Bergvliet High School

GRADE 10

Physical Science Exam
Paper 2
18 November 2024

MARKS: 100
TIME: 2 hours
EXAMINER: Z.Booysen
MODERATOR/S: S. Van Harte T.Abrahams, K. Stuck

This question paper consists of 11 pages and 2 data sheets.
Detach this sheet and attach it to the front of your answer sheets.

Name: _____ Teacher: Ab, Bo, Vh, Su

For official use only					
Question 1	Marker	Moderator	**Question 6**	Marker	Moderator
Question 2	Marker	Moderator	**Question 7**	Marker	Moderator
Question 3	Marker	Moderator	**Question 8**	Marker	Moderator
Question 4	Marker	Moderator	**Total**		
Question 5	Marker	Moderator	**Percentage**		
Signature	Marker		**Signature**	Moderator	

INSTRUCTIONS

1. Write your name in the appropriate space on the Cover Page and all pages of your ANSWER PAPER.
2. The question paper consists of 8 questions. Answer ALL the questions on the paper provided.
3. Start EACH question on a NEW page on the answer pages.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEETS.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round off your final numerical answers to a minimum of TWO decimal places.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

QUESTION 1

Four options are provided as possible answers to the following questions. Choose the answer and place a **X** on the letter (A–D) on the table below:

1.1.1	A	B	C	D
1.1.2	A	B	C	D
1.1.3	A	B	C	D
1.1.4	A	B	C	D
1.1.5	A	B	C	D
				/10

Question 1 Multiple choice questions

Four options are provided as possible answers to the following questions. Choose the answer and place a **X** on the letter (A–D) on the table above:

1.1 Which of the following elements has both metallic and non-metallic properties?

A Ar

B Ge

C Mg

D S (2)

1.2 A sulphur atom in its ground state has the electron configuration:

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

How many orbitals are occupied by at least one electron?

A 3

B 5

C 8

D 9 (2)

1.3 An example of a heterogeneous mixture is:

A Soil

B Carbon monoxide

C Sugar

D Ammonia (2)

1.4 In the compound potassium sulphate (K_2SO_4), oxygen constitutes ***x*** % of the mass of the compound. ***x*** = ?

A 4 %

B 9,2 %

C 18,3 %

D 36,8 % (2)

1.5 The electron grouping in the **2p** orbitals of the boron atom, in the ground state, is:

A 

B 

C 

D  (2)

[10]

Question 2 (Start on a new page)

The table contain different items **A** – **F**.

A.	Coffee	**B.**	Sodium hydroxide	**C.**	Pure water
D.	Muesli	**E.**	Aluminium	**F.**	Bromine

2.1 Define a *heterogeneous mixture*. (2)

2.2 Identify the following:
(Write down only the letters A – F.)

2.2.1 Two compounds (2)

2.2.2 A homogeneous mixture (1)

2.2.3 An element that is a liquid at room temperature. (1)

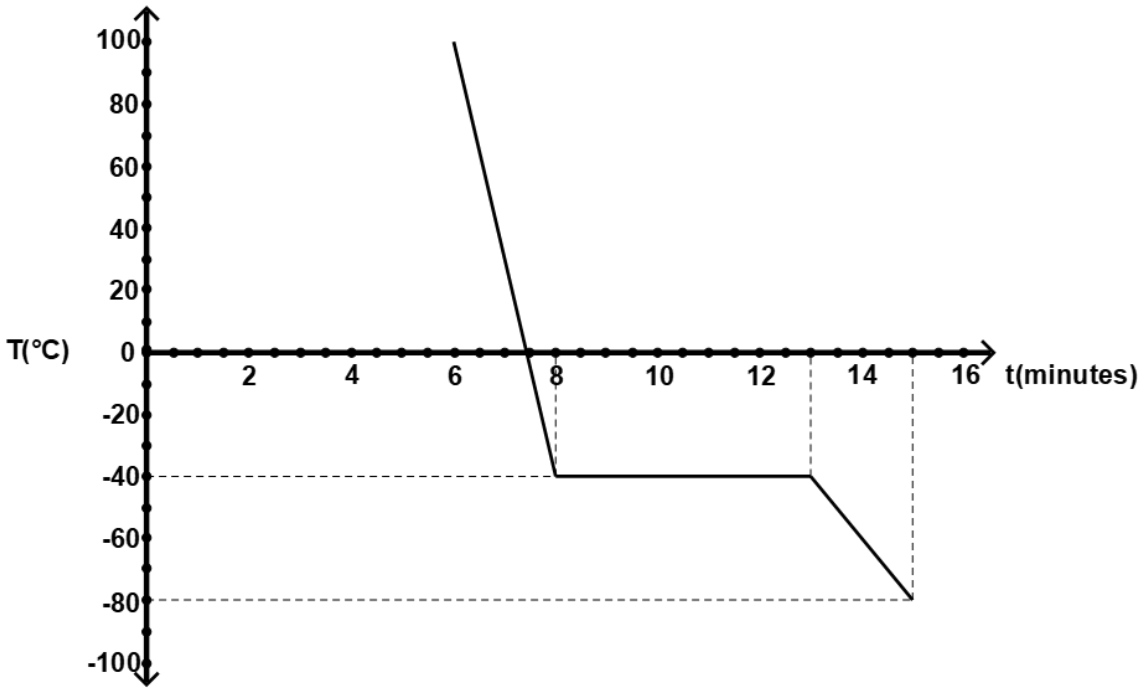
2.2.4 A good conductor of electricity. (1)

2.3 Write down the chemical formula for the compound that forms during the reaction between ITEM **E** and **F**. (2)

[9]

Question 3 (Start on a new page)

An unknown liquid is cooled from 100 °C to – 80 °C.



3.1 What happens to the substance at t = 8 minutes to t = 12 minutes? (1)

3.2 Is the kinetic energy of the substance INCREASING, DECREASING or REMAINING CONSTANT from t = 8 minutes to t = 12 minutes? (1)

3.3 Determine the melting point of the substance. (1)

3.4 Do the particles of the unknown liquid move more freely at 0 °C or at – 80 °C? (1)

3.5 Give a reason for your answer in QUESTION 3.4. (2)

3.6 Use the following table with melting points and boiling points to identify the Substance above, that is being cooled.

Substance	Melting point (°C)	Boiling point (°C)
Water	0	100
Lead	327	1613
Mercury	– 39	357

(1)

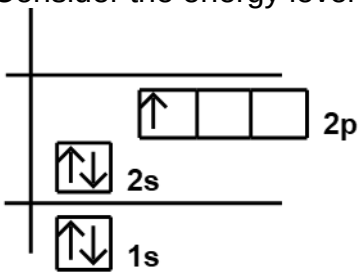
3.7 Define the term *boiling point.* (2)

3.8 To what temperature should this substance be heated for it to boil? (1)

[10]

Question 4 (Start on a new page)

Consider the energy level diagram of a neutral atom.



4.1 What is meant by the word "neutral" atom? (1)

4.2 Give the spectroscopic electron configuration notation (sp-notation) of the element represented by the above-mentioned energy level diagram (2)

4.3 Determine the number of:

4.3.1 Core electrons. (1)

4.3.2 Valence electrons. (1)

4.4 Write down the name of this atom. (1)

4.5 How many neutrons does this atom possess? (1)

4.6 What will be the charge of an ion of this element? (1)

[8]

Question 5 (Start on a new page)

Consider the standard notation of an unknown element that occurs mainly in two forms in nature.

$$\begin{matrix} 35 & 35 \\ \boldsymbol{X} & \boldsymbol{X} \\ 80 & 81 \end{matrix}$$

5.1 What is the term used to describe elements, as above, that exist in more than one form. (1)

5.2 Write down the symbol of the element represented by X. (1)

5.3 In which group number and period does this element appear on the periodic table? (2)

5.4 Give the unique name of this group in which element X is found. (1)

5.5 Is this element a METAL, NON-METAL or SEMI - METAL? (1)

5.6 Give a reason for your answer in QUESTION 5.5. (1)

5.7 Define *relative atomic mass*. (2)

5.8 What is the mass number of this element as it appears on the periodic table? (1)

5.9 Will this element have magnetic properties?
Write only YES or NO? (1)

5.10 Give any three properties of metals. (3)

[14]

Question 6 (Start on a new page)

Consider the following two elements and their ions.

ATOM	ION
H_1^1	H_A^+
$Cl_{35,5}^{17}$	Cl^-

6.1 For the **hydrogen ion**:

6.1.1 What is the value of the relative atomic mass (***A***)? (1)

6.1.2 Explain what the (+) means. (1)

6.2 For the **chlorine ion**:

6.2.1 Draw the Aufbau diagram. (3)

6.2.2 Determine the number of valence electrons (1)

Hydrogen and chlorine bond with each other to form hydrogen chloride.

6.3 Is this a COVALENT, IONIC, or METALLIC bond? (3)
Explain your answer

6.4 Draw the Lewis structure of hydrogen chloride. (2)

[11]

Question 7 (Start on a new page)

The amount of substance is so important in chemistry that it is given its own name, which is the **mole**. The number of particles in a mole is equal to 6,022 × 10^{23}.

7.1 Define the term *one mole* (2)

7.2 How many atoms will there be in 32 g of sulphur? (1)

7.3 2 moles of sulphur powder react with an unknown amount of zinc powder.

$$sulphur + zinc \xrightarrow{\Delta} zinc\ sulphide$$

7.3.1 Write a balanced chemical equation for this reaction. Also indicate the phases of the reagents and products. (3)

7.3.2 Calculate the mass of sulphur that is used. (3)

7.3.3 What mass of zinc will be needed, if all the sulphur is to be used? (3)

7.3.4 Calculate the theoretical yield of zinc sulphide for this reaction. (2)

7.3.5 It was found that 175 g of zinc sulphide was produced. Calculate the percentage yield. (3)

[17]

Question 8 (Start on a new page)

A compound is found to contain 63,52% iron and 36,48% sulphur.

8.1 Define an *empirical formula*. (2)

8.2 Determine its empirical formula. (4)

8.3 The following chemical equation was given to the learners:

$Fe_2(CO_3)_3(s) + HC\ell(aq) \rightarrow$ Iron(III)chloride(aq) + CO_2 + H_2O

8.3.1 Rewrite and balance the equation. (3)

8.3.2 146g of $Fe_2(CO_3)_3$ is allowed to react with $HC\ell$ in the 30000 cm^3 container. Calculate:

8.3.2.1 The number of moles of $Fe_2(CO_3)_3$. (3)

8.3.2.2 The number of moles of $HC\ell$ required. (2)

8.3.2.3 The concentration of the $HC\ell$. (3)

8.3.3 What volume of CO_2 gas would be formed? (4)

[21]

TOTAL: 100

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
(CHEMIE)
DATA FOR PHYSICAL SCIENCES GRADE 10
(CHEMISTRY)

TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIESE KONSTANTES

NAME/*NAAM*	**SYMBOL/*SIMBOOL***	**VALUE/*WAARDE***
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}\ C$
Electron mass *Elektronmassa*	m_e	$9{,}11 \times 10^{-31}\ kg$
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	$22{,}4\ dm^3 \cdot mol^{-1}$
Standard pressure *Standaarddruk*	$p^\ominus$	$1{,}013 \times 10^5\ Pa$

TABLE 2: FORMULAE/TABEL 2: FORMULES

$n = \frac{m}{M}$	$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$	$n = \frac{N}{N_A}$

THE PERIODIC TABLE OF ELEMENTS // *DIE PERIODIEKE TABEL VAN ELEMENTE*

