



education

Department of  
Education  
FREE STATE PROVINCE

**GRADE 9**

**NATURAL SCIENCES**

**JUNE 2025**

**TIME: 1 HOUR**

**MARKS: 50**

This question paper consists of 8 pages and a PERIODIC TABLE on page 8.

**INSTRUCTIONS AND INFORMATION:**

1. Write your name on the ANSWER BOOK.
2. Answer ALL questions in this question paper.
3. The question paper consists of TWO sections:

**SECTION A: 10 MARKS**

**SECTION B: 40 MARKS**

4. Number the answers correctly according to the numbering system used in this question paper.
5. LEAVE OPEN one line between two sub-questions, for example between QUESTION 2.1.1 and QUESTION 2.1.2.
6. Write neatly and legibly.
7. You are provided with a PERIODIC TABLE at the END of the question paper.

**SECTION A**

**QUESTION 1**

- 1.1 Various options are provided as possible answers to the following questions. Choose the 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 Which element has the atomic number 1?

- A Helium
  - B Lithium
  - C Hydrogen
  - D Oxygen
- (1)

1.1.2 What is the name of the chemical compound  $\text{CaCO}_3$ ?

- A Calcium carbonate
  - B Calcium oxide
  - C Calcium bicarbonate
  - D Calcium chloride
- (1)

1.1.3 Given the chemical reaction:  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$

Which of the following is/are the reactant(s)?

- A  $\text{NH}_3$  only
  - B  $\text{N}_2$  and  $\text{H}_2$
  - C  $\text{N}_2$  and  $\text{NH}_3$
  - D  $\text{H}_2$  and  $\text{NH}_3$
- (1)

1.1.4 The option that correctly shows the chemical formulae for sulphur trioxide, nitrogen dioxide and carbon monoxide.



	Sulphur trioxide	Nitrogen dioxide	Carbon monoxide
A	SO	NO	CO <sub>2</sub>
B	SO <sub>3</sub>	NO <sub>2</sub>	CO
C	SO <sub>2</sub>	NO <sub>3</sub>	CO <sub>2</sub>
D	SO <sub>3</sub>	N <sub>2</sub> O	CO

(1)

1.1.5 Which of the following is an example of a non-metal oxide?

- A MgO
- B CaO
- C Na<sub>2</sub>O
- D CO<sub>2</sub>

(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	A solution with a pH of less than 7	A	Rusting
1.2.2	A reaction between an acid and a base	B	Salt and water
1.2.3	An example of a slow irreversible chemical reaction	C	Metal oxide
1.2.4	Typical products of a neutralisation reaction	D	Acidic solution
1.2.5	A substance used in agriculture to decrease acidity in soil	E	Neutralisation
		F	Non-metal
		G	Salt and carbon dioxide

[5]

**TOTAL SECTION A: 10**

## SECTION B

## QUESTION 2

The diagram below illustrates a part of the Periodic Table of elements. Some of the elements have been labelled as indicated.

[illegible]

- 2.1 REFER TO THE DIAGRAM ABOVE to answer questions 2.1.1 to 2.1.3.
- 2.1.1 Which element in the diagram has the smallest atomic number? (1)
- 2.1.2 Which two metals in the diagram have similar chemical properties? (1)
- 2.1.3 Which two non-metals in the diagram are found in the same period? (1)
- 2.2 The symbol below represents an electrically neutral atom of **element G**.

17 Cl 35
----------------

Write down the following:

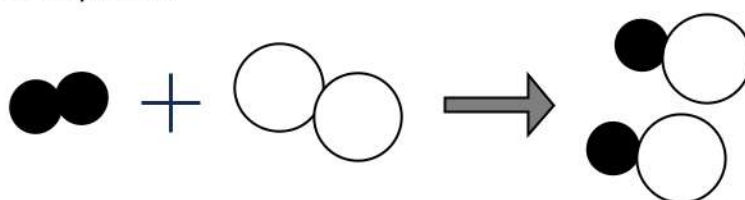
- 2.2.1 Number of electrons in this atom. (1)
- 2.2.2 Number of neutrons in this atom. (1)
- 2.2.3 The NAME of the **compound** that is formed when **element G** reacts with **element B**. (Use the Periodic Table on page 8.) (1)
- 2.3 Consider: **CO<sub>2</sub>** and **O<sub>2</sub>**.
  - 2.3.1 Explain why CO<sub>2</sub> is a compound. (1)
  - 2.3.2 Explain why O<sub>2</sub> is an element. (1)

2.4 Study the models for hydrogen and chlorine in the table.



Hydrogen	
Chlorine	

2.4.1 Use the above key to rewrite the following picture equation as a balanced chemical equation.

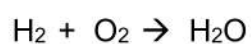


(3)

2.4.2 Give a reason why this chemical equation is balanced.

(1)

2.5 Balance the following UNBALANCED chemical equation:



(1)

[13]

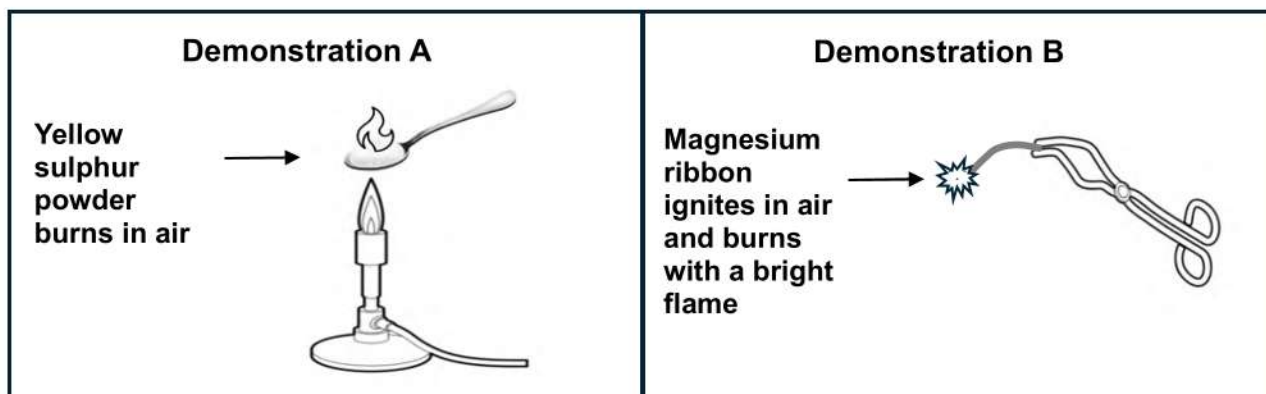


### QUESTION 3

The diagram below shows an experiment where the combustion of two elements is demonstrated.

In **Demonstration A**, a small amount of sulphur powder (a spoonful) is heated over a flame until it ignites spontaneously in the air.

In **Demonstration B**, a shiny strip of magnesium ribbon is gripped with tongs, heated, and ignites when exposed to air.



- 3.1 Identify the reactant required for the combustion of the elements in both **Demonstration A** and **B**. (1)
- 3.2 The yellow sulphur powder in **Demonstration A** burns with a bluish-purple flame and gives off a suffocating smell.
- 3.2.1 Write down the chemical symbol of the element sulphur. (1)
- 3.2.2 Classify sulphur as a metal or a non-metal. (1)
- 3.2.3 Give the NAME of the product that forms when sulphur combusts (burns) in air. (1)
- 3.2.4 Is the product mentioned in question 3.2.3 a solid, a liquid or a gas? (1)
- 3.2.5 Write down the balanced chemical equation for the reaction that takes place when sulphur combusts in air. (2)
- 3.3 Consider **Demonstration B** and answer 3.3.1 to 3.3.4.
- 3.3.1 Classify magnesium as a metal or a non-metal. (1)
- 3.3.2 What is the COLOUR of the bright flame when magnesium burns in air? (1)

3.3.3 Write down the word equation for the reaction that takes place in **Demonstration B**. (3)

3.3.4 Describe what the product of this combustion reaction looks like. Include its color AND whether it is a solid, liquid, or gas. (2)  
[14]

#### QUESTION 4

A few drops of universal indicator are added to a magnesium oxide solution. The colour scale for universal indicator is given below.

Universal indicator			
Colour	Red, orange, yellow	Green	Blue, purple
pH	below 7	7	above 7

4.1 What will the colour of universal indicator be in the magnesium oxide solution? Give a reason for your answer. (2)

4.2 While diluted hydrochloric acid solution is added to the magnesium oxide solution, the colour of the solution gradually changes to green.

4.2.1 What is the pH of the hydrochloric acid solution? Choose between BELOW 7, SEVEN or ABOVE 7. (1)

4.2.2 Explain why the color of the solution will gradually change to green while hydrochloric acid solution is added. (2)

4.3 Complete the following general word equation:

metal oxide + acid  $\rightarrow$  ... + ... (2)

4.4 The product of the reaction between magnesium oxide (MgO) and hydrochloric acid (HCl) is a compound with the ratio, Mg:Cl = 1:2.

Give the CHEMICAL FORMULA and NAME of this product. (2)

4.5 Write a balanced chemical equation for the reaction between magnesium oxide and hydrochloric acid. (4)  
[13]

**TOTAL SECTION B: 40**  
**GRAND TOTAL: 50**

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 <b>H</b> 1																	2 <b>He</b> 4
3 <b>Li</b> 7	4 <b>Be</b> 9																
11 <b>Na</b> 23	12 <b>Mg</b> 24																
19 <b>K</b> 39	20 <b>Ca</b> 40	21 <b>Sc</b> 45	22 <b>Ti</b> 48	23 <b>V</b> 51	24 <b>Cr</b> 52	25 <b>Mn</b> 55	26 <b>Fe</b> 56	27 <b>Co</b> 59	28 <b>Ni</b> 59	29 <b>Cu</b> 63,5	30 <b>Zn</b> 65	31 <b>Ga</b> 70	32 <b>Ge</b> 73	33 <b>As</b> 75	34 <b>Se</b> 79	35 <b>Br</b> 80	36 <b>Kr</b> 84
37 <b>Rb</b> 86	38 <b>Sr</b> 88	39 <b>Y</b> 89	40 <b>Zr</b> 91	41 <b>Nb</b> 92	42 <b>Mo</b> 96	43 <b>Tc</b> 98	44 <b>Ru</b> 101	45 <b>Rh</b> 103	46 <b>Pd</b> 106	47 <b>Ag</b> 108	48 <b>Cd</b> 112	49 <b>In</b> 115	50 <b>Sn</b> 119	51 <b>Sb</b> 122	52 <b>Te</b> 128	53 <b>I</b> 127	54 <b>Xe</b> 131
55 <b>Cs</b> 133	56 <b>Ba</b> 137	57 <b>La</b> 139	72 <b>Hf</b> 179	73 <b>Ta</b> 181	74 <b>W</b> 184	75 <b>Re</b> 186	76 <b>Os</b> 190	77 <b>Ir</b> 192	78 <b>Pt</b> 195	79 <b>Au</b> 197	80 <b>Hg</b> 201	81 <b>Tl</b> 204	82 <b>Pb</b> 207	83 <b>Bi</b> 209	84 <b>Po</b>	85 <b>At</b>	86 <b>Rn</b>
87 <b>Fr</b>	88 <b>Ra</b> 226	89 <b>Ac</b>															
			58 <b>Ce</b> 140	59 <b>Pr</b> 141	60 <b>Nd</b> 144	61 <b>Pm</b>	62 <b>Sm</b> 150	63 <b>Eu</b> 152	64 <b>Gd</b> 157	65 <b>Tb</b> 159	66 <b>Dy</b> 163	67 <b>Ho</b> 165	68 <b>Er</b> 167	69 <b>Tm</b> 169	70 <b>Yb</b> 173	71 <b>Lu</b> 175	
			90 <b>Th</b> 232	91 <b>Pa</b>	92 <b>U</b> 238	93 <b>Np</b>	94 <b>Pu</b>	95 <b>Am</b>	96 <b>Cm</b>	97 <b>Bk</b>	98 <b>Cf</b>	99 <b>Es</b>	100 <b>Fm</b>	101 <b>Md</b>	102 <b>No</b>	103 <b>Lr</b>	

KEY/SLEUTEL

Atomic number

Atoomgetal

30

**Zn**

65

Symbol  
Simbool

Mass number / Massagetal



## NATURAL SCIENCES

GRADE 9  
MARKING GUIDELINE

JUNE 2025

## SECTION A

## QUESTION 1

1.1.1 C ✓

1.1.2 A ✓

1.1.3 B ✓

1.1.4 B ✓

1.1.5 D ✓

[5]

1.2.1 D ✓

1.2.2 E ✓

1.2.3 A ✓

1.2.4 B ✓

1.2.5 C ✓

TOTAL SECTION A

[5]  
10

## SECTION B

## QUESTION 2

2.1.1 Element **B** ✓ (Accept: Sodium / Na) (1)2.1.2 **R** and **A** ✓ (Accept: Calcium and Barium / Ca and Ba) (1)2.1.3 **L** and **G** ✓ (Accept: Phosphorus and Chlorine / P and Cl) (1)

2.2.1 17 ✓ (1)

2.2.2 18 ✓ (1)

2.2.3 Sodium chloride ✓ (1)

2.3.1 CO<sub>2</sub> is a compound because it consists of atoms from **different elements**. ✓ (1)2.3.2 O<sub>2</sub> is an element because it consists of two atoms of the **same element**. ✓ (1)2.4.1 H<sub>2</sub> ✓ + Cl<sub>2</sub> ✓ → 2HCl ✓ (3)

2.4.2 The number of H-atoms (2 H-atoms) on the left is equal to the number of H-atoms on the right, and the number of Cl-atoms (2 Cl-atoms) on the left is equal to the number of Cl-atoms on the right. ✓

**OR**

The number of atoms of each element is the same on the left and right side of the equation. ✓

(1)

2.5 2H<sub>2</sub> + O<sub>2</sub> → 2H<sub>2</sub>O (BOTH coefficients correct for **ONE** mark ✓) (1)

[13]

### QUESTION 3

- 3.1 Oxygen (gas) / O<sub>2</sub> ✓ (1)
- 3.2.1 S ✓ (1)
- 3.2.2 Non-metal ✓ (1)
- 3.2.3 Sulfur dioxide ✓ (1)
- 3.2.4 Gas ✓ (1)
- 3.2.5  $S + O_2 \rightarrow SO_2$  (Both reactants ✓ Product ✓) (2)
- 3.3.1 Metal ✓ (1)
- 3.3.2 White / blinding white ✓ (1)
- 3.3.3 Magnesium ✓ + Oxygen ✓ → Magnesium oxide ✓ (3)
- 3.3.4 White ✓ solid / powder ✓ (2)
- [14]

### QUESTION 4

- 4.1 Blue / purple ✓  
Magnesium is a metal and **metal oxides are basic** ✓ oxides. (2)
- 4.2.1 Below 7 ✓ (1)
- 4.2.2 Hydrochloric acid makes the basic magnesium oxide solution less basic / more acidic ✓ until it becomes neutral. ✓ (2)
- 4.3 Salt ✓ + Water ✓ (2)
- 4.4 MgCl<sub>2</sub> ✓ Magnesium chloride ✓ (2)
- 4.5  $MgO + 2HCl \rightarrow MgCl_2 + H_2O$

Mark with mistake

Marking criteria	Marks
Both reactants; MgO and HCl	✓
Product: MgCl <sub>2</sub> (mark with mistake)	✓
Product: H <sub>2</sub> O	✓
Balancing	✓

(4)  
[13]

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

NATURAL SCIENCES GR. 8

JUNE 2025

# MARKING GUIDELINES

Also refer to the FS Marking Guidelines in the Subject Guide, Appendix D.

## SECTION A

### QUESTION 1

1.1.1	C✓	(1)
1.1.2	A✓	(1)
1.1.3	C✓	(1)
1.1.4	B✓	(1)
1.1.5	D✓	(1)
		<b>[5]</b>
1.2.1	D✓	(1)
1.2.2	A✓	(1)
1.2.3	E✓	(1)
1.2.4	H✓	(1)
1.2.5	B✓	(1)
		<b>[5]</b>
<b>TOTAL SECTION A:</b>		<b>10</b>

## SECTION B

### QUESTION 2

2.1	(a) Helium✓	(1)
	(b) Calcium✓	(1)
	(c) Magnesium✓	(1)
	(d) Silicon✓	(1)
2.2	P✓	(1)
2.3.1	Boron / B has <u>5 protons</u> ✓ in the nucleus.	(1)
2.3.2	6✓	(1)
2.3.3	It has an equal number of protons (+particles) and electrons (-particles).✓	
	<b>OR</b>	
	It has 5 protons and 5 electrons.✓	(1)
		<b>[8]</b>

### QUESTION 3

- 3.1.1  $H_2$  ✓ (1)
- 3.1.2  $H_2O$  ✓ (1)
- 3.1.3  $CO_2$  ✓ (1)
- 3.2.1 B ✓ (1)
- 3.2.2 E ✓ (1)
- 3.2.3 A ✓ (1)
- 3.2.4 D ✓ (1)
- 3.2.5 C ✓ (1)
- [8]**

### QUESTION 4

- 4.1.1 C ✓ and D ✓ (in any order) (2)
- 4.1.2 **NOTE:** Only accept what is VISIBLE in diagram B.
- Particles are closely packed. ✓
- Particles are in a regular arrangement. ✓
- Particles have (very) small spaces ✓ between them. (ANY ONE) (1)
- 4.1.3 A ✓ (1)
- 4.2.1 Solid, liquid, gas (in any order; ALL three for ONE mark) (1)
- 4.2.2 B ✓ (1)
- 4.2.3 Condensation ✓ (1)
- 4.3.1 Melting; ✓ The wax/solid changes into a liquid. ✓
- OR**
- The wax melts ✓ and changes from a solid into a liquid. ✓ (2)
- 4.3.2 Solidification; ✓ The liquid changes into a solid. ✓
- OR**
- The liquid wax turns into a solid ✓ through solidification / freezing. ✓ (2)
- [11]**



### QUESTION 5

5.1.1 Volume of cube =  $l \times b \times h$   
 $= 2 \times 2 \times 2$  ✓  
 $= 8 \text{ cm}^3$

Density =  $\frac{\text{mass}}{\text{volume}}$

$= \frac{6,88}{8}$  ✓

$= 0,86 \text{ g/cm}^3$

#### Marking criteria:

- ✓ Volume of cube:  $2 \times 2 \times 2$
- ✓ Substitution of 6,88
- ✓ Substitution of 8 **OR**  $2 \times 2 \times 2$
- ✓ Answer, with unit:  $0,86 \text{ g/cm}^3$   
**OR**  $0,86 \text{ g·cm}^{-3}$

**NOTE:** If any substitution is incorrect, the learner forfeits the mark on the substitution **AND** on the answer (maximum 2 out of 4). (4)

5.1.2 Candle wax has a lower density ( $0,86 \text{ g/cm}^3$ ) than water ( $1 \text{ g/cm}^3$ ). ✓ (1)

5.2.1 Due to expansion. / The ball expanded. ✓  
**ACCEPT:** The ball becomes larger / bigger / increases in volume / size. ✓ (1)

5.2.2 (a) Number of particles remains the same. ✓ (1)

(b) The spaces between the particles become bigger / increase. ✓  
**OR**  
 The particles move further apart. ✓ (1)

(c) The particles move faster. ✓ (1)

**[9]**

### QUESTION 6

6.1 Oxygen ✓ and hydrogen ✓ (**in any order**)  
 (NOTE: Do not accept air) (2)

6.2 Water ✓ (vapour) (1)

6.3 The only products are water and electrical energy / heat which are not harmful to the environment / no harmful gases are released. ✓  
**OR**  
 It is a clean energy source with no greenhouse gas emissions / no air pollution. ✓  
**OR**  
 No fossil fuels are used in a hydrogen fuel cell. ✓  
 (Any relevant answer.) (ANY ONE) (1)

**[4]**

**TOTAL SECTION B: 40**

**GRAND TOTAL: 50**

