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 $CaCO_3$?

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

1.1.3 Given the chemical reaction: $N_2 + 3H_2 \rightarrow 2NH_3$

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

A NH_3 only
B N_2 and H_2
C N_2 and NH_3
D H_2 and 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_2
B	SO_3	NO_2	CO
C	SO_2	NO_3	CO_2
D	SO_3	N_2O	CO

(1)

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

A MgO
B CaO
C Na_2O
D CO_2

(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

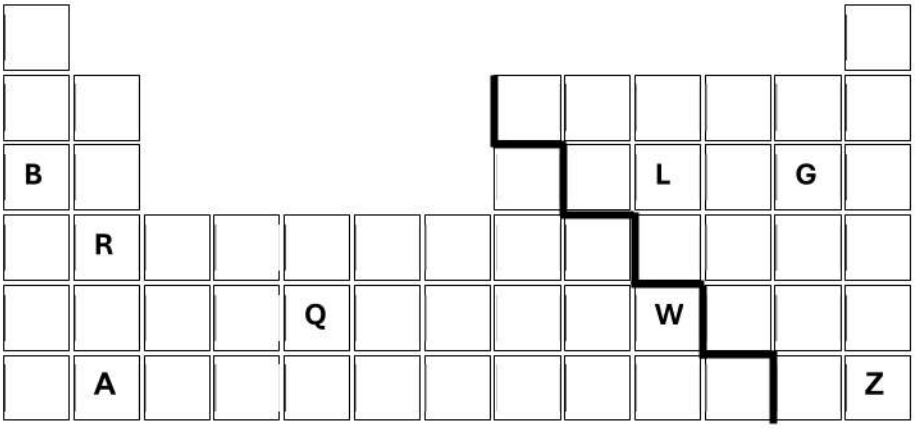
[5]

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.



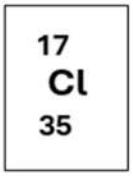
2.1 **REFER TO THE DIAGRAM ABOVE** to answer questions 2.1.1 to 2.1.3.

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**.



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_2** and **O_2**.

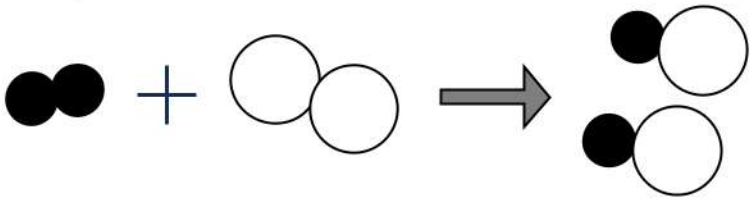
2.3.1 Explain why CO_2 is a compound. (1)

2.3.2 Explain why O_2 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:

$H_2 + O_2 \rightarrow H_2O$ (1)

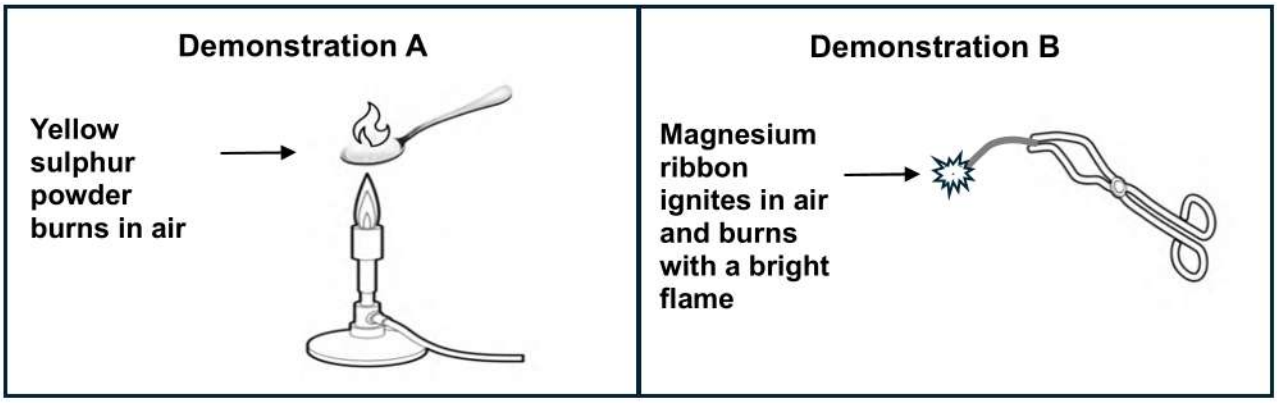
[13]

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 → … + … (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

PERIODIC TABLE / *PERIODIEKE TABEL*

KEY/*SLEUTEL*

Atomic number
Atoomgetal

30
Zn
65

Symbol
Simbool

Mass number / *Massagetal*

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 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 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

NATURAL SCIENCES **GRADE 9** **JUNE 2025**

MARKING GUIDELINE

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 ✓ **[5]**

TOTAL SECTION A **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_2 is a compound because it consists of atoms from **different elements**.✓ (1)

2.3.2 O_2 is an element because it consists of two atoms of the **same element.**✓ (1)

2.4.1 H_2✓ + Cl_2✓ → $\underline{2HCl}$ ✓ (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 $\underline{2}H_2 + O_2 \rightarrow \underline{2}H_2O$ (BOTH coefficients correct for **ONE** mark ✓) (1)

[13]

QUESTION 3

3.1 Oxygen (gas) / O_2 ✓ (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 $MgC\ell_2$✓ Magnesium chloride✓ (2)

Mark with mistake

4.5 $MgO + \underline{2}HC\ell \rightarrow MgC\ell_2 + H_2O$

Marking criteria	Marks
Both reactants; MgO and $HC\ell$	✓
Product: $MgC\ell_2$ (mark with mistake)	✓
Product: H_2O	✓
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)
		[5]

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)
		[5]

TOTAL SECTION A: 10

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 5 protons✓ in the nucleus.	(1)
2.3.2	6✓	(1)
2.3.3	It has an equal number of protons (+particles) and electrons (-particles).✓ **OR** It has 5 protons and 5 electrons.✓	(1)
		[8]

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 x b x h
= 2 x 2 x 2✓
= 8 cm^3

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

= $\frac{6,88}{8}$

= 0,86 g/cm^3

Marking criteria:
✓ Volume of cube: 2 x 2 x 2

✓ Substitution of 6,88
✓ Substitution of 8 **OR** 2 x 2 x 2

✓ Answer, with unit: 0,86 g/cm^3
OR 0,86 $g \cdot cm^{-3}$

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 g/cm^3) than water (1 g/cm^3).✓ (1)

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

5.2.2 (a) Number of particles <u>remains the same</u>. ✓ (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