



# education

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Department:  
Education  
North West Provincial Government  
**REPUBLIC OF SOUTH AFRICA**

**PROVINCIAL ASSESSMENT**

**GRADE 10**

**PHYSICAL SCIENCES: CHEMISTRY (P2)**  
**JUNE 2024**

**MARKS: 75**

**TIME: 1½ hours**

**This question paper consists of 8 pages and 2 data sheets.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of FIVE questions. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page in the ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave ONE line between two sub-questions, e.g. between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your FINAL numerical answers to a minimum of TWO decimal places.
9. Give brief motivations, discussions, etc. where required.
10. You are advised to use the attached DATA SHEETS.
11. Write neatly and legibly.

**QUESTION 1: MULTIPLE- CHOICE QUESTIONS**

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question numbers (1.1 to 1.5) in the ANSWER BOOK, e.g. 1.6 C.

- 1.1 The process where a solid substance change directly to a gas is called:
- A Evaporation
  - B Condensation
  - C Sublimation
  - D Melting (2)
- 1.2 The number of neutrons of  ${}_{12}^{24}\text{Mg}$  is:
- A 6
  - B 24
  - C 36
  - D 12 (2)
- 1.3 In which ONE of the following compounds do metallic bond occur between elementary particles?
- A Sodium chloride
  - B Mercury
  - C Water
  - D Sulphur (2)

1.4 Which ONE of the following is correct regarding a PHYSICAL CHANGE of a substance?

- (i) No new substances are formed.
- (ii) Intermolecular forces are broken.
- (iii) Energy changes are large.
- (iv) Number of atoms are conserved.

A (i), (ii) and (iv) only

B (i), (iii) and (iv) only

C (i), (ii) and (iii) only

D (i) and (ii) only

(2)

1.5 Which ONE of the following represents 1 mole of a substance?

A 16 g oxygen gas

B 2 g hydrogen gas

C 22,4 dm<sup>3</sup> copper

D 22,4 cm<sup>3</sup> nitrogen gas

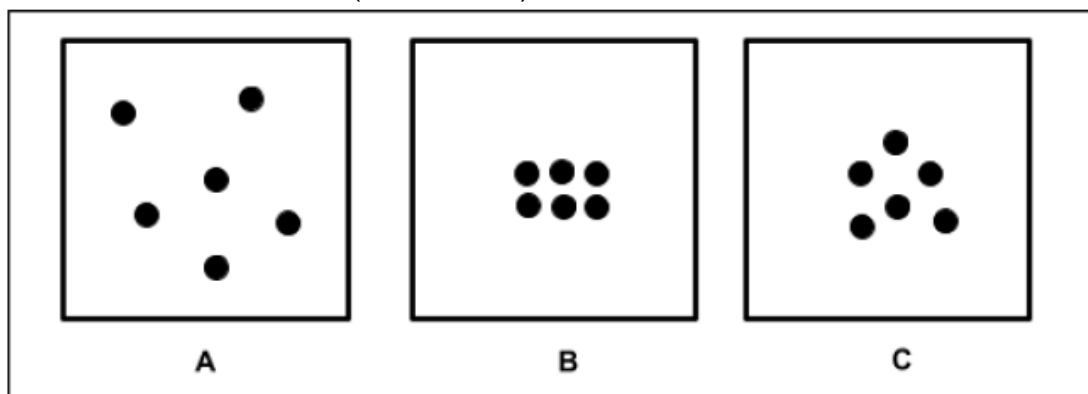
(2)  
**[10]**

**QUESTION 2 (Start on a new page.)**

Study the list below that shows a variety of substances.

glass; bromine; copper wire; table salt; air; sodium chloride

- 2.1 Define a *pure substance*. (2)
- 2.2 Use the information above and write down:
- 2.2.1 ONE substance that is a mixture. (1)
- 2.2.2 ONE substance that is malleable. (1)
- 2.2.3 A substance that is a liquid at room temperature. (1)
- 2.3 The grade 10 learners are investigating the effect of increasing temperature on three different substances (**A**, **B** and **C**).



- 2.3.1 Organise the diagrams according to the increasing average kinetic energy of the substances. (3)
- 2.3.2 Identify the phase which substance C is in? (1)
- [9]**

**QUESTION 3 (Start on a new page.)**

Chlorine is a non-metallic element with an atomic number of 17 and can exist as isotopes.

- 3.1 Define *isotopes*. (2)
- 3.2 Natural chlorine consists of  $\text{Cl} - 35$  and  $\text{Cl} - 37$ .
- 3.2.1 Write down the sp-notation for  $\text{Cl}$ . (2)
- 3.2.2 Calculate the relative atomic mass of chlorine if 24,23 % of natural chlorine is  $\text{Cl} - 37$ . (3)
- 3.2.3 Write down the number of valence electron in a chlorine atom. (1)
- 3.2.4 What period of the Periodic Table does chlorine belong to? (1)
- 3.3 Calcium reacts with chlorine to form calcium chloride.
- 3.3.1 Draw the Aufbau (orbital box) diagram for a calcium-ion. (3)
- 3.3.2 Write down the chemical symbols of the particles found in the calcium chloride crystal (lattice). (2)

Study the table of the first ionisation energies below and answer the questions that follow.

	<b>FIRST IONISATION ENERGY (kJ.mol<sup>-1</sup>)</b>
<b>Li</b>	520
<b>F</b>	1 681

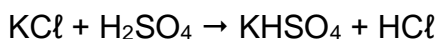
- 3.4 Define the term ionisation energy. (2)
- 3.5 Use the information in the table to:
- 3.5.1 Explain why the first ionisation energy of Lithium is so much lower compared to that of Fluorine. (3)
- 3.5.2 Choose from the options below if the second ionisation energy of Lithium will be lower than, higher than or equal to.  
Write only LOWER THAN, HIGHER THAN or EQUAL TO. (1)
- [20]**

**QUESTION 4 (Start on a new page.)**

Chlorine gas can be prepared in the laboratory by allowing concentrated hydrochloric acid to react with manganese dioxide. Manganese (II) chloride and water also forms from the reaction.

- 4.1 Define the term *covalent molecule*. (2)
- 4.2 Classify the reaction between hydrochloric acid and manganese dioxide as a chemical or physical change. (1)
- 4.3 Write down:
- 4.3.1 The Lewis structure for the formation of the water molecule. (4)
- 4.3.2 Name the chemical bond that exist between atoms of a water molecule. (1)
- 4.3.3 A balanced chemical equation for the reaction between hydrochloric acid (HCl) and manganese dioxide (MnO<sub>2</sub>). Show all phases of the reactants and products. (3)

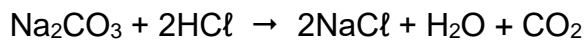
Hydrochloric acid is one of the most used acids in the industry. In one reaction hydrochloric acid is prepared as seen in the balanced chemical equation below.



- 4.4 Give the CHEMICAL NAME of the following compounds:
- 4.4.1 H<sub>2</sub>SO<sub>4</sub> (1)
- 4.4.2 KCl (1)
- 4.5 Write an ionic equation for the formation of KHSO<sub>4</sub>. (3)
- 4.6 Give the name of the type of bond that is formed in KHSO<sub>4</sub>. (1)
- 4.7 Use the law of conservation of mass to show that mass is conserved in the reaction above. (5)
- [22]**

**QUESTION 5 (Start on a new page.)**

The reaction of sodium carbonate and hydrochloric acid produces table salt, water and carbon dioxide according to the following balanced chemical equation.



- 5.1 Define the term *mole* of a substance. (2)
- 5.2 Calculate the:
- 5.2.1 Molar mass of  $\text{Na}_2\text{CO}_3$ . (2)
- 5.2.2 Number of atoms in 2 mol of  $\text{HCl}$ . (4)
- 5.2.3 Mole of  $\text{Na}_2\text{CO}_3$  if 243,8 g was used in this reaction. (3)
- 5.2.4 Volume of  $\text{CO}_2$ , if 1,15 mol of  $\text{CO}_2$  is produced in this reaction at STP. (3)

**[14]****TOTAL: 75**



**DATA FOR PHYSICAL SCIENCES GRADE 10  
PAPER 2 (CHEMISTRY)**

**TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIIESE KONSTANTES**

<b>NAME/NAAM</b>	<b>SYMBOL/SIMBOOL</b>	<b>VALUE/WAARDE</b>
Standard pressure <i>Standaarddruk</i>	$p^{\theta}$	$1,013 \times 10^5 \text{ Pa}$
Molar gas volume at STP <i>Molêre gasvolume by STD</i>	$V_m$	$22,4 \text{ dm}^3 \cdot \text{mol}^{-1}$
Standard temperature <i>Standaardtemperatuur</i>	$T^{\theta}$	273 K
Charge on electron <i>Lading op elektron</i>	e	$-1,6 \times 10^{-19} \text{ C}$
Avogadro's constant <i>Avogadro-konstante</i>	$N_A$	$6,02 \times 10^{23} \text{ mol}^{-1}$

**TABLE 2: FORMULAE/TABEL 2: FORMULES**

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ OR $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$

**TABLE 3: THE PERIODIC TABLE OF ELEMENTS/TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE**

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 2,1 1 <b>H</b>																	2 4 <b>He</b>
3 1,0 7 <b>Li</b>	4 1,5 9 <b>Be</b>											5 2,0 11 <b>B</b>	6 2,5 12 <b>C</b>	7 3,0 14 <b>N</b>	8 3,5 16 <b>O</b>	9 4,0 19 <b>F</b>	10 20 <b>Ne</b>
11 0,9 23 <b>Na</b>	12 1,2 24 <b>Mg</b>											13 1,5 27 <b>Al</b>	14 1,8 28 <b>Si</b>	15 2,1 31 <b>P</b>	16 2,5 32 <b>S</b>	17 3,0 35,5 <b>Cl</b>	18 40 <b>Ar</b>
19 0,8 39 <b>K</b>	20 1,0 40 <b>Ca</b>	21 1,3 45 <b>Sc</b>	22 1,5 48 <b>Ti</b>	23 1,6 51 <b>V</b>	24 1,6 52 <b>Cr</b>	25 1,5 55 <b>Mn</b>	26 1,8 56 <b>Fe</b>	27 1,8 59 <b>Co</b>	28 1,8 59 <b>Ni</b>	29 1,9 63,5 <b>Cu</b>	30 1,6 65 <b>Zn</b>	31 1,6 70 <b>Ga</b>	32 1,8 73 <b>Ge</b>	33 2,0 75 <b>As</b>	34 2,4 79 <b>Se</b>	35 2,8 80 <b>Br</b>	36 84 <b>Kr</b>
37 0,8 86 <b>Rb</b>	38 1,0 88 <b>Sr</b>	39 1,2 89 <b>Y</b>	40 1,4 91 <b>Zr</b>	41 92 <b>Nb</b>	42 1,8 96 <b>Mo</b>	43 1,9 96 <b>Tc</b>	44 2,2 101 <b>Ru</b>	45 2,2 103 <b>Rh</b>	46 2,2 106 <b>Pd</b>	47 1,9 108 <b>Ag</b>	48 1,7 112 <b>Cd</b>	49 1,7 115 <b>In</b>	50 1,8 119 <b>Sn</b>	51 1,9 122 <b>Sb</b>	52 2,1 128 <b>Te</b>	53 2,5 127 <b>I</b>	54 131 <b>Xe</b>
55 0,7 133 <b>Cs</b>	56 0,9 137 <b>Ba</b>	57 139 <b>La</b>	72 1,6 179 <b>Hf</b>	73 181 <b>Ta</b>	74 184 <b>W</b>	75 186 <b>Re</b>	76 190 <b>Os</b>	77 192 <b>Ir</b>	78 195 <b>Pt</b>	79 197 <b>Au</b>	80 201 <b>Hg</b>	81 1,8 204 <b>Tl</b>	82 1,8 207 <b>Pb</b>	83 1,9 209 <b>Bi</b>	84 2,0 <b>Po</b>	85 2,5 <b>At</b>	86 <b>Rn</b>
87 0,7 <b>Fr</b>	88 0,9 226 <b>Ra</b>	89 <b>Ac</b>	<p style="text-align: center;"><b>KEY/SLEUTEL</b></p> <p style="text-align: center;">Atomic number <i>Atoomgetal</i></p> <p style="text-align: center;">Electronegativity <i>Elektronegatiwiteit</i></p> <p style="text-align: center;">Symbol <i>Simbool</i></p> <p style="text-align: center;">Approximate relative atomic mass <i>Benaderde relatiewe atoommassa</i></p>														
			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>	