



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

JUNE 2023

GRADE 10

**PHYSICAL SCIENCES
(CHEMISTRY)**

PAPER 2

TIME: 1 hour

MARKS: 50

8 pages + 2 data sheets



INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate space on the ANSWER BOOK.
2. This question paper consists of SIX questions. Answer ALL the questions.
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 subquestions, e.g. between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. Use the DATA SHEETS that are attached.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round-off your final numerical answers to a minimum of TWO decimal places.
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 to 1.4) in the ANSWER BOOK, e.g. 1.5 D.

1.1 Boron is classified as a ...

- A non-metal.
- B metal.
- C heterogeneous mixture.
- D metalloid.

(2)

1.2 Covalent bonding is the ...

- A sharing of protons between atoms to form molecules.
- B transfer of electrons to form cations and anions.
- C sharing of electrons between atoms to form molecules.
- D transfer of protons to form cations and anions.

(2)

1.3 A physical change is a change in which ...

- A new chemical substances are formed.
- B mass and atoms are conserved; number of molecules is not.
- C mass, numbers of atoms and molecules are conserved.
- D a large amount of energy is absorbed or released.

(2)

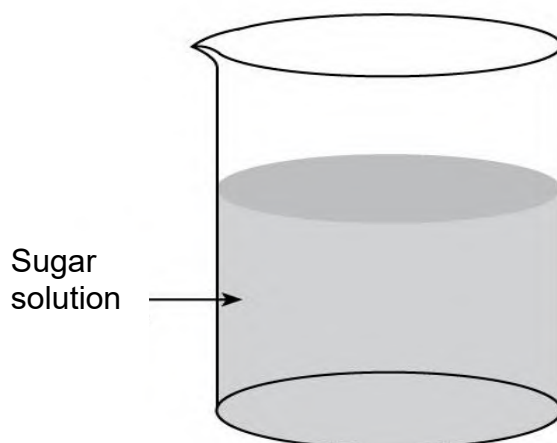
1.4 The electron configuration of sodium ion (Na^+) is:

- A $1s^22s^22p^6$
- B $1s^22s^22p^63s^1$
- C $1s^22s^22p^63s^2$
- D $1s^22s^22p^63s^23p^6$

(2)
[8]

QUESTION 2 (Start on a new page.)

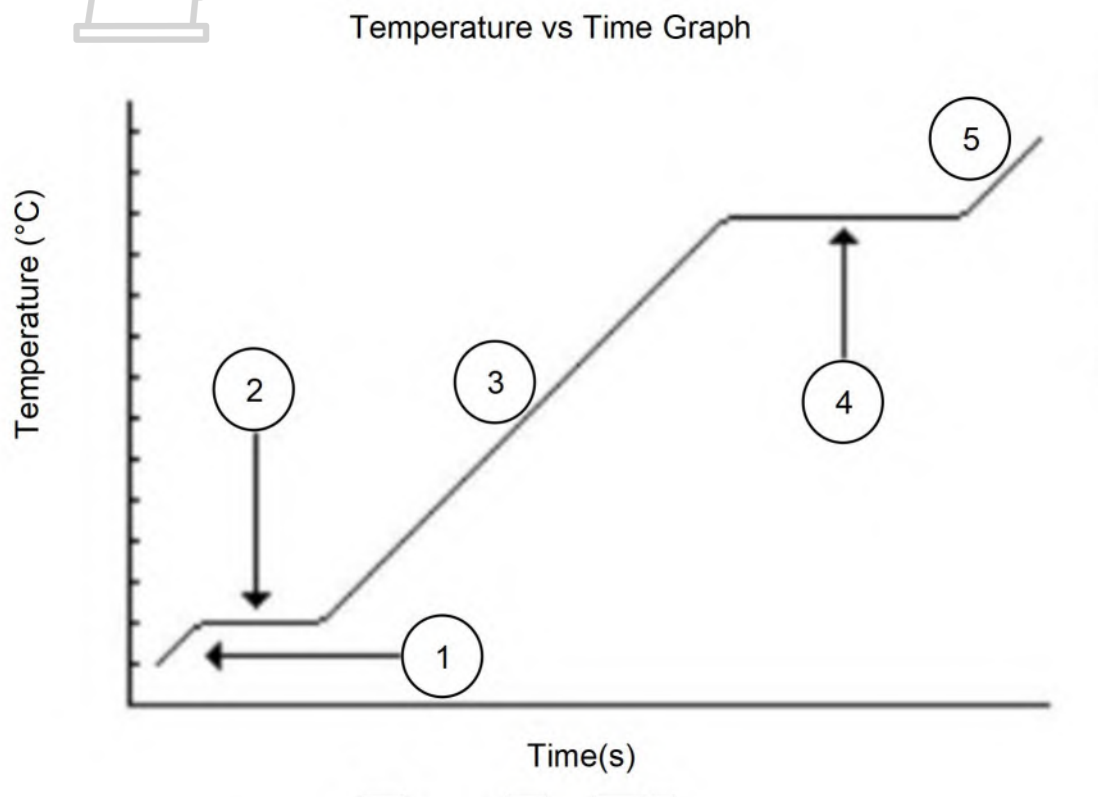
- 2.1 Define the term *compound*. (2)
- 2.2 The grade 10 learners mixed sugar crystals with water to form the solution below.



- 2.2.1 Is the solution a HETEROGENEOUS or HOMOGENEOUS mixture? (1)
- 2.2.2 Explain your answer in QUESTION 2.2.1. (2)
- 2.2.3 Name the process that can be used to separate sugar from water. (1)
- [6]**

QUESTION 3 (Start on a new page.)

The learners were investigating the effect of temperature on ice over a period of time. The graph below was drawn from the results obtained during the investigation.



- 3.1 Define the term *melting point*. (2)
- 3.2 In which phase is the substance at point **1** on the graph? (1)
- 3.3 Name the process at point **4** on the graph. (1)
- 3.4 On point **2** on the graph there is no change in temperature. Explain this observation. (2)
- 3.5 Write down the molecular formula of ice. (1)

[7]

QUESTION 4 (Start on a new page.)

Two isotopes of carbon are represented below.

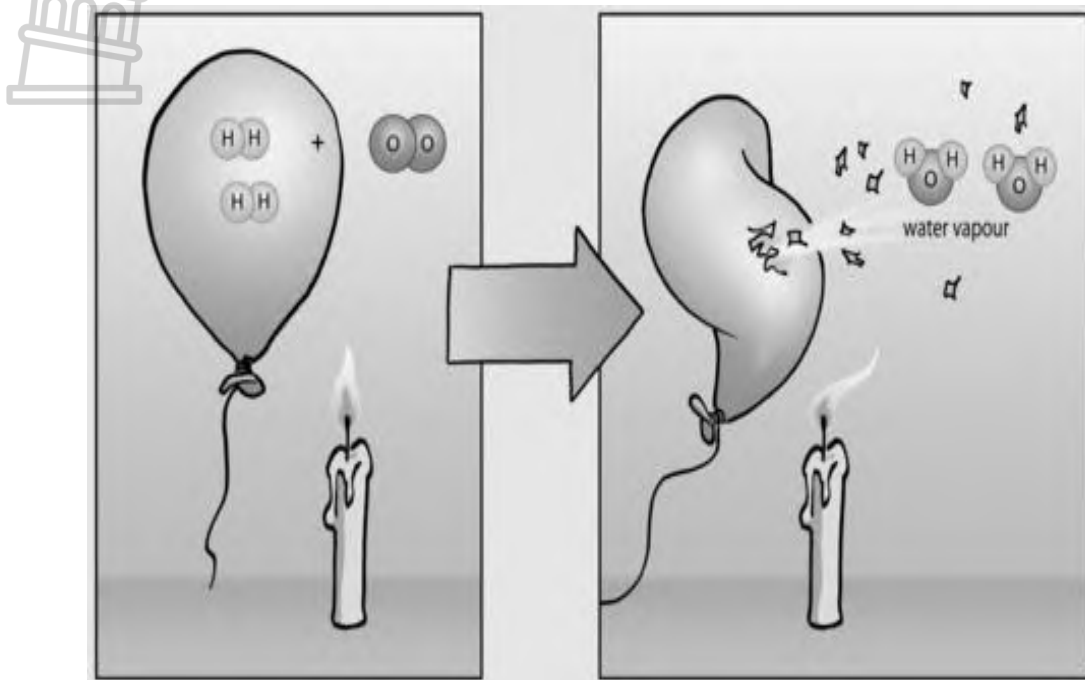


- 4.1 Define the term *isotopes*. (2)
- 4.2 How many neutrons are there in the carbon-14 atom? (1)
- 4.3 Draw the Aufbau diagram of the carbon-12 atom. (2)
- 4.4 Write down the (sp notation) electron configuration of the carbon-14 atom. (2)
- [7]

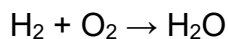


QUESTION 5 (Start on a new page.)

The following diagram shows the synthesis reaction that occurs when hydrogen burns in oxygen to form water and release heat and sound.



The unbalanced equation for this reaction is:

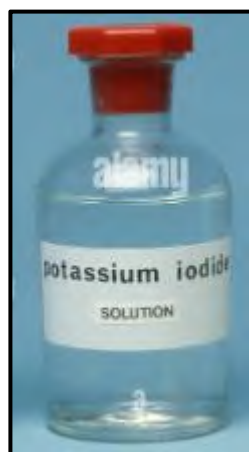


- 5.1 Rewrite and balance this equation. (2)
- 5.2 Name the phase of the water. (1)
- 5.3 Draw the Lewis dot diagrams of:
- 5.3.1 Oxygen (2)
- 5.3.2 Water (2)
- 5.4 Is this reaction ENDOTHERMIC or EXOTHERMIC? (1)
- 5.5 Calculate the molar mass of water. (2)

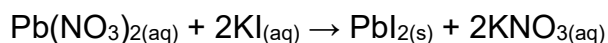
[10]

QUESTION 6 (Start on a new page.)

When a lead(II)nitrate solution and a potassium iodide solution is added together, a yellow lead(II)iodide precipitate forms as one of the products.



The balanced chemical equation is as follows:



- 6.1 What does (aq) represent in the above equation? (1)
- 6.2 Define the term *mole*. (2)
- 6.3 If 30 g of lead(II) iodide is formed, calculate:
- 6.3.1 The number of iodide ions that is present in the precipitate (6)
- 6.3.2 The mass of potassium iodide crystals that was used to prepare the potassium iodide solution (3)

[12]

TOTAL: 50



TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIIESE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Standard pressure <i>Standaarddruk</i>	p^{\ominus}	$1,013 \times 10^5 \text{ Pa}$
Molar gas volume at STP <i>Molêre gasvolume by STD</i>	V_m	$22,4 \text{ dm}^3 \cdot \text{mol}^{-1}$
Standard temperature <i>Standaardtemperatuur</i>	T^{\ominus}	273 K
Charge on electron <i>Lading op elektron</i>	e	$-1,6 \times 10^{-19} \text{ C}$
Avogadro's constant <i>Avogadro se konstante</i>	N_A	$6,02 \times 10^{23} \text{ mol}^{-1}$

TABLE 2: FORMULAE/TABEL 2: FORMULES

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ OR $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$





PROVINCIAL EXAMINATION
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GRADE 10
MARKING GUIDELINES

PHYSICAL SCIENCES (CHEMISTRY) (PAPER 2)

4 pages




**QUESTION 1: MULTIPLE-CHOICE QUESTIONS**

- 1.1 D ✓✓ (2)
- 1.2 C ✓✓ (2)
- 1.3 C ✓✓ (2)
- 1.4 A ✓✓ (2)
- [8]**

QUESTION 2

- 2.1 A compound is a pure substance consisting of two or more different elements. ✓✓ (2)
- 2.2 2.2.1 Homogeneous mixture ✓ (1)
- 2.2.2 The mixture of uniform composition in which all the components are in the same phase. ✓✓ (2)
- 2.2.3 Crystallisation ✓ (1)
- [6]**

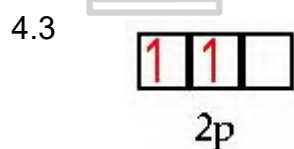
QUESTION 3

- 3.1 The temperature at which a solid, given sufficient heat, becomes a liquid. ✓✓ (2)
- 3.2 Solid ✓ (1)
- 3.3 Boiling/Evaporation ✓ (1)
- 3.4 The temperature is constant, meaning that the solid is changing into liquid. ✓
The kinetic energy stays constant. ✓
The potential energy is increasing. (2)
- 3.5 H₂O ✓ (1)
- [7]**
- 

QUESTION 4

4.1 Atoms of the same element having the same number of protons, but different numbers of neutrons. ✓✓ (2)

4.2 8 ✓ (1)



2s



1s

(2)

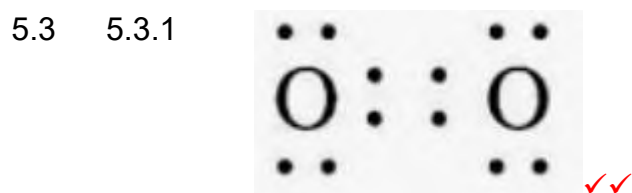
4.4 $1s^2 2s^2 2p^2$ ✓✓ (2)

[7]

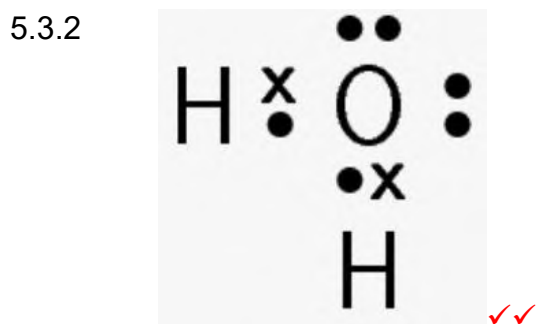
QUESTION 5

5.1 $2H_2 + O_2 \rightarrow 2H_2O$ ✓✓ (2)

5.2 gas ✓ (1)



(2)



(2)

5.4 exothermic ✓ (1)

5.5 $M(H_2O) = 2(1) + (16) = 18 \text{ g}\cdot\text{mol}^{-1}$ ✓✓ (2)

[10]

QUESTION 6

6.1 Aqueous solution or a solution where water is the solvent. ✓ (1)

6.2 One mole is the amount of substance having the same number of particles as there are atoms in 12 g carbon-12. ✓✓ (2)

6.3 6.3.1 $n = \frac{m}{M} = \frac{30}{461} = 0,065 \text{ mol PbI}_2$ ✓
 $n(\text{PbI}_2) : n(\text{I}^-)$
 $1 : 2$ ✓
 $0,065 : 0,13 \text{ mol I}^-$
 $n = \frac{N}{N_A} = 0,31 = \frac{N}{6,02 \times 10^{23}}$ ✓ $N = 1,866 \times 10^{23} \text{ I}^-$ ✓ (6)

6.3.2 $n(\text{PbI}_2) : n(\text{KI})$
 $1 : 2$ ✓
 $0,065 : 0,13 \text{ mol KI}$
 $n = \frac{m}{M} = 0,13 = \frac{m}{166}$ ✓ $m = 21,58 \text{ g KI}$ ✓ (3)
[12]

TOTAL: 50