KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL STANDARDISED ASSESSMENT

GRADE 10

PHYSICAL SCIENCES P2

JUNE 2026

MARKS: 75

DURATION: 1½ hours

This question paper consists of 9 pages and 2 data sheets.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX 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. downloaded from Stanmorephysics
4. Leave ONE line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEETS.
8. Show ALL formulae and substitutions in ALL calculations.
9. Round off your final numerical answers to a minimum of TWO decimal places.
10. Give brief motivations, discussions et cetera where required.
11. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four 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 number (1.1–1.5) in the ANSWER BOOK, for example 1.6 E.

1.1 When a metal bonds with a non-metal, the non-metal atom will.....

A lose electrons and decrease in size

B gain electrons and decrease in size

C lose electrons and increase in size

D gain electrons and increase in size (2)

1.2 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)

1.3 The electronegativity of elements of the Periodic Table increases ...

A across the groups from left to right.

B across the period from left to right.

C down the periods of the same group.

D when their relative atomic mass decreases. (2)

1.4 Nitrogen has a higher first ionisation energy than oxygen.
Which statement explains this observation?

A The radius of an oxygen atom is smaller.

B An oxygen atom has more electron shells occupied.

C Oxygen has paired electrons in the 2p sub-shell.

D An oxygen atom has more protons in the nucleus (2)

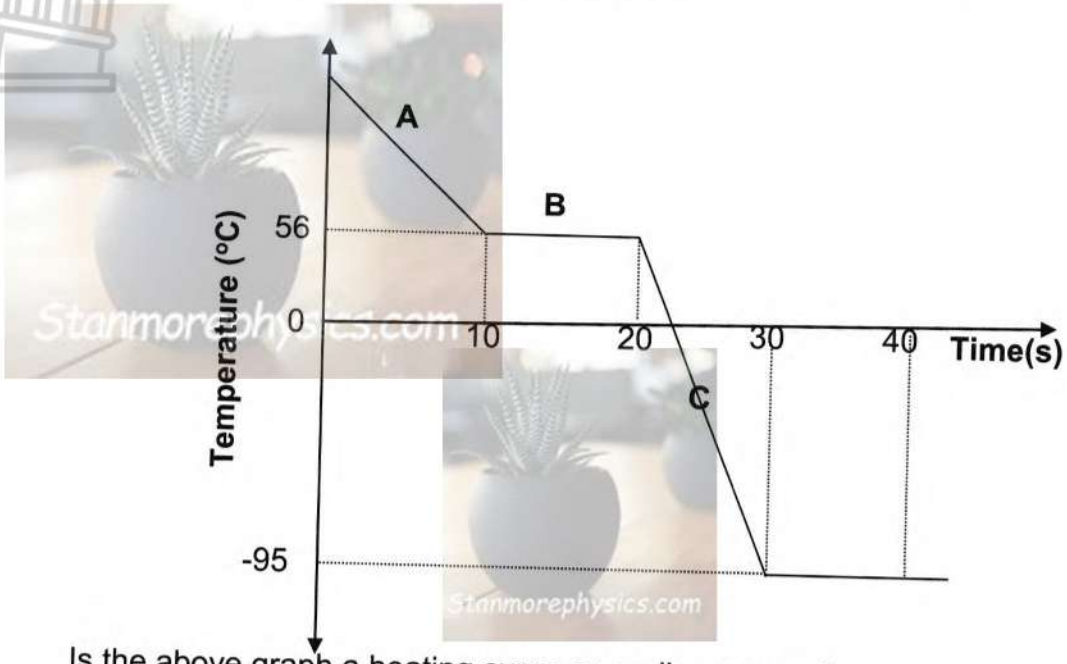
1.5 A mixture of gases consists of 12.0 g of hydrogen, 42.0 g of nitrogen and 4.0 g of helium. downloaded from Stanmorephysics
What is the mole fraction of hydrogen in the mixture?

A 0.21
B 0.60
C 0.71
D 0.75 (2)

[5 x 2 = 10]

QUESTION 2 (Start on a new page.)

Study the temperature versus time graph for acetone and answer the questions that follow.
The boiling point of acetone is 56°C and its melting point is -95°C.
NOTE: The graph is NOT drawn to scale.



2.1 Is the above graph a heating curve or cooling curve of acetone. Give a reason . (2)

2.2 Define *melting point* (2)

2.3 In what phase(Gas, liquid or solid) are the particles at :

2.3.1 section A (1)

2.3.2 room temperature (25 °C) (1)

2.4 On section B on the graph, there is no temperature change. Explain this observation. (2)

2.5 Name the processes that take place at the following time intervals :

2.5.1 10 s -20 s (1)

2.5.2 30 s - 40 s (1)

2.6 Sketch a **well-labelled** heating or cooling curve **but** showing a process that opposes the one above. Indicate all **relevant temperatures** on the graph. No time values are required on the x-axis. (3)

[13]

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 the term *isotopes*. (2)

3.2 Write down the :

3.2.1 Number of valence electrons in a chlorine atom (1)

3.2.2 Valency of chlorine (1)

3.2.3 group for Cℓ in the periodic table (1)

3.2.4 Period for Cℓ in the periodic table (1)

Natural chlorine consists of Cℓ - 35 and Cℓ - 37.

3.3 Calculate the relative % abundance of the isotope Cℓ - 35 in natural chlorine if the relative atomic mass of chlorine is 35.5 (AMU) (4)

[10]

QUESTION 4 (Start on a new page.)

The table below shows letters that represent different types of elements and their respective atomic numbers, chemical formulae and electronic configurations.
Use the information provided in the table to answer questions 4.1.1 to 4.1.4.
DO NOT REDRAW THE TABLE, write ONLY THE ANSWER next to the question number eg 4.1.5 $A\ell^{3+}$

ELEMENT	ATOMIC NUMBER	ACTUAL CHEMICAL FORMULA	ELECTRONIC CONFIGURATION
A	**4.1.1**	S^{2-}	**4.1.2**
B	12	**4.1.3**	$1s^2\ 2s\ 2p^6$
C	**4.1.4**	N^{3-}	$1s^2\ 2s^2\ 2p^6$

(4)

4.2 Element **D** is found in group **II** and period **4** of the periodic table.

Draw/Write down the :

4.2.1 Number of electrons that element D loses or gains during chemical reactions (1)

4.2.2 Aufbau diagram for element D (3)

4.2.3 Type of a chemical bond(covalent/ionic/metallic) that element D is involved with in forming compounds (1)

4.3 Define *covalent bond* (2)

4.4 Draw Lewis diagrams of :

4.4.1 $H C\ell$ (2)

4.4.2 Magnesium bromide (2)

4.5 Write down the chemical formulae of

4.5.1 Dinitrogen tetroxide (2)

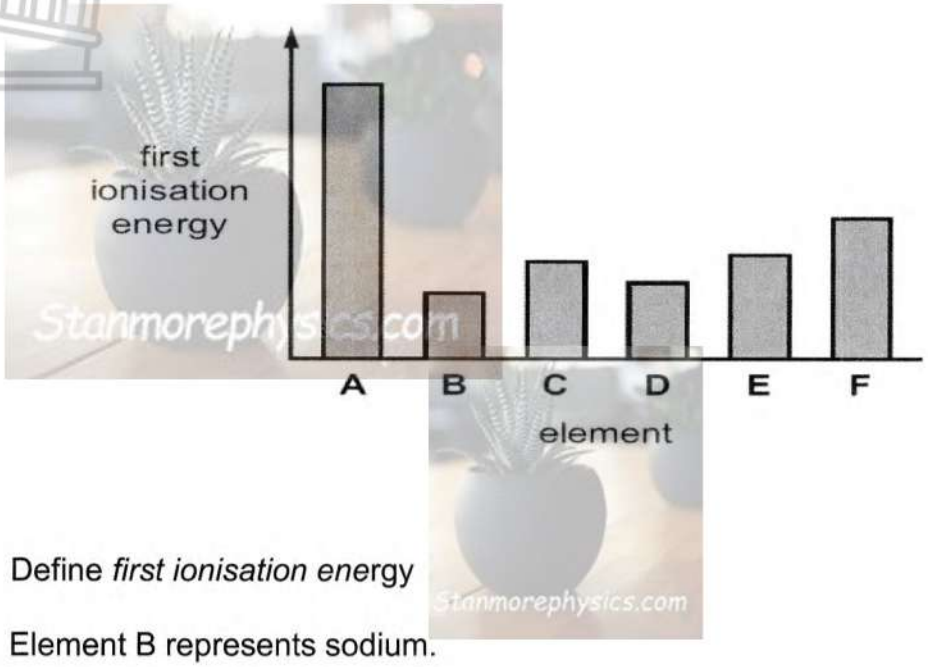
4.5.2 Iron III iodide (2)

4.4.3 Ammonium sulphate (2)

. **[21]**

QUESTION 5 (Start on a new page.)

The bar graph below shows the relative first ionisation energies of six **successive** elements in the periodic table. The letters are **not** the symbols of the elements.



5.1 Define *first ionisation energy* (2)

5.2 Element B represents sodium.

5.2.1 Write down the NAME or CHEMICAL SYMBOL of element A. (1)

5.2.2 Explain why the first ionisation energy of element **B** is much less than that of **A** on the graph. (3)

5.3 Explain the general increase in the first ionisation energies from element **B** to **F.** (3)

[9]

QUESTION 6 (Start on a new page)

6.1 Define *one mole* (2)

The balanced chemical equation below represents the reaction between calcium carbonate($CaCO_3$) and hydrochloric acid($HC\ell$).

$$\mathbf{CaCO_3(s) + 2HC\ell\ (aq) \rightarrow CaC\ell_2\ (aq) + CO_2\ (g) + H_2O\ (l)}$$

6.2 What does **(aq)** represent in the above chemical equation? (1)

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

Calculate:

6.3.1 The molar mass of calcium carbonate (2)

6.3.2 Initial number of moles of calcium carbonate (3)

6.3.3 Number of carbon dioxide molecules produced if 2240cm^3 of CO_2 (g) at STP were released in the above reaction (4)

[12]

TOTAL 75

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Standard pressure	p^{θ}	$1,013 \times 10^5$ Pa
Molar gas volume at STP	V_m	22,4 $dm^3 \cdot mol^{-1}$
Standard temperature	T^{θ}	273 K
Charge on electron	e	$-1,6 \times 10^{-19}$ C
Avogadro's constant	N_A	$6,02 \times 10^{23}$ mol^{-1}

TABLE 2: FORMULAE

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

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

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	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	La 139	1,6 Hf 179	Ta 181	W 184	Re 186	Os 190	Ir 192	Pt 195	Au 197	Hg 201	1,8 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	86 Rn
0,7 Fr	0,9 Ra 226	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	91	92	93	94	95	96	97	98	99	100	101	102	103
Th 232	Pa	U 238	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

KEY/*SLEUTEL*

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

29
1,9 Cu
63,5

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa

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MARKING MEMORANDUM
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QUESTION 1:

1.1 D ✓✓ (2)
1.2 B ✓✓ (2)
1.3 C ✓✓ (2)
1.4 A ✓✓ (2)
1.5 D ✓✓ (2)
[10]

QUESTION 2

2.1 The overlapping/occupying/addition of a crest of one pulse with the trough of another✓ resulting in a pulse of reduced amplitude✓ (2)

2.2 -2 = +3 + B✓
B = -5cm✓ (2)

FULL MARKS FOR CORRECT ANSWER ONLY

2.3.1 Pulse C has an amplitude of -3cm or Pulse C has a trough 3cm below rest position or Pulse C has a trough of equal amplitude ✓ (1)

2.3.2 Destructive (interference) ✓ (1)

[6]

QUESTION 3

3.1.1 0.1 s. ✓ (1)

3.1.2 4 cm✓ (1)

3.2.1 λ =30 × 2✓
= 60 cm✓ **accept 0.60m** (2)

FULL MARKS FOR ANSWER ONLY

3.2.2 **OPTION 1**

$f = \frac{1}{T}$
$= \frac{1}{0,1}$
= 10 Hz
V = f × λ ✓
= 10× 0.6✓
= 6m.s^{-1} ✓

OPTION 2

$V = \frac{1}{T} \times \lambda$ ✓
$= \frac{1}{0.1} \times 0.6$✓
= 6m.s^{-1} ✓

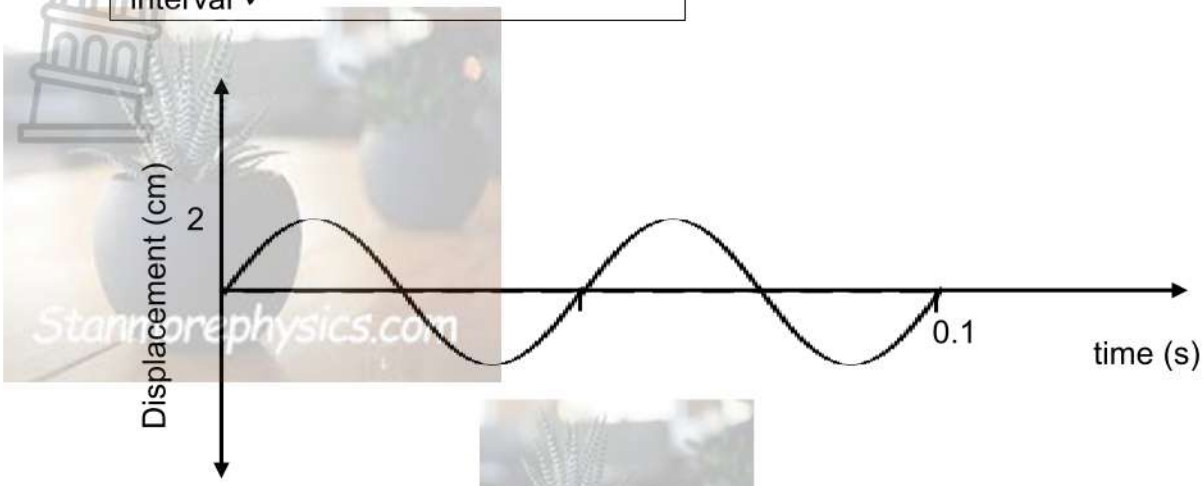
OPTION 3

speed = $\frac{\text{distance}}{\text{time}}$✓
$= \frac{0.6}{0.1}$ ✓
= 6m.s^{-1} ✓
(Accept $\Delta x = v \times \Delta t$)

(3)

3.3 **POSITIVE MARKING FROM QUESTION 3.2**

CRITERIA:
wave drawn with amplitude of 2 cm ✓
Two waves drawn for the 0.1 second interval ✓



(2)

[9]

QUESTION 4

4.1.1 rarefaction✓ (1)

4.1.2 compression✓ (1)

4.2 $\lambda = 20 \times 2$✓
$= 40$ mm✓

FULL MARKS FOR ANSWER ONLY

(2)

4.3 **POSITIVE MARKING FROM QUESTION 4.2**

$v = f \times \lambda$
$0.5 = f \times 0.04$✓
$f = 12{,}5$ Hz

OR

$V = \Delta x/\Delta t$ ✓
$0,5$✓ $= 0,04/\Delta t$ ✓
$\Delta t = 0,08$s ✓

$T = \frac{1}{f}$ ✓
$= \frac{1}{12,5}$ ✓
$= 0,08$ s ✓

(4)

4.4

Accept $\Delta x = v \times \Delta t$

OPTION 1

Δt for sound to travel from position 1 to position 2:

Distance = speed x time

300 = 340 x t ✓

t = 0,88 s

Δt for sound to travel from position 2 to the building : ✓

$\Delta t = \frac{2 - 0.88✓}{2✓}$

= 0,56 s

Distance = speed x time

= 340 x 0,56✓

= 190,4m✓

OPTION 2

Δt for sound to travel from position 1 to position 2:

Distance = speed x time

300 = 340 x t ✓

t = 0,88 s

Δt for sound to travel from position 1 to the building: ✓

$\Delta t = \frac{2 + 0,88✓}{2✓}$

= 1,44 s

Distance = speed x time

= 340 x 1,44✓

= 489,6m

Distance from position 2 to the building :

489,6-300 =189,6m✓

OPTION 3

Distance = speed x time✓

2x-300 ✓ = 340 x 2 ✓

x = 490m ✓

= position 1 from the building

Position 2 from building = 490-300✓

= 190m✓

(outgoing distance =x. Return distance is x-300. Therefore x+ (x-300)= 680m. This equates to: 2x-300= 680m

(6)

[14]

QUESTION 5

5.1 Infrared and ultraviolet ✓ (1)

5.2.1 **OPTION 1**

$E = \frac{hc}{\lambda}$ ✓

$= \frac{6,63 \times 10^{-34} \times 3 \times 10^{8}}{600 \times 10^{-9}}$ ✓✓

= 3,32 x10^{-19} J✓

OPTION 2

c = f x λ

3 x 10^{8} = f x 600 x10^{-9}✓

f = 5 x10^{14}Hz

E = h x f ✓

= 6,63 x10^{-34} x 5 x10^{14} ✓

= 3,32 x10^{-19} J✓ (4)

5.2.2 **OPTION 1**

c = f x λ ✓

3 x 10^{8} = f x 600 x 10^{-9} ✓

f = 5 x10^{14}Hz✓

OPTION 2 POSITIVE MARKING FROM 5.2.1

E = h x f ✓

3.32 x10^{-19} =6,63 x10^{-34} x f ✓

f = 5 x10^{14}Hz ✓ (3)

[8]

QUESTION 6

6.1 Net/total charge remains constant✓ in an isolated system during any physical process. ✓

(2)

6.2 $Q = \frac{Q_1 + Q_2}{2}$ ✓

$[1.6 \times 10^{-9} = \frac{3 \times 10^{-9} + Q_Y}{2}]$ ✓

$Q_Y = +2 \times 10^{-10}$ C (or 0.2nC) ✓ (3)

6.3 $\Delta Q = + 1.6 \times 10^{-9} - 3 \times 10^{-9}$ OPTION 1

$= - 1.4 \times 10^{-9}$ C

$Q = n \times q_e$ ✓

$1.4 \times 10^{-9} = n \times 1,6 \times 10^{-19}$ ✓ accept: $-1.4 \times 10^{-9} = n \times -1,6 \times 10^{-19}$ ✓

$n = 8,75 \times 10^{9}$ (electrons) ✓ (3)

$\Delta Q = + 1.6 \times 10^{-9} - 2 \times 10^{-10}$ OPTION 2

$= 1,4 \times 10^{-9}$ C

$Q = n \times q_e$ ✓

$1.4 \times 10^{-9} = n \times 1,6 \times 10^{-19}$ ✓

$n = 8,75 \times 10^{9}$ (electrons) ✓ **[8]**

QUESTION 7

7.1 The potential difference across a conductor is directly proportional to the current✓ through the conductor at constant temperature ✓ (2)

7.2.1 $\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$ ✓ **accept** $R_P = \frac{R1\ X\ R2}{R1+R2}$

$= \frac{1}{12} + \frac{1}{6}$ ✓

$R_P = 4\Omega$

$R_T = 4 + 10 + 6$✓

$= 20\ \Omega$ ✓ (4)

7.2.2 $R = \frac{V}{I}$ ✓ **POSITIVE MARKING FROM 7.2.1**

$20 = \frac{48}{I}$ ✓

$I = 2,4$ A ✓ (3)

7.2.3 $V = IR$✓ or $V=IR$✓ **POSITIVE MARKING FROM 7.2.2**

$= 2.4 \times 16$✓ $= 2,4 \times 4$✓

$= 38,4$ V✓ $= 9,6$V and 48V- 9,6V= 38,4V✓ (3)

7.2.4 **POSITIVE MARKING FROM 7.2.3**

$V_P = V_T - V$

$= 48 - 38.4$✓

$= 9,6$V

$I_{12\ \Omega} = \frac{V}{R}$

$= \frac{9.6}{12}$ ✓

$= 0,8$ A

Accept ratio method

$I_{12\ \Omega} = \frac{1}{3} \times 2.4$ ✓

$= 0,8$ A✓

MARKING CRITERIA

- calculate $I_{12\ \Omega}$ ✓✓
- calculate charge through the $R_{12\ \Omega}$ using $Q = I \times \Delta t$ ✓
- calculate number of electrons using $Q = n \times q_e$ ✓✓

$Q = I \times \Delta t$

$= \underline{0.8 \times (5 \times 60)}$ ✓

$= 240$ C

$Q = n \times q_e$

$\underline{240 = n \times 1.6 \times 10^{-19}}$✓

$n = 1,5 \times 10^{21}$ (electrons) ✓ (5)

7.3 Decreases✓

Total resistance (in the circuit) increases✓

Current is inversely proportional to resistance, so total current decreases✓ (3)

($R = \frac{V}{I}$: Learners may also make use of the equation to explain)

[20]

TOTAL: 75