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education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

PHYSICAL SCIENCES P2

JUNE 2024

MARKS: 50

TIME: 1 hour

This question paper consists of 6 pages and a data sheet.

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INSTRUCTIONS AND INFORMATION

1. Write your name on the ANSWER BOOK provided.
2. This question paper consists of FOUR questions. Answer ALL 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 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, etc. where required.
11. 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 1.3) in the ANSWER BOOK, e.g. 1.4 D.

1.1 Which ONE of the following molecules is a polar molecule?

A CH_4

B CO_2

C Cl_2

D HCl (2)

1.2 Bond length is the distance between …

A the orbitals of two attached atoms.

B the nuclei of two attached atoms.

C the electrons in two attached atoms.

D the molecules of the same substance. (2)

1.3 When NaCl dissolves in water, aqueous Na^+ and Cl^- ions result. The force of attraction that exists between Na^+ and H_2O is called a(n) … interaction.

A dipole-dipole

B ion-ion

C hydrogen bonding

D ion-dipole (2)

[6]

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QUESTION 2

Molecules such NH_3 and HCN are formed through covalent bonding.

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

2.2 Draw Lewis structures for the following:

2.2.1 NH_3 (2)

2.2.2 HCN (2)

2.3 Define the term *electronegativity*. (2)

2.4 Use the difference in electronegativity to determine the covalent bond strength of the following:

2.4.1 H and N in NH_3 (2)

2.4.2 H and C in HCN (2)

2.5 How many lone pairs of electrons are in ONE molecule of NH_3? (1)

2.6 What is the valency of Carbon in HCN molecule. (1)

2.7 Write down the molecular shape of : (1)

2.7.1 NH_3 (1)

2.7.2 HCN (1)

2.8 NH_4^+ is formed when NH_3 forms a bond with an H^+ ion.

2.8.1 What type of bond forms between a H^+ ion and NH_3 molecule? (1)

2.8.2 Is NH_4^+ a POLAR or NON-POLAR molecule?

Explain your answer by referring to molecular shape and polarity of the bonds in the molecule. (4)

[22]

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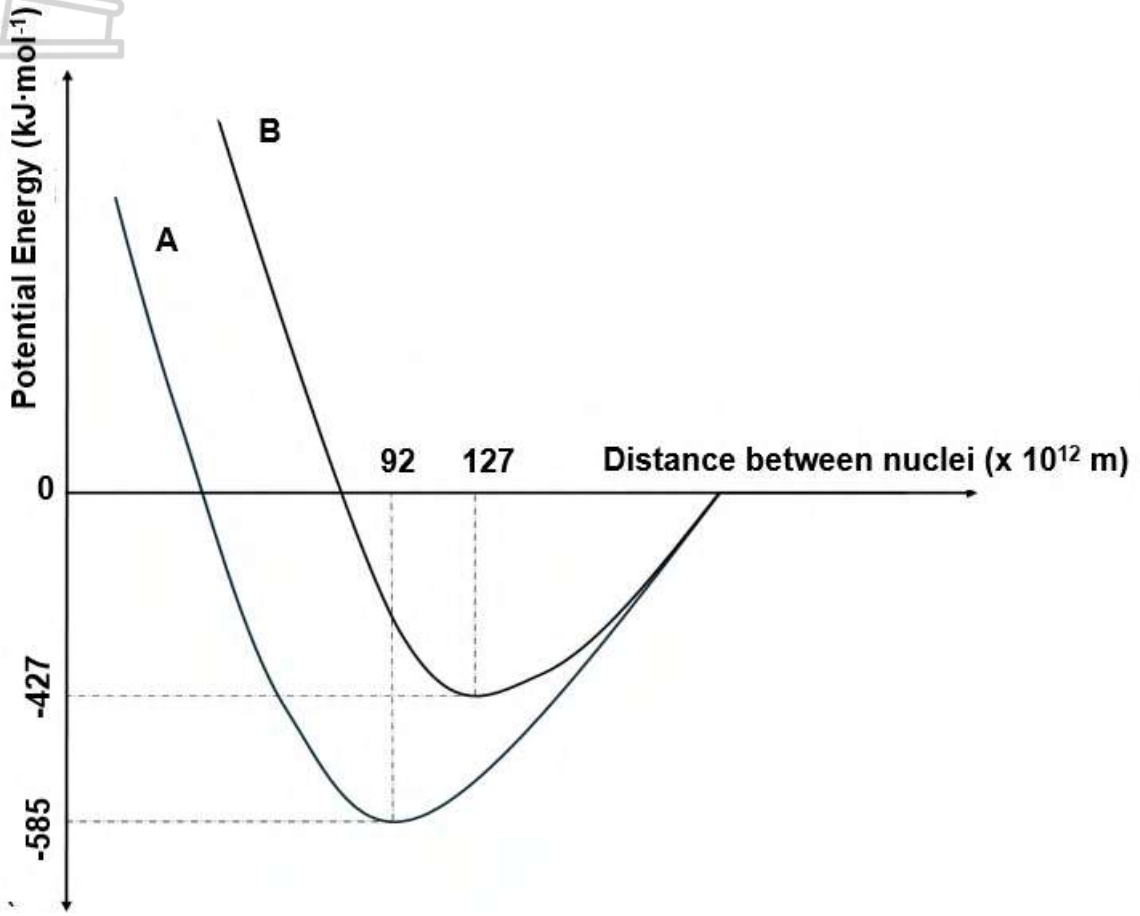
QUESTION 3

The graph below shows the potential energy associated withwhich the formation of the bond between HF atoms and HCl atoms. The graphs are labelled **A** and **B** in with no particular order.



3.1 Define the term *bond energy*. (2)

3.2 What is the relationship between the bond length and bond strength? (2)

3.3 Which ONE of the graphs, **A** or **B,** represent the bond formation between the atoms of **HF**.

Explain your answer by referring to atomic size, bond length and bond strength. (4)

3.4 Use the graph and your answer to **QUESTION 3.3** to determine:

3.4.1 Bond length for graph **HF** (1)

3.4.2 Bond energy of **HCl** (1)

[10]

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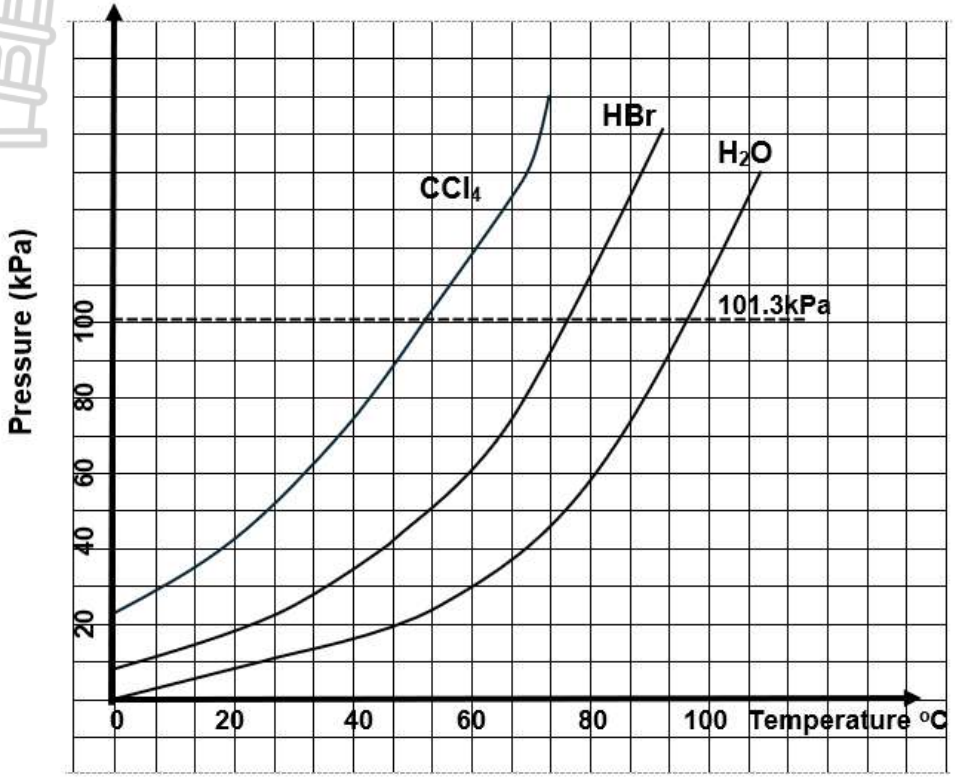
QUESTION 4

The vapour pressure versus temperature graph below was obtained for three different liquids.



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

4.2 Vapour pressure of HBr and CCl_4 are compared at 40 ^{0}C.

4.2.1 What is the relationship between vapour pressure and boiling point? (2)

4.2.2 Which compound HBr or CCl_4 will have the highest boiling point.

Explain your answer. (2)

4.3 Write down the physical state of HBr at 90 ^{0}C. (1)

4.4 Use the graph above to write down the boiling point of the following molecules:

4.4.1 HBr (1)

4.4.2 H_2O (1)

4.5 Explain the difference in the boiling points of HBr and H_2O in **QUESTION 4.4** by referring to the TYPE OF INTERMOLECULAR FORCES, STRENGTH OF THE INTERMOLECULAR FORCE AND ENERGY. (4)

[13]

TOTAL: 50

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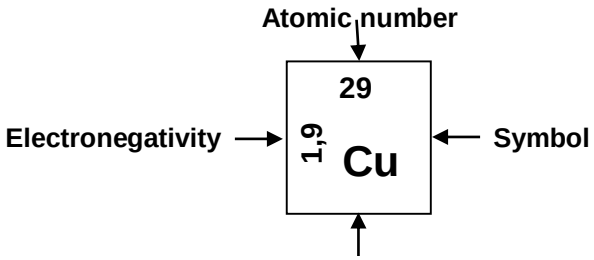
THE PERIODIC TABLE OF ELEMENTS

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)
1 2,1 H 1																	2 He 4
3 1,0 Li 7	4 1,5 Be 9											5 2,0 B 11	6 2,5 C 12	7 3,0 N 14	8 3,5 O 16	9 4,0 F 19	10 Ne 20
11 0,9 Na 23	12 1,2 Mg 24											13 1,5 Aℓ 27	14 1,8 Si 28	15 2,1 P 31	16 2,5 S 32	17 3,0 Cℓ 35,5	18 Ar 40
19 0,8 K 39	20 1,0 Ca 40	21 1,3 Sc 45	22 1,5 Ti 48	23 1,6 V 51	24 1,6 Cr 52	25 1,5 Mn 55	26 1,8 Fe 56	27 1,8 Co 59	28 1,8 Ni 59	29 1,9 Cu 63,5	30 1,6 Zn 65	31 1,6 Ga 70	32 1,8 Ge 73	33 2,0 As 75	34 2,4 Se 79	35 2,8 Br 80	36 Kr 84
37 0,8 Rb 86	38 1,0 Sr 88	39 1,2 Y 89	40 1,4 Zr 91	41 Nb 92	42 1,8 Mo 96	43 1,9 Tc	44 2,2 Ru 101	45 2,2 Rh 103	46 2,2 Pd 106	47 1,9 Ag 108	48 1,7 Cd 112	49 1,7 In 115	50 1,8 Sn 119	51 1,9 Sb 122	52 2,1 Te 128	53 2,5 I 127	54 Xe 131
55 0,7 Cs 133	56 0,9 Ba 137	57 La 139	72 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	81 1,8 Tℓ 204	82 1,8 Pb 207	83 1,9 Bi 209	84 2,0 Po	85 2,5 At	86 Rn
87 0,7 Fr	88 0,9 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



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MARKING GUIDELINES

These marking guidelines consist of 3 pages.

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QUESTION 1

1.1 D ✓✓

1.2 B ✓✓

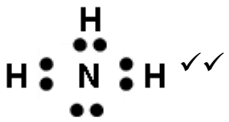
1.3 D ✓✓

[6]

QUESTION 2

2.1 Covalent bond as the sharing of electrons between two atoms to form a molecule. ✓✓ (2)

2.2 2.2.1



✓✓ (2)

2.2.2

✓✓ (2)

2.3 Electronegativity is a measure of the tendency of an atom in a molecule to attract bonding electrons. ✓✓ (2)
OR
A measure of an atom's attractive force on bonding electrons to form a molecule. ✓✓

2.4 2.4.1 ΔE = 3.0-2.1= 0.9 ✓, polar. ✓ (2)

2.4.2 ΔE = 2.5-2.1= 0.4 ✓,slightly polar/ weak polar. ✓ (2)

2.5 1/ONE. ✓ (1)

2.6 4/FOUR ✓ (1)

2.7.1 Trigonal pyramidal ✓ (1)

2.7.2 Linear ✓ (1)

2.8.1 Covalent dative bond ✓ (1)

2.8.2 Non-polar ✓
- N – H is a polar bond ✓ (ΔEN = 3,0 – 2, = 1)
- NH^+_4 is a tetrahedral ✓
- Charge distribution /molecular geometry / molecule is symmetrical. ✓ (4)

[22]

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QUESTION 3

3.1 Bond energy is the energy needed to break one mole of its molecules into separate atoms. ✓✓ (2)

3.2 The shorter the bond the stronger the bond **OR** the longer the bond the weaker the bond. ✓✓ (2)

3.3 A ✓
- F has a smaller atomic size than Cl. ✓
- The bond between H and F atoms is shorter than the bond between H and Cl atoms. ✓
- The bond between H and F atoms is stronger than the bond between H and Cl atoms. ✓ (4)

3.4 92×10^{-12} m ✓ (1)

3.5 427 k·J·mol^{-1} ✓ (1)

[10]

QUESTION 4

4.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure. ✓✓ (2)

4.2 4.2.1 When the boiling point is low the vapour pressure will be higher. ✓✓ (2)

4.2.2 HBr ✓
It has the lowest vapour pressure. ✓ (2)

4.3 Gas ✓ (1)

4.4 4.4.1 80 ^{0}C ✓ (1)

4.4.2 100 ^{0}C ✓ (1)

4.5
- HBr has dipole-dipole forces, H_2O has hydrogen bonds. ✓
- Hydrogen bonds are stronger than the dipole-dipole forces. ✓
- More energy is needed to overcome the intermolecular forces in H_2O than in HBr. ✓

Thus H_2O will have a higher boiling point than HBr ✓ (4)

[13]

TOTAL: 50

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