammonium nitrate (NH_4NO_3)? (RAM: N = 14, H = 1, O = 16)
- A. 17.5 %
 - B. 60 %
 - C. 35 %
 - D. 5%
20. Which of the following are products of a neutralisation reaction?
- A. salt and oxygen
 - B. salt and carbon dioxide
 - C. carbon dioxide and water
 - D. water and salt

Section B (50 marks)

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

21. a. State the law of conservation of matter.

(1 mark)

- b. The reaction between methane and oxygen is represented by the following equation: $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

- (i) Calculate the total masses of
- 1. the reactants
 - 2. products.

(A_r: C = 12, H = 1, O = 16)

(4 marks)

21.b. (Continued)

- (ii) What is the relationship between the total mass of reactants and total mass of products?

(1 mark)

- c. How many hydrogen atoms are in $\text{CO}(\text{NH}_2)_2$.

(1 mark)

22. a. In the chemical symbol $\overset{\text{A}}{\underset{\text{Z}}{\text{X}}}$, what do the following letters stand for?

A: _____ (1 mark)

Z: _____ (1 mark)

- b. Table 3 shows ionisation energy of elements X, Y and Z.

Table 3

Element	Ionisation energy (kJ/mol)
X	520
Y	496
Z	479

- (i) Which element is the least reactive?

(1 mark)

- (ii) Give a reason for the answer in 22.b.(i).

(1 mark)

22.b. (Continued)

(iii) Which element will have the biggest atomic radius?

(1 mark)

(iv) Explain the answer in 22.b.(iii) .

(1 mark)

23. Why does reactivity of group VII elements decrease down the group?

(3 marks)

24. a. Give any **one** source of soil pollutants.

(1 mark)

b. State the following chemical properties of soil:

(i) cation exchange capacity

(1 mark)

(ii) salinity

(1 mark)

24. (Continued)

- c. In the fractional distillation of air, why are water vapour, dust particles and carbon dioxide gas removed first?

(1 mark)

25. Figure 2 shows a method of separating mixtures.

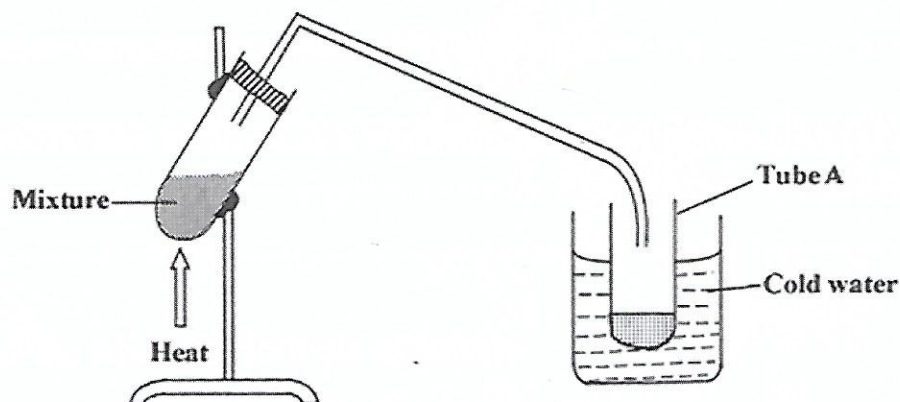


Figure 2

- a. Name the type of method of separating mixture used in Figure 2.

(1 mark)

- b. What name is given to tube A?

(1 mark)

- c. What will happen if the cold water is removed?

(1 mark)

26. Table 4 shows elements P, Q, R and S with their electron configuration.

Table 4

Element	Electron configuration
P	2, 8, 1
Q	2, 5
R	2, 1
S	2, 2

- a. To what group does S belong in the periodic table?

_____ (1 mark)

- b. Draw a dot and cross diagram to show a product formed between two Q atoms.

_____ (2 marks)

- c. Identify **two** elements in Table 4 which belong to the same group in the periodic table.

_____ (2 marks)

27. a. Give any **one** difference between “covalent bonding” and “ionic bonding”.

_____ (1 mark)

- b. Define a “homogenous mixture”.

_____ (1 mark)

27. (Continued)

- c. Calculate the total number of atoms in $\text{C}_2\text{H}_5\text{COOH}$.

(2 marks)

28. Why are gases compressible while solids are not?

(2 marks)

29. a. Draw the structural formula of butane.

(2 marks)

- b. Give any **two** natural sources of organic compounds.

(2 marks)

- c. List any **two** physical properties of alkenes.

(2 marks)

30. a. (i) State any **two** careers that need knowledge of Chemistry.

- (ii) Outline any **two** ways in which Chemistry is applied in everyday life in our homes.

(2 marks)

- b. (i) Define the term "precision".

(1 mark)

- (ii) **Table 5** shows results of an experiment which was repeated four times.

Table 5

1 st reading	2 nd reading	3 rd reading	4 th reading
20.87	20.49	20.89	21.0

1. Which of the readings was **not** precise?

(1 mark)

2. Explain your answer.

(1 mark)

2022

30. (Continued)

- c. Figure 3 shows pieces of apparatus labelled P, Q and R.

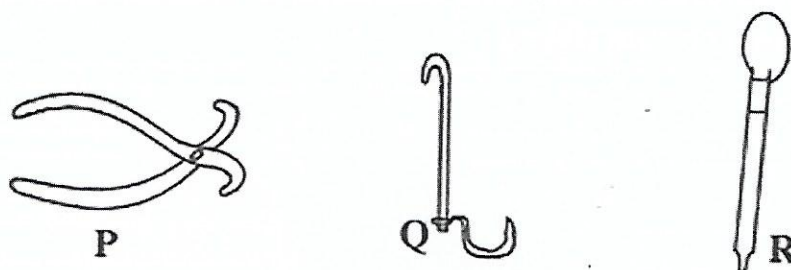


Figure 3

- (i) Name the apparatus labelled P and R.

P: _____ (1 mark)

R: _____ (1 mark)

- (ii) Give **one** use of apparatus labelled Q.

(1 mark)

- (iii) Give any **one** safety measure when handling apparatus R.

(1 mark)

Section C (30 marks)

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

31. a. Briefly explain how a weak acid could be distinguished from a strong acid using magnesium ribbon.

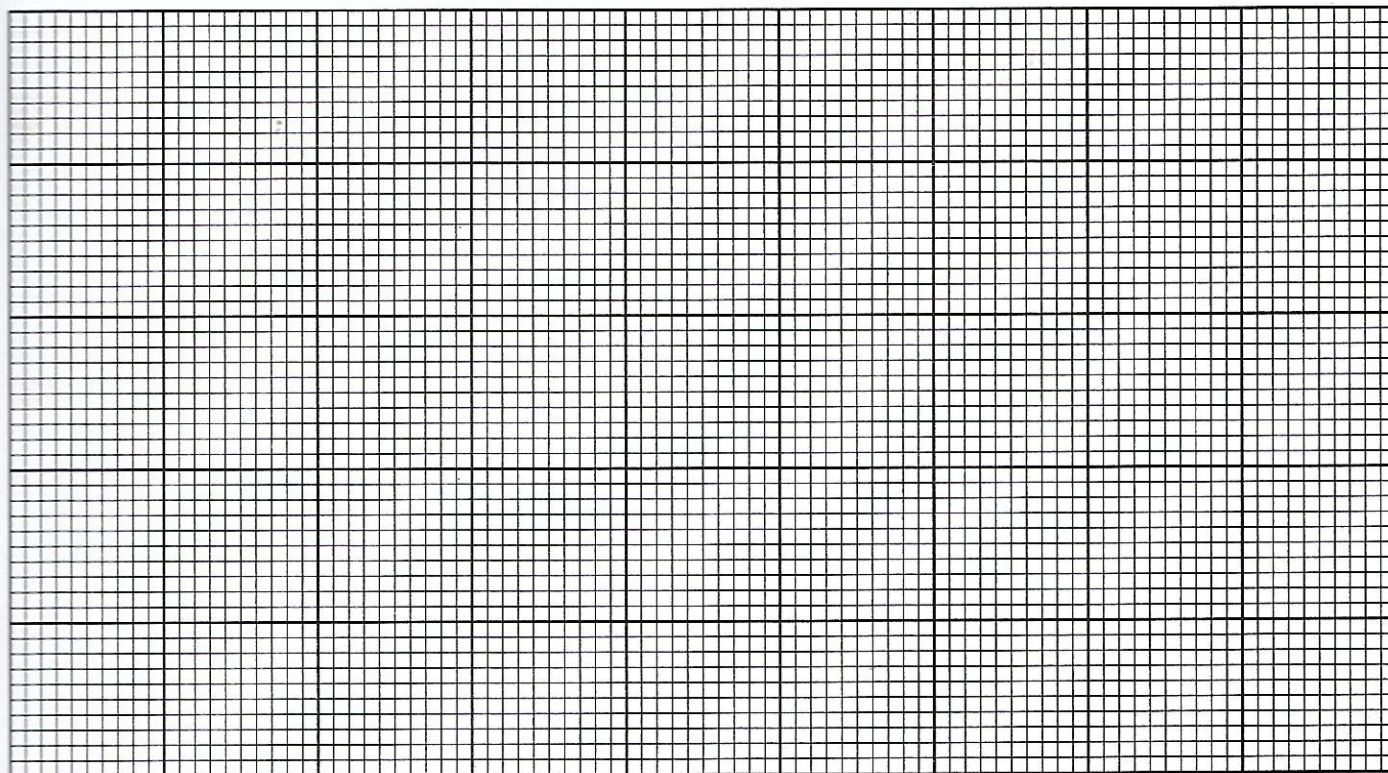
(5 marks)

- b. **Table 6** shows volume and temperature of a gas.

Table 6

Volume (dm³)	1	2	3	4	5
Temperature (K)	60	120	180	240	300

Plot a graph of volume against temperature.

**(5 marks)**

32. a. Briefly explain how industries are contributing to the rise of air pollution.

(4 marks)

- b. Describe an experiment that could be done to distinguish an alkane from an alkene.

(6 marks)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

END OF QUESTION PAPER

This paper contains 14 printed pages.