



HILLCREST HIGH SCHOOL

PHYSICAL SCIENCE P2

Nov 2025

Grade 10

MARKS: 113
TIME: 2 Hours

EXAMINER: Mrs T. Thrash
MODERATOR: Ms N. Badenhorst
Mrs J. Knox-Whitehead

Instructions:

1. Answer ALL the questions.
2. This question paper consists of TWO sections:
3. SECTION A (18)
SECTION B (95)
4. Answer SECTIONS A and B in the ANSWER BOOK.
5. Non-programmable calculators may be used.
6. Appropriate mathematical instruments may be used.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Data sheets are attached for your use.
9. Give brief motivations, discussions, et cetera where required.
10. Numbers must be rounded off to two decimal places

SECTION A - QUESTION 1: MULTIPLE CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write only the letter (A-D) next to the question number (1.1-1.10) in the answer book.

1.1 Which of the following substances is a mixture?

- A Diamond
- B Distilled water
- C Sea water
- D Sodium chloride

1.2 Elements T, X, Z and Y are respectively in group I, II, VI and VII of the periodic table of elements.

A formula for the compound formed by two of these elements which is NOT CORRECT is:

- A. TZ
- B. XY_2
- C. T_2Z
- D. TY

1.3 At STP...

I the molar volume of hydrogen gas is $22,4 \text{ dm}^3$.

II $22,4 \text{ dm}^3$ of any gas consists of $6,02 \times 10^{23}$ particles.

III $22,4 \text{ dm}^3$ of helium consists of 1 mol of atoms.

Which of these statements are true?

- A only I
- B I and II only
- C II and III only
- D I, II and III

1.4 The percentage water in $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is:

- A 51,22
- B 48,78
- C 21
- D 7

- 1.5 All of the following consist of approximately one mole of particle EXCEPT:
- A $6,02 \times 10^{23}$ helium atoms
 - B 1 g of hydrogen molecules
 - C 12 g of carbon atoms
 - D $22,4 \text{ dm}^3$ ammonia at STP
- 1.6 2,7 g of sodium hydroxide is added to 250 cm^3 distilled water. Which of the following is the CORRECT concentration of solution in mol.dm^{-3} ?
- A 0,15
 - B 0,5
 - C 0,27
 - D 2,5
- 1.7 Which of the following pairs of ions and atoms have the same number of electrons?
- A S^{2-} and Ar
 - B Mg^{2+} and Mg
 - C Mg^{2+} and Ar
 - D N^{3-} and He
- 1.8 Which of the following is an example of a strong base?
- A NaOH
 - B HCl
 - C NaHCO_3
 - D CH_3COOH
- 1.9 Which of the following is true for an endothermic reaction?
- A. Bonds in the reactants are broken, and energy is absorbed.
 - B. Bonds in the reactants are broken, and energy is released.
 - C. Bonds in the reactants are formed, and energy is absorbed.
 - D. Bonds in the reactants are formed, and energy is released.

[2 X 9 = 18]

QUESTION 2

2.1 Use the following substances to answer the questions that follow.

SUBSTANCES

A Cobalt

B Gold

C Phosphorus

D Silicon

E Air

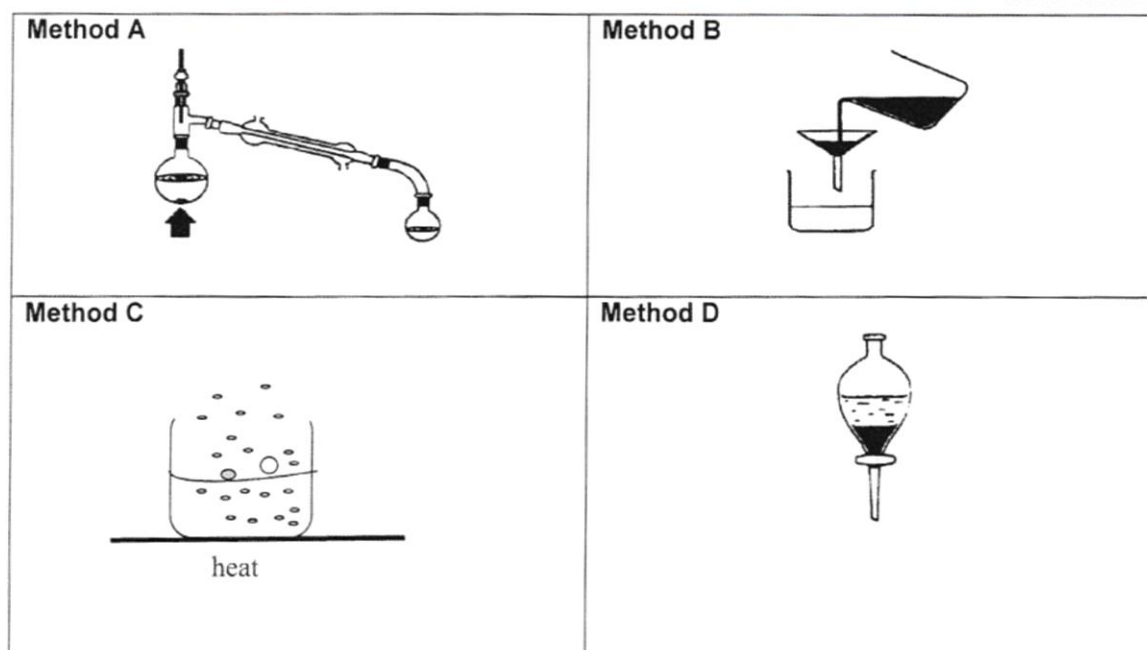
F Ammonium nitrate

2.1.1 Identify the ELEMENT that has a dull surface and cannot conduct electricity. (1)

2.1.2 Identify ONE substance that is ductile. (1)

2.1.3 Which element has magnetic properties? (1)

2.1.4 Identify the element that is a metalloid. (1)



2.2.1 Are the above CHEMICAL or PHYSICAL processes? (2)

Give a reason for your answer.

2.2.2 Identify the method in:

a) A

b) D

2.2.3 Which of the above methods (write only the letter A – D) would be most suitable for separating:

a) sand and water

b) salt and water

(2)

2.3 Use the electron configurations of the atoms of elements D, E, F, G and H below to answer

D: $1s^2 2s^2 2p^6 3s^2$

E: $1s^2 2s^2 2p^3$

F: $1s^2 2s^2 2p^6$

G: $1s^2 2s^2 2p^5$

H: $1s^2 2s^2 2p^1$

2.3.1 Name the group element G belongs to

(1)

2.3.2 Which letter represents a noble gas?

(1)

2.3.3 Identify elements D and E and give their symbols

(2)

2.4 Aluminium is a metal and a good conductor of electricity.

2.4.1 Name the type of bonding between aluminium atoms that makes it a good conductor of electricity.

(1)

2.4.2 Explain why aluminium is a good conductor of electricity

(1)

[16]

QUESTION 3

3.1 Define the term *isotope*.

(2)

3.2 A certain element X with a relative mass of 108 amu has 2 isotopes in nature. One isotope has a relative mass of 106,9 amu and a relative abundance of 50%.

3.2.1 Give the name and symbol of the unknown element X

(2)

3.2.2 Calculate the relative mass of the unknown isotope

(5)

3.3 Complete the following table. Write only the number and the answer (4)

Name of element	Number of protons	Number of valence electrons	Overall charge
Nitrogen	7	5	0
3.3.1	14	3.3.2	0
Nitride	7	3.3.3	3.3.4

3.4 Complete the following table. Write only the number and the answer (6)

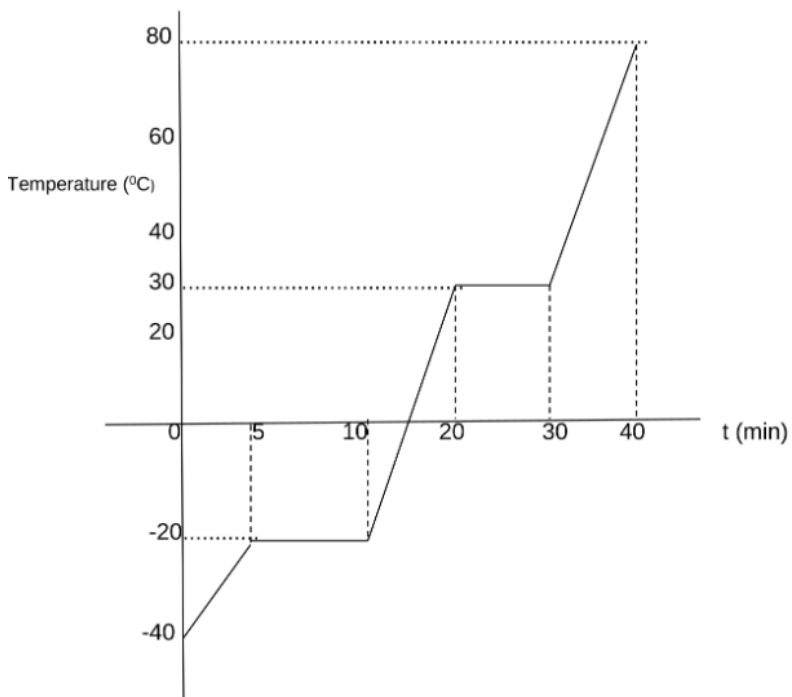
Compound	Type of bonding between atoms	Lewis structure
Methane (CH ₄)	3.4.1	3.4.2
Magnesium oxide (MgO)	3.4.3	3.4.4

3.5 Draw the Aufbau diagram for a sulfide ion. (3)

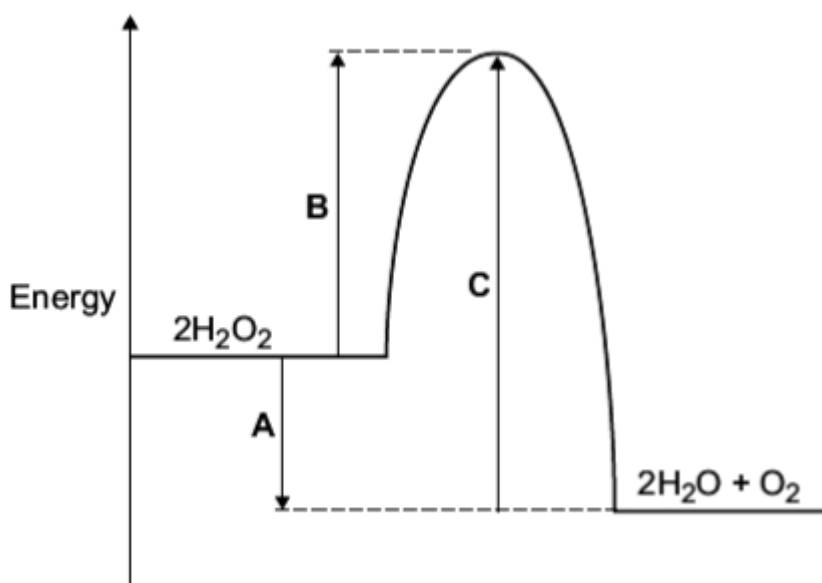
[22]

QUESTION 4

The graph below shows the heating curve of a pure substance under standard pressure.



- 4.1 What is the boiling point of this substance? (1)
- 4.2 Define the term temperature according to the kinetic molecular theory (2)
- 4.3 During which time interval/s will the ...
- 4.3.1 forces of attraction be at their weakest (1)
- 4.3.2 particles vibrate at their fixed positions (1)
- 4.4 Explain what is happening at time interval 5 – 10 minutes in terms of energy (2)
- 4.5 Explain in terms of particle energy and distance between particles what happens when a substance condenses (2)

[9]**QUESTION 5**

- 5.1 State whether the reverse reaction of the above graph would be EXOTHERMIC or ENDOTHERMIC (1)
- 5.2 Provide suitable labels for A and B (2)
- 5.3 A catalyst has now been added to the chemical reaction. State whether A and B would each INCREASE, DECREASE or STAY THE SAME (2)

[5]

QUESTION 6

The reaction between **hydrochloric acid** and **calcium carbonate** is represented by the following balanced equation:

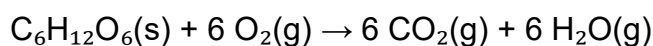


A student reacts excess calcium carbonate powder with 25.0 cm³ of hydrochloric acid solution of concentration 4.00 mol·dm⁻³.

- 6.1 State Avogadro's law. (2)
- 6.2 Show by way of calculation that 5,55g of calcium chloride was produced (5)
- 6.3 Calculate the volume of carbon dioxide gas that will be produced at STP. (3)
- 6.4 Calculate the actual volume of carbon dioxide gas that would have been produced if the yield of the reaction was only 93%. (3)

[13]**QUESTION 7**

- 7.1 When 112 g of iron reacts with sulfur, 176 g of an iron sulfide compound is formed. Use a calculation to determine the empirical formula of this iron sulfide. (5)
- 7.2 **Glucose pills** are chewable tablets containing pure glucose (dextrose), used to quickly raise blood sugar levels. When glucose (C₆H₁₂O₆) is burned in oxygen, it produces carbon dioxide and water. The balanced chemical equation is:



- 7.2.1 Use the law of conservation of mass to show that mass is conserved in this reaction. (5)

[10]

QUESTION 8

- 8.1 Define a base according to the Arrhenius definition. (1)
- 8.2 Copy and complete the following reactions to give BALANCED chemical equations:
- 8.2.1 $\text{Ca} + \text{HNO}_3 \rightarrow \dots$ (3)
- 8.2.2 $\text{HCl} + \text{Al(OH)}_3 \rightarrow \dots$ (3)
- 8.3 Write a balanced chemical equation to represent the reaction between sulphuric acid and zinc carbonate. (5)

[12]**QUESTION 9**

- 9.1 Write the formulae of the following compounds:
- 9.1.1 iron (III) oxide (2)
- 9.1.2 potassium nitrate (2)
- 9.2 Write down the names of the following compounds:
- 9.2.1 NaCO_3 (2)
- 9.2.2 CF_4 (2)

[8]**Total 113****FORMULA SHEET**

$n = \frac{m}{M}$	
$n = \frac{No}{NA}$	$N_A = 6.02 \times 10^{23}$
$n = \frac{V}{Vm}$	$V_m/V_o = 22.4 \text{ dm}^3$
$C = \frac{n}{V}$	

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
	(I)	(II)			(III)	(IV)	(V)	(VI)	(VII)	(VIII)									
1	H 1	He 4																	
3	Li 7	Be 9																	
11	Na 23	Mg 24																	
19	K 39	Ca 40	Sc 45	Ti 48	V 51	Cr 52	Mn 55	Fe 56	Co 59	Ni 59	Cu 63,5	Zn 65	Ga 70	Ge 73	As 75	Se 79	Br 80	Kr 84	
37	Rb 86	Sr 88	Y 89	Zr 91	Nb 92	Mo 96	Tc 101	Ru 101	Rh 103	Pd 106	Ag 108	Cd 112	In 115	Sn 119	Sb 122	Te 128	I 127	Xe 131	
55	Cs 133	Ba 137	La 139	Hf 179	Ta 181	W 184	Re 186	Os 190	Ir 192	Pt 195	Au 197	Hg 201	Tl 204	Pb 207	Bi 209	Po 209	At 210	Rn 222	
87	Fr 223	Ra 226	Ac 227																
90	Th 232																		
91	Pa 231																		
92	U 238																		
93	Np 237																		
94	Pu 244																		
95	Am 243																		
96	Cm 247																		
97	Bk 247																		
98	Cf 251																		
99	Es 252																		
100	Fm 257																		
101	Md 258																		
102	No 259																		
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118																			

KEY/SLEUTEL

Electronegativity
Elektronnegatiwiteit →

Atomic number
Atoomgetal →

Symbol
Simbool →

Approximate relative atomic mass
Benaderde relatiewe atoommassa