KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

PHYSICAL SCIEN STRY (P2)

JUNE E



MARKS: 75

TIME: 1 ½ hours

This question paper consists of 8 pages and 2 data sheets.

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INSTRUCTIONS AND INFORMATION

1. This question paper consists of FIVE 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.
4. Leave ONE line between two subquestions, 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
9. Round off your final numerical answers O decimal places.
10. Give brief motivations, discussions et c .
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 correct 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 The hydrogen bond is a type of...

A ionic bond.

B metallic bond.

C covalent bond.

D intermolecular force. (2)

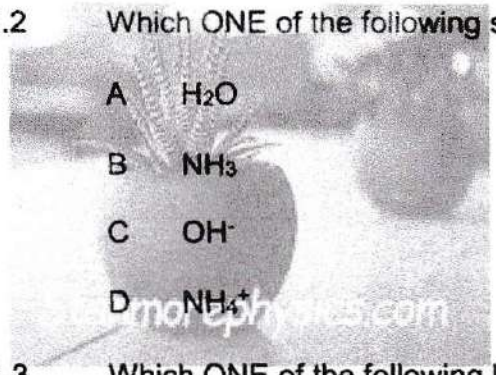
1.2 Which ONE of the following substances has dative covalent bonds?

A H_2O

B NH_3

C OH^-

D NH_4^+ (2)





1.3 Which ONE of the following liquids will have the greatest vapour pressure when equal amounts are placed in a sealed container at the same temperature?

A HF

B HCℓ

C HBr

D HI (2)

1.4 Which ONE of the following statements is correct about intermolecular forces?

A They hold atoms together in a molecule

B They are much stronger than intramolecular forces

C They determine the physical state of the compound

D They are chemical bonds (2)

1.5 Which ONE of the following molecules is non-polar, but has polar bonds?

A H_2O

B $HC\ell$

C CO_2

D H_2

(2)
[10]



QUESTION 2

2.1 Write down the number of valence electrons in an atom of:

2.1.1 Flourine (1)

2.1.2 Hydrogen (1)

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

2.3 Write down the name given to the type of bond between the particles in:

2.3.1 NaF (1)

2.3.2 CH_4 (1)

2.4 Write down the Lewis structure for:

2.4.1 F_2 (2)

2.4.2 HCN (2)

2.4.3 MgF_2 (3)

2.5 State whether the following molecul ON-POLAR and write down the name of its molecular sha



2.5.1 H_2O (2)

2.5.2 CH_4 (2)

2.5.3 NH_3 (2)

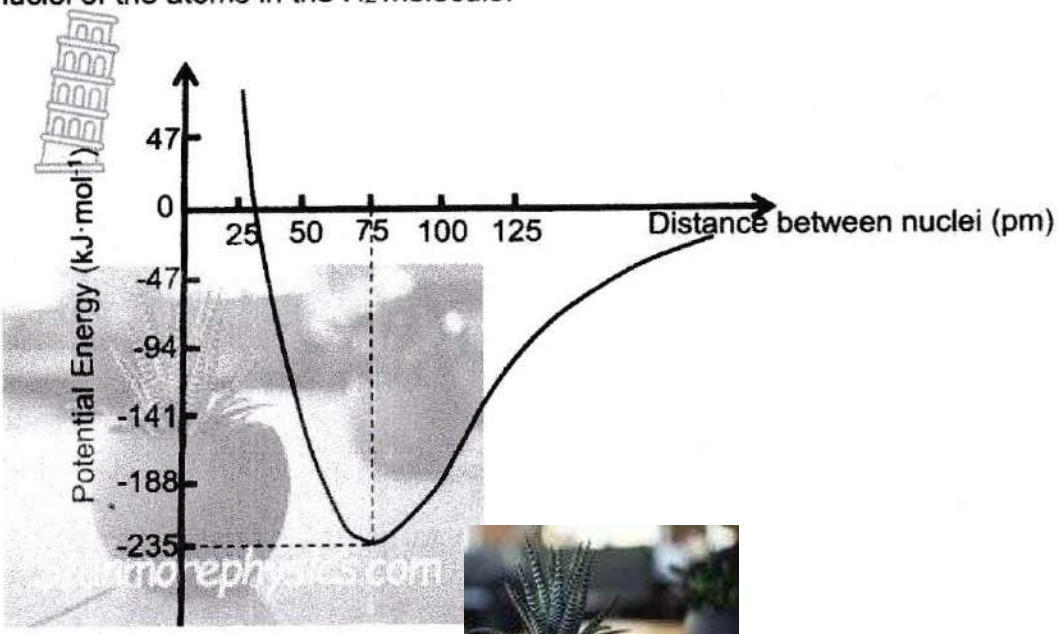
2.6 Both BF_3 and NH_3 are molecules that are made up of 4 atoms. Explain the difference in shapes between these molecules. (3)

2.7 Use Lewis Diagrams to show how a dative covalent bond forms between H_2O and the H^+ ion. (3)

[25]

QUESTION 3

The graph below shows the relationship between the potential energy and the distance between the nuclei of the atoms in the H_2 molecule.





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

3.2 Give a reason why two hydrogen atom

3.2.1 Attract each other (1)

3.2.2 Repel each other (1)

3.3 Write down the:

3.3.1 Bond energy of H_2 (1)

3.3.2 Bond length of H_2 (1)

3.4 The BOND LENGTH of H_2 is less than that of N_2.
Give a reason for this statement. (2)

3.5 The BOND ENERGY of H_2 is less than that of N_2
Give a reason for this statement. (2)

3.6 Explain the shape of the graph between 0 and 75 pm. (3)
[13]

QUESTION 4

4.1 In an experiment to investigate the relationship between the hydrides of group IV and their boiling points, the following results were obtained:

Hydride	Relative molecular mass ($g \cdot mol^{-1}$)	Boiling point (°C)
CH_4	16	-164
SiH_4	32	-112
GeH_4	77	-89
SnH_4	123	-52

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

4.1.2 Identify the independent variable in this experiment. (1)

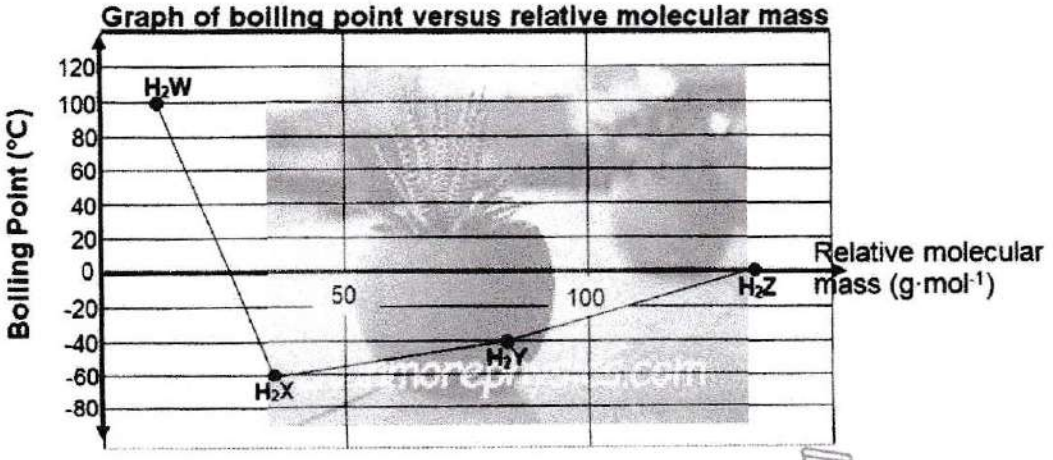
4.1.3 Use a relevant calculation to determine whether the bond between silicon (Si) and hydrogen is POLAR or NON-POLAR. (3)

4.1.4 Which one of the above hydrides will be a liquid at -60°C? (1)

4.1.5 Which one of the above hydrides will have the greatest vapour pressure at -180°C? (1)

4.1.6 Fully explain why SiH_4 has a higher boiling point than CH_4. (3)

4.2 The graph below shows the relationship between the boiling points of the hydrides of a certain group of the periodic table and their relative molecular masses. W, X, Y and Z are elements. The boiling points were measured at atmospheric pressure.



4.2.1 State the relationship between boiling point and molecular mass for H_2X, H_2Y and H_2Z. (2)

4.2.2 Explain the relationship referred to in QUESTION 4.2.1. (3)

4.2.3 Identify element W. Give a reason for the answer. (2)

4.2.4 Explain why H_2W has a much higher boiling point than expected. (2)

[20]

QUESTION 5

5.1 Define *solubility*. (2)

5.2 Will iodine crystals, $I_2(s)$, dissolve in water, $H_2O(\ell)$?

Explain fully by referring to the polarity of the molecules and the types and strength of the intermolecular forces. (5)
[7]

TOTAL MARKS: [75]



DATA FOR PHYSICAL SCIENCES GRADE 11
PAPER 2 (CHEMISTRY)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11
VRAESTEL 2 (CHEMIE)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$
Molar gas constant *Molêre gaskonstante*	R	$8{,}31\ J{\cdot}K^{-1}{\cdot}mol^{-1}$
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*		273 K



TABLE 2: FORMULAE/*TABEL 2: F*

$\frac{p_1V_1}{T_1}=\frac{p_2V_2}{T_2}$	
$n=\frac{m}{M}$	$n=\frac{N}{N_A}$
$n=\frac{V}{V_m}$	$c=\frac{n}{V}$ OR/*OF* $c=\frac{m}{MV}$

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																	**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	**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	**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	**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	**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**	**Rn**
0,7 **Fr**	0,9 **Ra** 226	**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/*SLE* … umber … *etal*

Electro… *Elektron…* Symbol *Simbool*

Approximate relative atomic mass
Benaderde relatiewe atoommassa

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