LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 10

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PHYSICAL SCIENCES: CHEMISTRY (P2)

JUNE 2025

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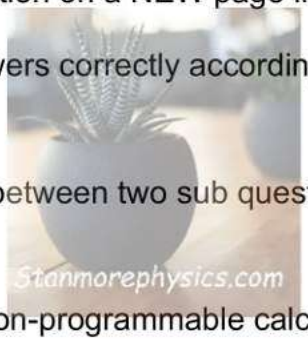
MARKS : 100

TIME : 2 hours

This question paper consists of 10 pages including cover page and 2 data sheets.

INSTRUCTIONS AND INFORMATION

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



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QUESTION 1 (Start on a new page)

Various options are provided as possible with 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 1.10) in the ANSWER BOOK, e.g. 1.11 D.

1.1 Which one of the following statements is TRUE about **brittle** physical property

A. Ability to be stretched into a wire.

B. Ability to be hammered or pressed into shape without breaking or cracking.

C. Hard but likely to break easy.

D. Ability to be stretched into a wire. (2)

1.2 A compound has been defined as…

A. A pure substance consisting of two or more different elements.

B. A pure substance consisting of one type of atom.

C. A substance that cannot be separated into simpler components by physical methods.

D. The temperature of a liquid at which its vapour pressure equals the external (atmospheric) pressure. (2)

1.3 Leago wants to state the kinetic molecular theory of gases to her teacher, and she has the following options:

i. Are very far apart
ii. Move around in all directions
iii. Vibrate about fixed positions.
iv. Have weak forces of attraction between them

Which ONE combination will be the most correct to explain kinetic molecular theory of gases?

A. (i) only

B. (iii) and (iv)

C. (i), (ii) and (iv)

D. (i), (ii) and (iii) (2)

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1.4 Study the unknown elements **J** to **N** below

	J	K	L	M	N
ELEMENT	$^{19}_{9}X$	$^{19}_{10}X$	$^{20}_{9}X$	$^{21}_{11}X$	$^{19}_{8}X$

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Which **TWO** elements from **J** to **N** are isotopes?

A. J and K

B. J and N

C. K and M

D. J and L (2)



1.5 What is the correct formula for copper (I) sulphate?

A. Cu_1SO_4

B. Cu_2SO_4

C. Cu_1SO_3

D. Cu_2SO_3 (2)

1.6 The electronegativity of elements of Periodic Table increases…

A. across the period from left to right

B. across the groups from left to right

C. down the periods of the same group

D. when their relative atomic mass decreases (2)

1.7 Covalent bonding involves the_____ of electrons, while the ionic bonding involves the_____ of electrons

A. sharing; splitting

B. transferring; sharing

C. exchanging; sharing

D. sharing; transferring (2)

1.8 The process whereby a solid substance changes directly to the gaseous phase is known as …

A. evaporation

B. condensation

C. sublimation

D. melting (2)

1.9 Consider the unbalanced chemical equation below.

$$A_2(s) + B_3(g) \rightarrow AB_2(g)$$

Which ONE of the sets of coefficients will balance the chemical equation?

A. 4: 6: 3

B. 2: 3: 2

C. 3: 4: 6

D. 3: 6: 4 (2)

1.10 One mole of H_2O contains …

A. 6.63×10^{34} molecules

B. 3 atoms

C. 1 molecule

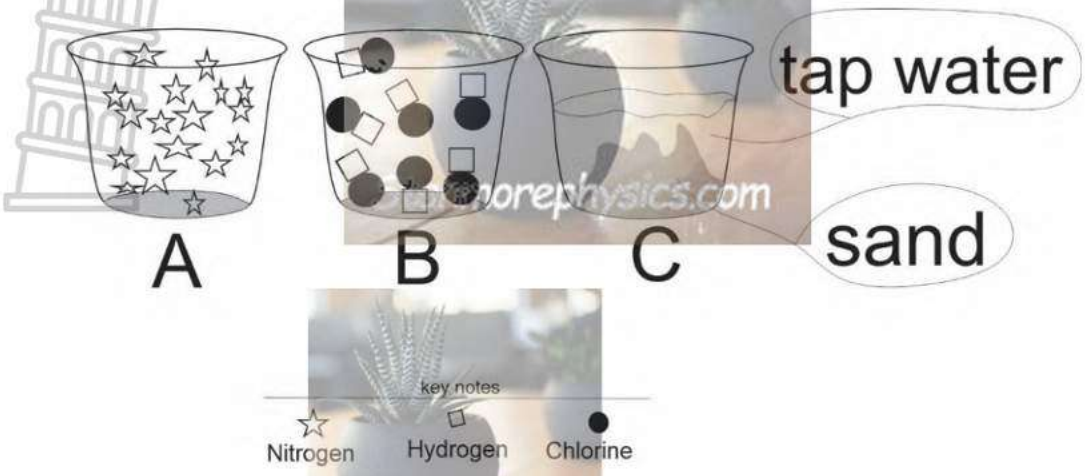
D. 6.02×10^{23} molecules (2)

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QUESTION 2 (Start on a new page.)

The diagram below shows three different substances, A, B and C.



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2.1 Define the term *compound*. (2)

2.2 From the diagram, use the key provided to answer the questions that follow.

Write down a LETTER (**A**, **B** or **C**) that represents the following:

2.2.1 Compound (1)

2.2.2 Element (1)

2.3 Write down a LETTER (**A**, **B** or **C**) that represents a heterogeneous mixture.

Explain your answer (2)

2.4 Which physical method would you use to separate substance **C**? (1)

[7]

QUESTION 3 (Start on a new page.)

3.1 The following table shows the melting and boiling point of five substances.

	Substances				
	Water	**Ethanol**	**Bromine**	**Chlorine**	**phosphorus**
Melting point (°C)	0	-144	-7	-102	44
Boiling point (°C)	100	78	59	-34	280

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3.1.1 Define *boiling point.* (2)

Which of these substances:

3.1.2 has the lowest boiling point? (1)

3.1.3 is a solid at room temperature (25 °C)? (1)

3.1.4 are liquids at room temperature (25 °C)? (3)

3.1.5 is a gas at room temperature (25 °C)? (1)

3.2 Explain the following use: In places where it snows, the traffic department pours salt on snow-covered roads. (2)

3.3 Explain each of the following in terms of the kinetic molecular theory of matter:

3.3.1 A metal laundry line which hangs droop on a very warm day (2)

3.3.2 Decrease of metal size due to exposure of liquid nitrogen (2)

3.3.3 The need for gaps in railway lines (2)

3.4 Many people **mistakenly** take a bath after heavy drinking of an alcohol to ease the smell so that his/her Boss won't notice the smell, but they turned to smell more of alcohol after a bath even a day after heavy drinking.

3.4.1 Is this primarily due to diffusion or Brownian motion? (1)

3.4.2 Explain your answer in 3.4.1 (2)

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QUESTION 4 (Start on a new page.)

4.1 Define the terms:

4.1.1 *Atomic number* (2)

4.1.2 *Isotope* (2)

4.2 Name the particle(s) found in the atom which:

4.2.1 carry no electrical charge. (1)

4.2.2 carry one negative electrical charge. (1)

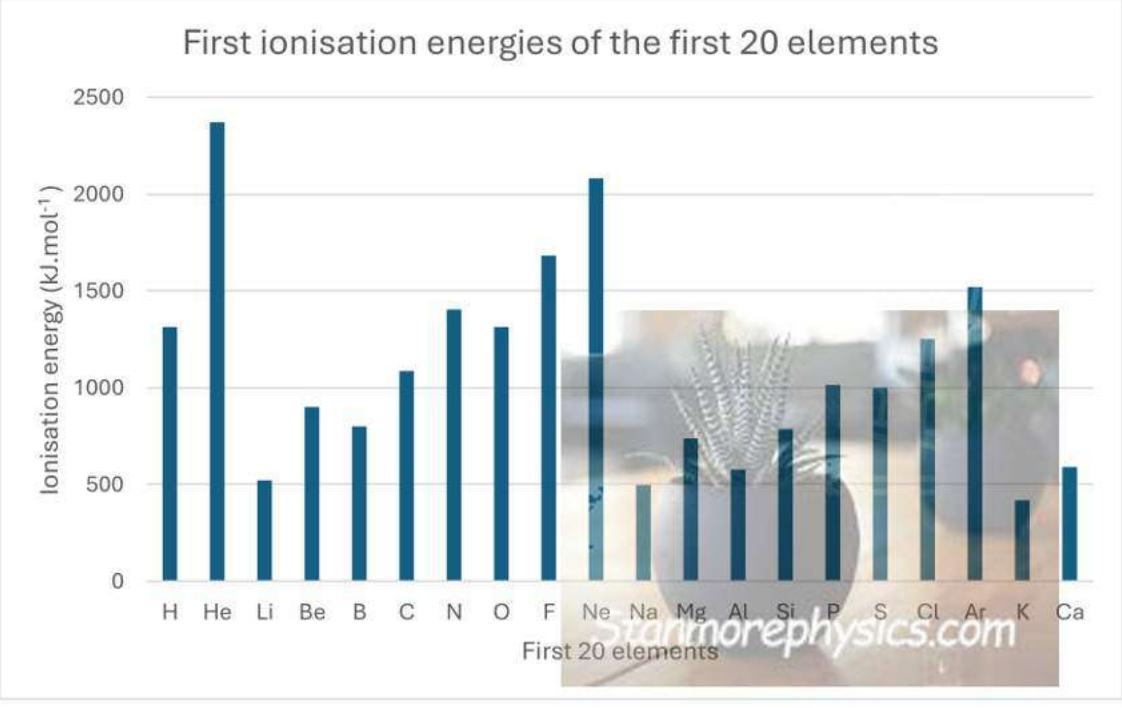
4.2.3 has the smallest mass of all. (1)

4.3 Complete the table below. Write only the answer next to the question number (4.3.1– 4.3.5).
NB. DON'T redraw the table, e.g. 4.3.1 – 10

ELEMENT	MASS NUMBER	ATOMIC NUMBER	NUMBER OF PROTONS	NUMBER OF NEUTRONS	NUMBER OF ELECTRONS
Oxygen	16	**4.3.1**	8	**4.3.2**	8
4.3.3	19	9	9	**4.3.4**	**4.3.5**

(5)

4.4 The graph below shows the first ionisation energies of the first 20 elements in the periodic table.



4.4.1 Define the term first *ionisation energy*. (2)

4.4.2 Which three elements have the lowest first ionisation energies? (1)

4.4.3 In which group of the periodic table do these elements **4.4.2** occur? (1)

4.4.4 Which of the metals or non-metals will preferably form positive ions? Justify your answer with data from the graph. (2)

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QUESTION 5 (Start on a new page.)

5.1 Define *covalent bond*. (2)

5.2 Draw the Lewis diagram of simple covalent molecules

5.2.1 HCl (2)

5.2.2 CH_4 (2)

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5.3 Ammonia (NH_3) is manufactured using an industrial process, known as the Haber process. It is used in the production of inorganic fertilisers, such as ammonium sulphate.

5.3.1 Write down the chemical formula for ammonium sulphate. (2)

5.3.2 Name the type of bond between the atoms in the ammonia molecule. (1)

5.3.3 Draw the Aufbau diagram (orbital box diagram) for nitrogen. (2)

5.3.4 How many valence electrons does nitrogen have? (1)

[12]

QUESTION 6 (Start on a new page.)

Magnesium ribbon burns in oxygen with a bright white flame to produce a white solid, magnesium oxide.

6.1 Is the reaction between magnesium ribbon and oxygen a PHYSICAL or CHEMICAL change? Give a reason for the answer. (2)

6.2 Write down a balanced equation for the reaction between magnesium and oxygen. (3)

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6.3 Use the Law of Conservation of mass to show that mass is conserved during the reaction in QUESTION 6.2. (4)

6.4 The balanced chemical equation (i) and the word equation (ii) for two chemical reactions are shown below

i. $C\ell_2(g) + H_2(g) \rightarrow 2HC\ell(g)$

ii. aluminium carbonate → aluminium oxide + carbon dioxide

6.4.1 Write the chemical equation (i) in word equation (2)

6.4.2 Write the word equation (ii) in chemical equation (3)

[14]

QUESTION 7 (Start on a new page.)

7.1 Define *one mole.* (2)

7.2 Study the balanced chemical equation of the reaction between sodium carbonate (Na_2CO_3) and hydrochloric acid ($HC\ell$) and answer the questions that follow.

$$Na_2CO_3(s) + 2HC\ell(\ell) \rightarrow 2NaC\ell(s) + CO_2(g) + H_2O(\ell)$$

In a reaction, initially 10,6 g of sodium carbonate reacts completely with excess hydrochloric acid.

Calculate

7.2.1 The molar mass of sodium carbonate. (2)

7.2.2 Initial number of moles of sodium carbonate (3)

7.2.3 Number of moles of carbon dioxide if 4,87 dm^3 of carbon dioxide was produced at STP. (3)

[10]

TOTAL : 100

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 2 (CHEMISTRY)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 2 (CHEMIE)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^{θ}	$1{,}013 \times 10^5$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	22,4 $dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^{θ}	273 K
Charge on electron *Lading op elektron*	e	$1{,}6 \times 10^{-19}$ C

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TABLE 2: FORMULAE/*TABEL 2: FORMULES*

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

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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)
2,1 H 1																	2 He 4
1,0 Li 7	1,5 Be 9											2.0 B 11	2,5 C 12	3,0 N 14	3,5 O 16	4,0 F 19	10 Ne 20
0,9 Na 23	1,2 Mg 24											1.5 Aℓ 27	1.8 Si 28	2.1 P 31	2.5 S 32	3.0 Cℓ 35,5	18 Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1.5 Mn 55	1,8 Fe 56	1,8 Co 59	1,8 Ni 59	1,9 Cu 63,5	1,6 Zn 65	1,6 Ga 70	1,8 Ge 73	2,0 As 75	2,4 Se 79	2,8 Br 80	36 Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	41 Nb 92	1,8 Mo 96	1.9 Tc	2,2 Ru 101	2,2 Rh 103	2,2 Pd 106	1,9 Ag 108	1,7 Cd 112	1,7 In 115	1,8 Sn 119	1,9 Sb 122	2,1 Te 128	2,5 I 127	54 Xe 131
0,7 Cs 133	0,9 Ba 137	57 La 139	1,6 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	1,8 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	86 Rn
0,7 87 Fr	0,9 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

KEY/*SLEUTEL*

