education

Department of Education
FREE STATE PROVINCE

# GRADE 8

# NATURAL SCIENCES

## JUNE 2024

## TIME: 1 HOUR

## MARKS: 50

**This question paper consists of 9 pages and a PERIODIC TABLE on page 9.**

**INSTRUCTIONS**:

1. The question paper consists of TWO SECTIONS:

   **SECTION A** – One question (Question 1)
   **SECTION B** – Seven questions (Question 2 to 8)

2. Answer ALL the questions.

3. Number all the answers in your answer book exactly as the questions are numbered in the question paper.

4. Write neatly and legibly.

5. A Periodic Table is provided on page 9 of this question paper.

## SECTION A

### QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 D.

1.1.1 The following particles are found in the nucleus of an atom:

A Neutrons and electrons.
B Neutrons, elements, and electrons.
C Protons and neutrons
D Protons, electrons, and neutrons. (1)

1.1.2 Which one of the following is NOT an example of a compound?

A $H_2O$
B $O_2$
C $CuCl_2$
D $CO_2$ (1)

1.1.3 Melting is the change in state of a …

A liquid to a solid.
B liquid to a gas.
C solid to a gas.
D solid to a liquid. (1)

1.1.4 What happens to the density of a substance if its volume increases while its mass remains constant?

A Density increases.
B Density decreases.
C Density remains the same.
D Density becomes zero. (1)

1.1.5 The reactants in a chemical reaction are …

A the new substances that are formed.
B all the substances that appear in the solid phase.
C all the substances that are involved.
D all the substances that react with each other. (1)

**[5]**

1.2 Choose the item from COLUMN B that matches the description in COLUMN A. Write only the letter (A – G) next to the question number (1.2.1 – 1.2.5) in the ANSWER BOOK.

| COLUMN A | | COLUMN B | |
|---|---|---|---|
| 1.2.1 | Phase change from a liquid to a solid state. | A | Property of a gas |
| 1.2.2 | The amount of space occupied by a substance. | B | Pressure |
| 1.2.3 | Particles move from high to low concentration. | C | Volume |
| 1.2.4 | Particles slide past each other. | D | Freezing |
| 1.2.5 | Caused by the collisions of gas particles with each other and with the sides of the container. | E | Property of a liquid |
| | | F | Condensation |
| | | G | Diffusion |

**[5]**

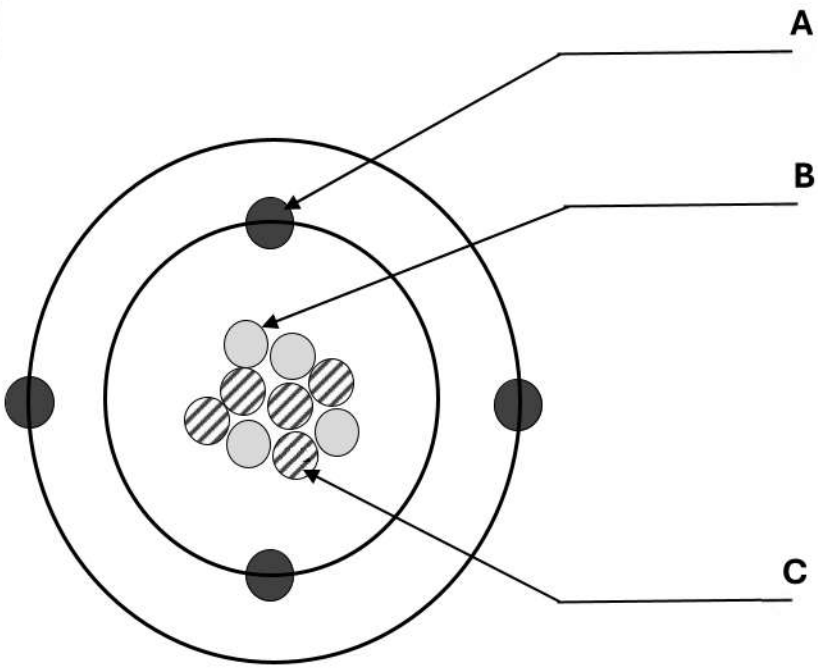
**TOTAL SECTION A: 10**

## SECTION B

### QUESTION 2

The diagram below represents the structure of an atom that is **NEUTRAL**.




2.1 Name the three sub-atomic particles labelled A, B and C in the above diagram. (3)

2.2 Which ONE of the particles you named in 2.1 is negatively charged? (1)

2.3 Explain why the above atom is regarded as neutral. (1)

**[5]**

### QUESTION 3

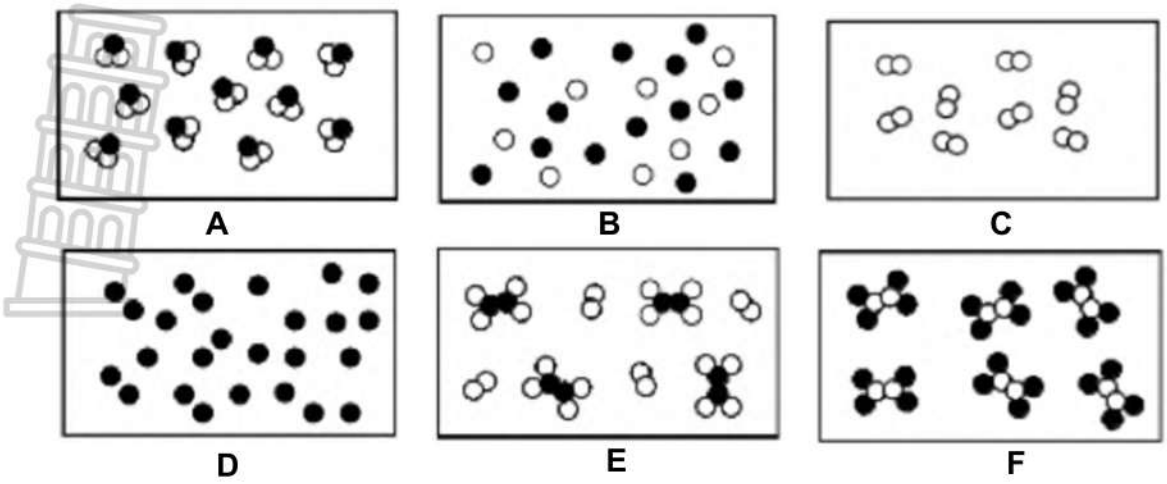
3.1 Use the Periodic table of elements provided at the end of this paper to answer the following questions:

3.1.1 The element ***Ca*** is a metal and is found on the periodic table of elements. What is the chemical NAME of this element? (1)

3.1.2 Write down the chemical SYMBOL for the element magnesium. (1)

3.1.3 Give a definition of an element. (1)

3.2 The following diagrams represent elements, compounds, and mixtures.

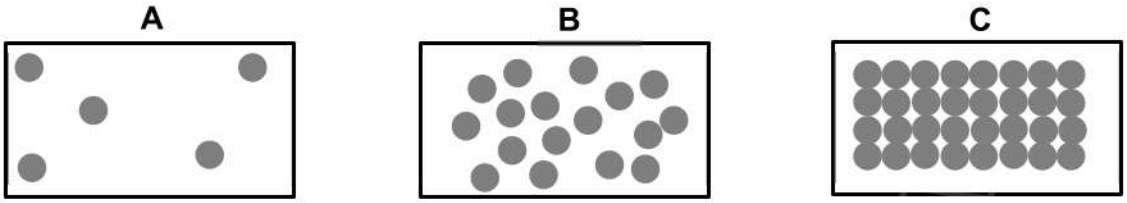



Consider the above diagrams and identify each of the following (ONLY write down A, B, C, D, E or F).

3.2.1 An element. (1)
3.2.2 A compound. (1)
3.2.3 A mixture. (1)
3.2.4 A diatomic element. (1)
3.2.5 Which diagram is most likely to represent water ($H_2O$)? (1)
**[8]**

**QUESTION 4**

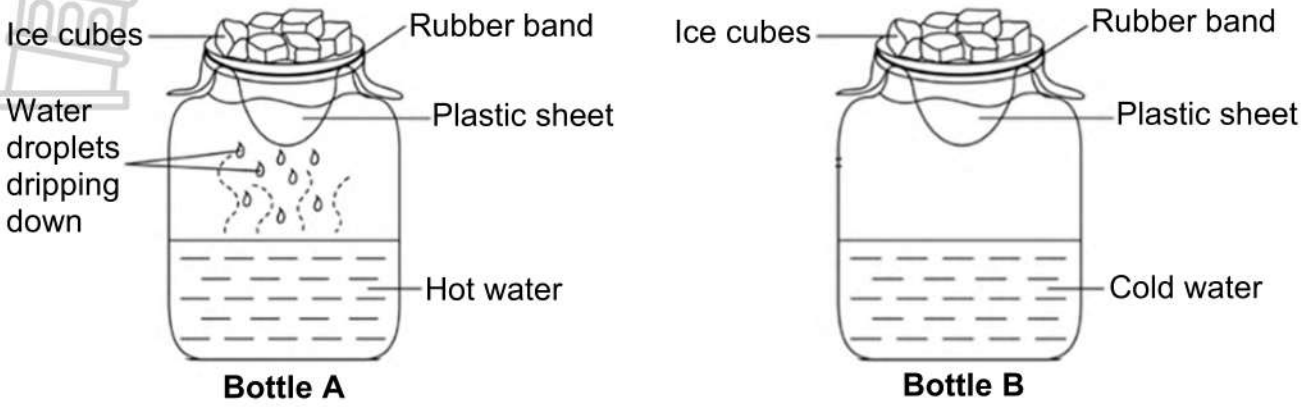
The diagrams shown below illustrate the particle arrangement in different states of matter.




4.1 Which of the diagrams represent a liquid? Only write A, B or C. (1)
4.2 Give one difference between a gas and a solid. (1)
4.3 Describe what will happen if a solid substance is heated? (1)
4.4 What do we call the process when a liquid changes to a gas? (1)
4.5 Explain why a gas, unlike a liquid, will always fill a container? (2)
4.6 Describe ONE way in which a person can change a gas to a liquid. (1)
**[7]**

**QUESTION 5**

Learners half-filled each of two glass bottles with water. **Bottle A** contained hot water while **bottle B** contained cold water. Both bottles were covered with plastic sheets and ice-cubes were placed on top of the plastic sheets as shown in the diagrams below.




5.1 What does the dripping of water (water droplets) in Bottle A indicate? (1)

5.2 Why don't water droplets form on the plastic sheet of the cold water (bottle B)? (1)

5.3 Indicate which of the following expressions can be regarded as the INDEPENDENT VARIABLE, DEPENDENT VARIABLE OR CONTROLLED VARIABLE statements.

Write down the question number and your choice of variable ONLY. (E.g. 5.3.4 Controlled variable)

5.3.1 Amount of water in each bottle. (1)

5.3.2 Temperature of the water in each bottle. (1)

5.3.3 Number of water droplets forming on the plastic sheet. (1)
**[5]**

**QUESTION 6**

A rectangular glass block with a mass of 180 g and dimensions (length, breadth, and height) as shown in Figure 1 was placed into a beaker containing 175 ml of water. The glass block sank to the bottom of the beaker, causing the water level to rise to 235 ml (as seen in Figure 2).

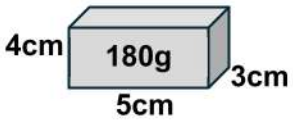



**Figure 1**

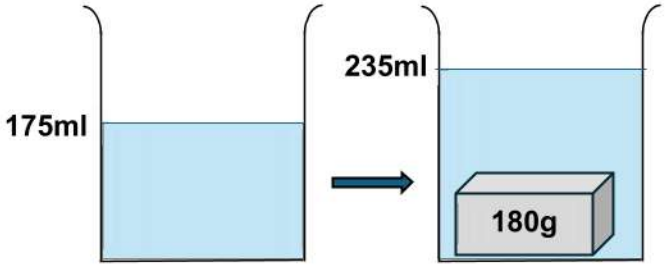



**Figure 2**

6.1 Does the glass block have a HIGHER DENSITY or a LOWER DENSITY when compared to the DENSITY of the water? (1)

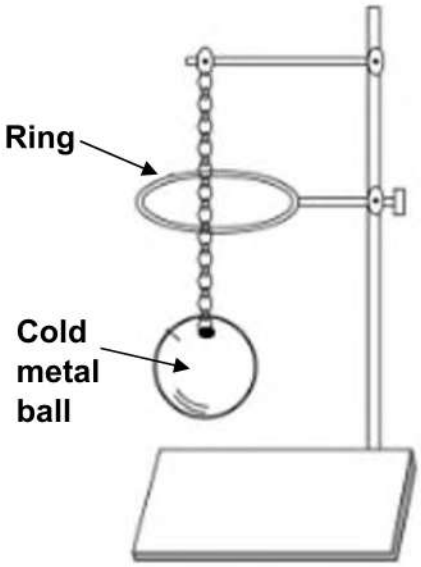
6.2 Give a reason for your answer in 6.1. (1)

6.3. Determine the volume of the glass block. (1)

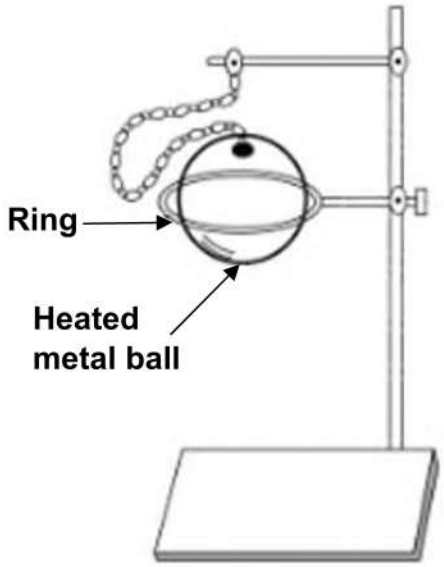
6.4 Calculate the density of the glass block. (3)
**[6]**

**QUESTION 7**

Study the metal ball-and-ring experiment below. When the metal ball is cold, it can pass through the metal ring. However, when the same metal ball is heated, it cannot pass through the metal ring.




**Before heating**
**At room temperature**




**After heating**

For each statement below, choose the correct word or phrase in brackets to make the statement true.
Write down ONLY the number and the correct word OR phrase.

7.1 The metal ball can pass through the ring before heating because it is (smaller than / larger than / same size as) the ring's inner diameter. (1)

7.2 When the metal ball is heated, metal particles (move closer together / do not move / move further apart). (1)

7.3 While heating the metal ball, the spaces between the metal particles will (remain the same / become larger / become smaller). (1)

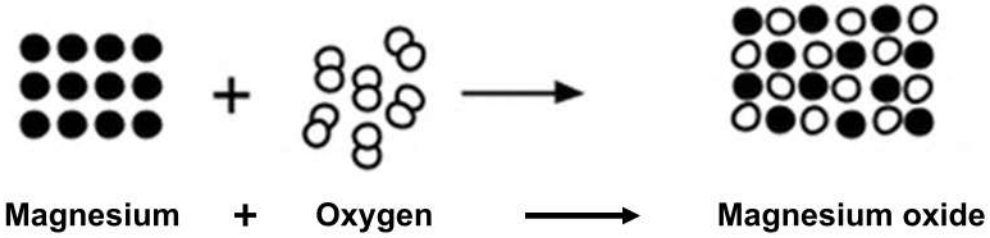
7.4 Therefore the heated metal ball will (contract / expand / stay the same size). (1)

7.5 As a result, when the heated metal ball is placed on top of the metal ring, it (fits / does not fit) through the ring. (1)

7.6 In summary, as the temperature of the metal ball increases, its (density / volume / mass) also increases. (1)
**[6]**

**QUESTION 8**

A chemical reaction is represented by the following diagram:




8.1 What is a chemical reaction? (1)

8.2 Write the name(s) of the product(s) for this reaction. (1)

8.3 Write the name(s) of the reactants(s) for this reaction. (1)
**[3]**

**TOTAL SECTION A: 10**

**TOTAL SECTION B: 40**

**GRAND TOTAL: 50**

# PERIODIC TABLE / *PERIODIEKE TABEL*

| 1 (I) | 2 (II) | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 (III) | 14 (IV) | 15 (V) | 16 (VI) | 17 (VII) | 18 (VIII) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H 1 | | | | | | | | | | | | | | | | | 2 He 4 |
| 3 Li 7 | 4 Be 9 | | | | | | | | | | | 5 B 11 | 6 C 12 | 7 N 14 | 8 O 16 | 9 F 19 | 10 Ne 20 |
| 11 Na 23 | 12 Mg 24 | | | | | | | | | | | 13 Aℓ 27 | 14 Si 28 | 15 P 31 | 16 S 32 | 17 Cℓ 35,5 | 18 Ar 40 |
| 19 K 39 | 20 Ca 40 | 21 Sc 45 | 22 Ti 48 | 23 V 51 | 24 Cr 52 | 25 Mn 55 | 26 Fe 56 | 27 Co 59 | 28 Ni 59 | 29 Cu 63,5 | 30 Zn 65 | 31 Ga 70 | 32 Ge 73 | 33 As 75 | 34 Se 79 | 35 Br 80 | 36 Kr 84 |
| 37 Rb 86 | 38 Sr 88 | 39 Y 89 | 40 Zr 91 | 41 Nb 92 | 42 Mo 96 | 43 Tc | 44 Ru 101 | 45 Rh 103 | 46 Pd 106 | 47 Ag 108 | 48 Cd 112 | 49 In 115 | 50 Sn 119 | 51 Sb 122 | 52 Te 128 | 53 I 127 | 54 Xe 131 |
| 55 Cs 133 | 56 Ba 137 | 57 La 139 | 72 Hf 179 | 73 Ta 181 | 74 W 184 | 75 Re 186 | 76 Os 190 | 77 Ir 192 | 78 Pt 195 | 79 Au 197 | 80 Hg 201 | 81 Tℓ 204 | 82 Pb 207 | 83 Bi 209 | 84 Po | 85 At | 86 Rn |
| 87 Fr | 88 Ra 226 | 89 Ac | | | | | | | | | | | | | | | |

| 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ce 140 | Pr 141 | Nd 144 | Pm | Sm 150 | Eu 152 | Gd 157 | Tb 159 | Dy 163 | Ho 165 | Er 167 | Tm 169 | Yb 173 | Lu 175 |
| 90 Th 232 | 91 Pa | 92 U 238 | 93 Np | 94 Pu | 95 Am | 96 Cm | 97 Bk | 98 Cf | 99 Es | 100 Fm | 101 Md | 102 No | 103 Lr |

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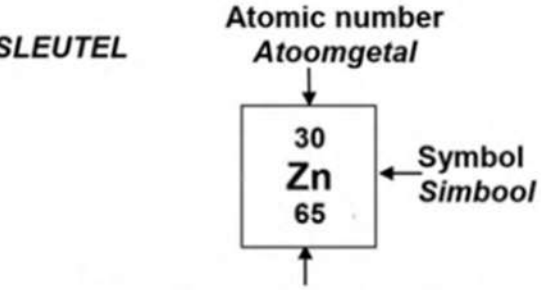

**NATURAL SCIENCES GR 8** **JUNE 2024**

**MARKING GUIDELINE**

**SECTION A**

**QUESTION 1**

1.1.1 C ✓
1.1.2 B ✓
1.1.3 D ✓
1.1.4 B ✓
1.1.5 D ✓ [5]

1.2.1 D ✓
1.2.2 C ✓
1.2.3 G ✓
1.2.4 E ✓
1.2.5 B ✓ [5]
**[10]**

**SECTION B**

**QUESTION 2**

2.1 A – Electron(s) ✓ (ONLY accept **Electron** OR **Electrons** as correct)
B – Proton(s) ✓ (ONLY accept **Proton** OR **Protons** as correct)
C – Neutron(s) ✓ (ONLY accept **Neutron** OR **Neutrons** as correct) (3)

2.2 A **OR** Electrons✓ (1)

2.3 Number of positively charged particles is equal to the number of negatively charged particles. ✓
**OR**
Number of protons (4) is equal to the number of electrons (4). (1)
**[5]**

**QUESTION 3**

3.1.1 Calcium ✓ (1)

3.1.2 Mg ✓ (1)

3.1 3 A substance that consists of atoms of only one/the same kind. ✓
**OR**
A substance which cannot be broken down into simpler substances.✓ (1)

3.2.1 C **OR** D ✓ (1)

3.2.2 A **OR** F ✓ (1)

3.2.3 B **OR** E ✓ (1)

3.2.4 C ✓ (1)

3.2.5 A ✓ (1)

**[8]**

**QUESTION 4**

4.1 Diagram B✓ (1)

4.2 **Note:** For convenience, the answer for question 4.2 are provided in table format. Learners were not expected to give their answer in a table.

| Gas | Solid | Marking criteria |
|---|---|---|
| Particles are **widely spaced** with no particular arrangement. | Particles are **closely packed** in regular arrangement | Any ONE of the corresponding differences for ONE mark✓ |
| Particles can **move** very **fast** | Particles **do not move** but **vibrate** in set positions | |
| There are **weak forces** between particles | **Strong forces** between particles hold them together | |
| There are **large open spaces** between particles | There are **small open spaces** between particles | |

(1)

4.3 Energy of the solid particles will increase. ✓
**OR**
Particles of the solid substance will vibrate faster. ✓
**OR**
Forces between particles will become weaker. ✓
**OR**
Solid substance may melt / turn into liquid. ✓
**OR**
Particles of the solid substance will move further apart. ✓ (1)

4.4 Evaporation ✓ (1)

4.5 Gas particles have **sufficient energy to overcome forces**✓ between them. Therefore, **gas particles can move far from one another**✓ to fill the volume of a container. (2)

4.6 By cooling the gas enough (until it turns into a liquid). ✓
**OR**
By compressing a gas (in a smaller container) / By increasing the pressure on a gas. ✓ (1)

**[7]**

## QUESTION 5

5.1 **Condensation** of hot water vapour on the cold plastic sheet. ✓ (1)

5.2 The temperature of the cold water and the surrounding air is lower, hence less water vapour and no visible formation of droplets.✓
**OR**
The air above the cold water is already cold and very little condensation takes place on the plastic sheet, therefore, no water droplets are observed. ✓ (1)

5.3.1 Controlled variable ✓ (1)

5.3.2 Independent variable ✓ (1)

5.3.3 Dependent variable ✓ (1)
**[5]**

## QUESTION 6

6.1 Higher density ✓ (1)

6.2 The glass block sank to the bottom✓ of the cylinder containing water (liquid) and therefore, has a HIGHER density than the water.
**OR**
If the density of the glass block was lower than that of the water, it would have floated on top of the water.✓ (1)

6.3 Volume = Length x Breadth x Height = 4 x 5 x 3 = 60 $cm^3$ ✓
**OR**
Volume = 235 – 175 = 60 $cm^3$ ✓ (1 ml = 1 $cm^3$) (1)

6.4 Density = Mass / Volume ✓
= 180 / 60 ✓
= 3 $g/cm^3$ ✓ (3)

Positive marking "With mistake"

| Criteria | Marks |
|---|---|
| Formula | 1 |
| Substitution Step (Units count no marks in this step and can be omitted) | 1 |
| Answer and Unit must be correct | 1 |

**[6]**

**QUESTION 7**

7.1 smaller than ✓

7.2 move further apart ✓

7.3 become larger ✓

7.4 expand ✓

7.5 does not fit ✓

7.6 volume ✓ **[6]**

**QUESTION 8**

8.1 A process that rearranges atoms to form new substances. ✓

**OR**

A process where reactants transform into new substances (products) by breaking and forming chemical bonds.✓ (1)

8.2 Product: Magnesium oxide ✓ (1)

8.3 Reactants: Magnesium and Oxygen (Both reactants for TWO marks) ✓ (1)

**[3]**

**SECTION A: 10 MARKS**
**SECTION B: 40 MARKS**
**GRAND TOTAL: 50 MARKS**