LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIENCES: CHEMISTRY (P2)

JUNE 2026

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MARKS: 100

TIME: 2 hours

This question paper consists of 09 pages and a periodic table.

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INSTRUCTIONS AND INFORMATION

1. Write your name and class in the appropriate spaces on the ANSWER BOOK.
2. This question paper consists of 5 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. QUESTION 2.1 and QUESTION 2.2.
6. You may use non-programmable calculator.
7. You may use appropriate mathematical instruments.
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. You are advised to use the attached DATA SHEET.
12. Write neatly and legibly

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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 1.10) in the ANSWER BOOK, e.g. 1.5 E.

1.1 Which ONE of the following compounds is the bonding ionic?

A $CC\ell_4$

B $C\ell_2$

C $HC\ell$

D $KC\ell$ (2)

1.2 Which one of the following combinations will form a dative covalent bond?

A $C\ell$ and $C\ell$

B $C\ell^-$ and Na^+

C H_2O and $C\ell^-$

D H_2O and H^+ (2)

1.3 Sodium chloride ($NaC\ell$) is a solid which is soluble in water. Which of the following describes the intermolecular forces that exist between sodium chloride and water in solution?

A Ion-dipole.

B Dipole-dipole.

C Ion-induced dipole.

D Induced dipole-dipole. (2)

1.4 Hydrogen bonds and London forces (induced dipole forces) have a common characteristic in that they:

A are both stronger than chemical bonds.

B both occur between non-polar molecules

C both occur between polar molecules

D are both intermolecular forces (2)

1.5 The shape of a CH_4 molecule according to the VSEPR theory is:

A. Linear

B. Trigonal planar

C. Tetrahedral

D. Angular

(2)

1.6 What is the **bond order** of a Nitrogen molecule (N_2)

A. 1

B. 2

C. 3

D. 4



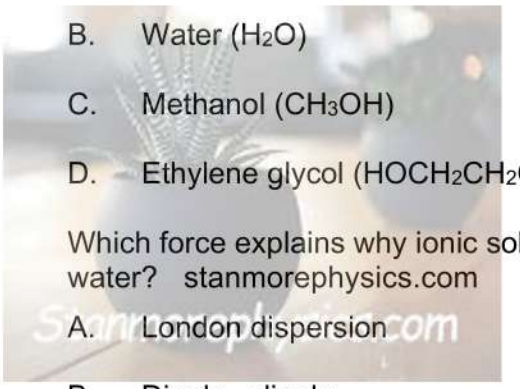
1.7 Which substance will have the highest viscosity at the same temperature?

A. Hexane (C_6H_{14})

B. Water (H_2O)

C. Methanol (CH_3OH)

D. Ethylene glycol ($HOCH_2CH_2OH$) (2)



1.8 Which force explains why ionic solids dissolve readily in polar solvents like water? stanmorephysics.com

A. London dispersion

B. Dipole - dipole

C. Hydrogen bonding

D. Ion - dipole (2)

1.9 Which molecule can hydrogen – bond with itself (i.e, form H – bonds between identical molecules)?

A. CH_3OH

B. CH_4

C. C_2H_6

D. CO_2 (2)

1.10 For noble gases, what trend explains increasing boiling point down the group?

A. Increasing polarity

B. Increasing molecular mass →stronger London dispersion

C. Increasing hydrogen bonding

D. Increasing ionic character (2)

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QUESTION 2 (Start on a new page.)

2.1 Define the term *covalent bond*. (2)

Consider the following substances:

HCN (g) H_2O (ℓ) CH_4 NH_3(g) CO (g) CO_2 (g)

Answer the following questions based on the above substances.

2.2 Draw the Lewis diagram of the HCN molecule. (2)

2.3 Write down the number of lone pairs in the central atom of a water molecule. (1)

2.4 Write down the shapes of the following molecules:

2.4.1 CH_4 (2)

2.4.2 NH_3 (2)

2.5 NH_3 can form a dative covalent bond to form NH_4^+.

2.5.1 Draw the Lewis structure NH_4^+. (2)

2.5.2 Explain how the ammonium ion (NH_4^+) is formed using a dative covalent bond. (4)

2.5.3 State TWO conditions for the formation of such a bond (4)

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Question 3 (Start on a new page.)

3.1 CO and CO_2 are molecules having only C-O bonds, and they are both linear is shape.

3.1.1 Define the term *electronegativity*. (2)

3.1.2 Calculate the difference in electronegativity (ΔEN) for the C-O bond. (2)

3.1.3 Explain why CO is a POLAR molecule, while CO_2 is a NON-POLAR molecule. (4)

3.2 On the Pauling scale the electronegativities of nitrogen and oxygen are respectively 3.0 and 3.5

3.2.1 What is meant by the Pauling electronegativity scale and why is the Pauling scale so useful? (2)

3.2.2 Why is oxygen more electronegative than nitrogen? (2)

3.3 By thinking about where the following atoms are in the Periodic Table, sort them into order of *increasing* electronegativity: stanmorephysics.com

Aluminium, Barium, Boron, Caesium, Calcium, Carbon, Fluorine (2)

3.4 Study the compounds bellow and answer the following questions:

Cl_2, CsCl, $MgCl_2$, NaCl, PCl_3, SCl_2

3.4.1 Which of these substances has non-polar bonds? Explain your reasoning. (2)

3.4.2 Which of these substances is the most ionic? Explain your reasoning. (2)

3.4.3 Which substance has polar covalent bonds. Explain your reasoning. (2)

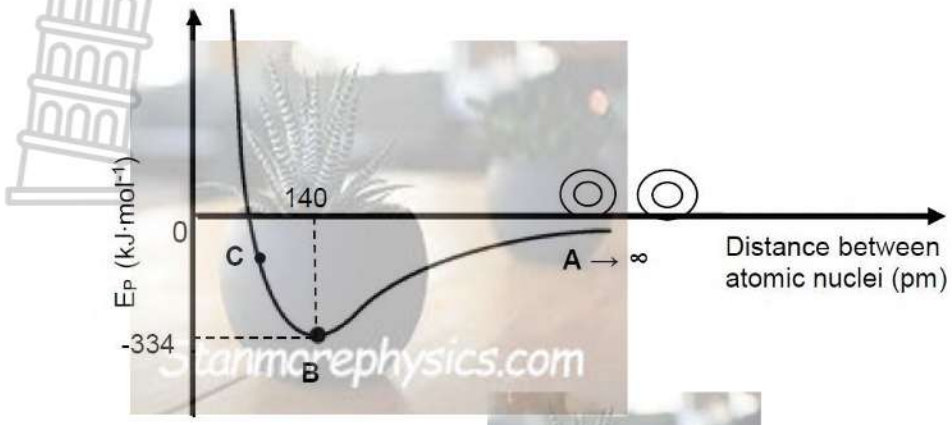
3.5 Using the compounds $CHCl_3$ and CCl_4 as examples, explain the difference between a polar bond and a polar compound (4)

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QUESTION 4 (Start on a new page.)

The potential energy graph represents the formation of a chemical bond.



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4.1 Explain why the potential energy of the system decreases as shown in the graph. (2)

4.2 At what point, **A** or **B**:

4.2.1 Are the atoms the furthest apart?
Give a reason for the answer by referring to the potential energy. (2)

4.2.2 Is the molecule formed?
Give a reason for the answer (2)

4.3 From the above graph, write down the VALUE and UNIT of the:

4.3.1 The bond length (2)

4.3.2 Bonding energy. (2)

4.4 Explain the change from point **B** to point **C** on the graph. (2)
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QUESTION 5 (Start on a new page.)

Consider the following substances with their formulae and appropriate boiling points at room temperature:

Name	Formula	Boiling point (^{0}C)
Iodine	I_2	184
Water	H_2O	100
Ethanol	CH_3CH_3OH	78
Bromine	Br_2	59
Hydrogen bromide	HBr	-67

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5.1 Define the term *boiling point.* (2)

5.2 Explain the difference in boiling points between the following substances by referring to the relevant intermolecular forces and their influence:

5.2.1 H_2O and HBr (4)

5.2.2 Iodine and bromine (4)

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5.3 Can ethanol dissolve in water? Choose YES or NO. (1)

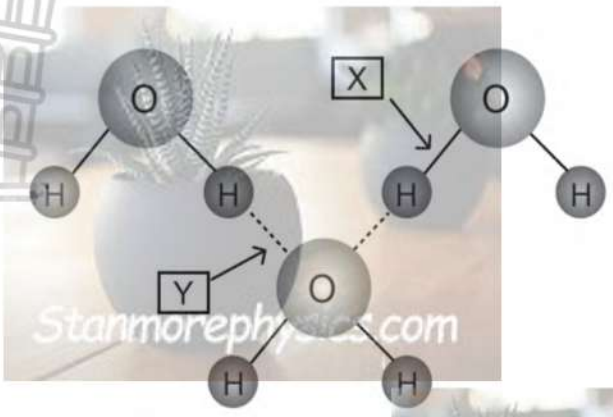
5.4 Explain your answer in QUESTION 5.3 by referring to the intermolecular forces. (3)

5.5 Hydrogen bromide has the highest vapour pressure of the substances in the table.

5.5.1 Define the term *vapour pressure*. (2)

5.5.2 Briefly explain why its vapour pressure is the highest. (2)

5.6 Consider the diagram below, showing an arrangement of water molecules in the liquid phase.



5.6.1 Explain the term *interatomic bond*. (2)

5.6.2 Describe the difference between intermolecular forces and interatomic forces. (2)

5.6.3 Name the specific type of intermolecular force represented by the letter Y in the diagram. (1)

5.6.4 What is the partial charge on the hydrogen atom in the water molecule. (2)

[25]

TOTAL: 100

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NSC

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 3 Li 7	1,5 4 Be 9											2.0 5 B 11	2.5 6 C 12	3,0 7 N 14	3.5 8 O 16	4.0 9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24											1.5 13 Al 27	1.8 14 Si 28	2.1 15 P 31	2.5 16 S 32	3.0 17 Cl 35,5	18 Ar 40
0,8 19 K 39	1,0 20 Ca 40	1,3 21 Sc 45	1.5 22 Ti 48	1,6 23 V 51	1.6 24 Cr 52	1.5 25 Mn 55	1.8 26 Fe 56	1.8 27 Co 59	1.8 28 Ni 59	1.9 29 Cu 63,5	1.6 30 Zn 65	1.6 31 Ga 70	1.8 32 Ge 73	2.0 33 As 75	2.4 34 Se 79	2.8 35 Br 80	36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1.4 40 Zr 91	41 Nb 92	1.8 42 Mo 96	1.9 43 Tc	2.2 44 Ru 101	2.2 45 Rh 103	2.2 46 Pd 106	1.9 47 Ag 108	1.7 48 Cd 112	1.7 49 In 115	1.8 50 Sn 119	1.9 51 Sb 122	2.1 52 Te 128	2.5 53 I 127	54 Xe 131
0,7 55 Cs 133	0,9 56 Ba 137	57 La 139	1.6 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	1.8 81 Tl 204	1.8 82 Pb 207	1.9 83 Bi 209	2.0 84 Po	2.5 85 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*

Atomic number
Atoomgetal

29
Electronegativity → 1,9 Cu ← Symbol
Elektronegatiwiteit *Simbool*
63,5

Approximate relative atomic mass
Benaderde relatiewe atoommassa

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