GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

JUNE 2023

GRADE 10

PHYSICAL SCIENCES
(CHEMISTRY)

PAPER 2

EXEMPLAR

TIME:

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)
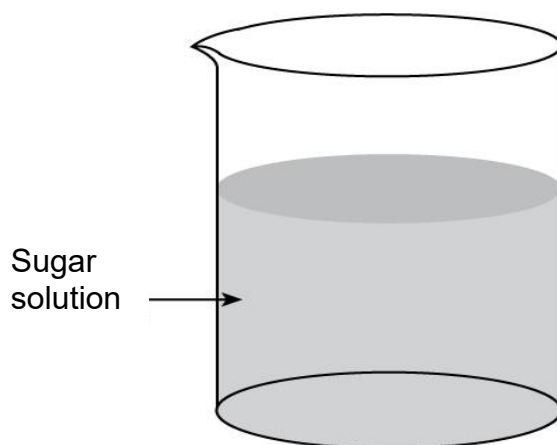   **[8]**

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.

Sugar solution →

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.

Temperature vs Time Graph
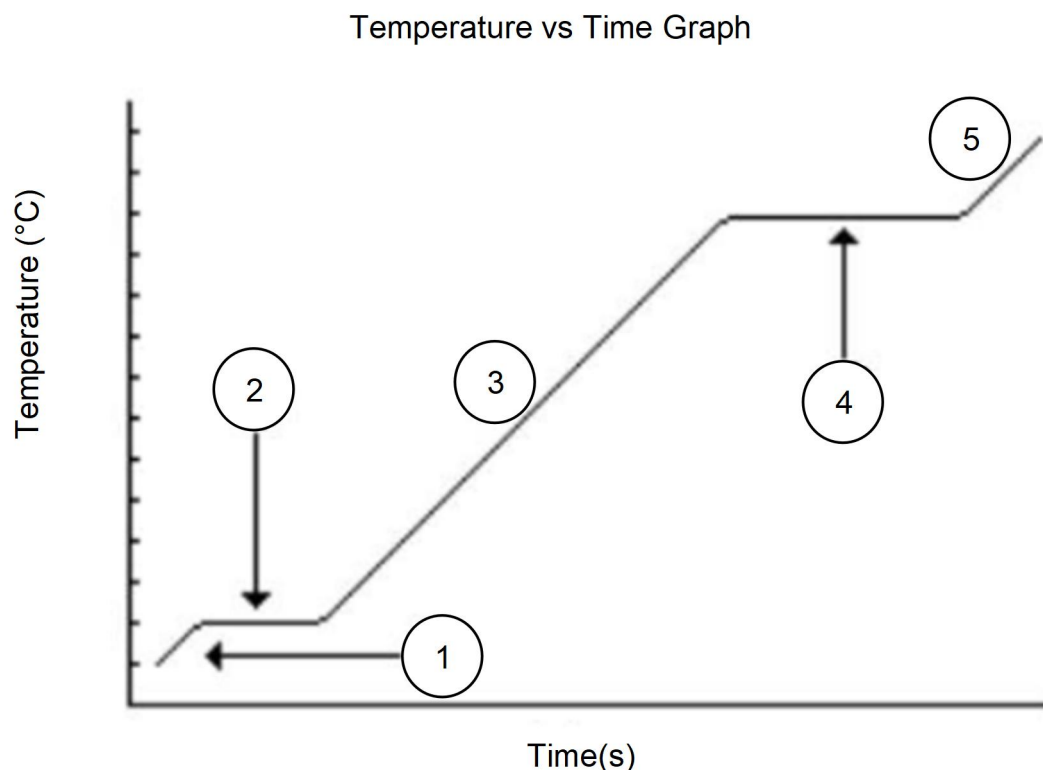
3.1   Define the term *melting point*.   (2)

3.2   In which phase is the substance at point **1** on the graph?   (1)

3.3   Name the process at point on the graph.   (1)

3.4   At 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.

$$^{12}_{6}C \qquad\qquad ^{14}_{6}C$$

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.
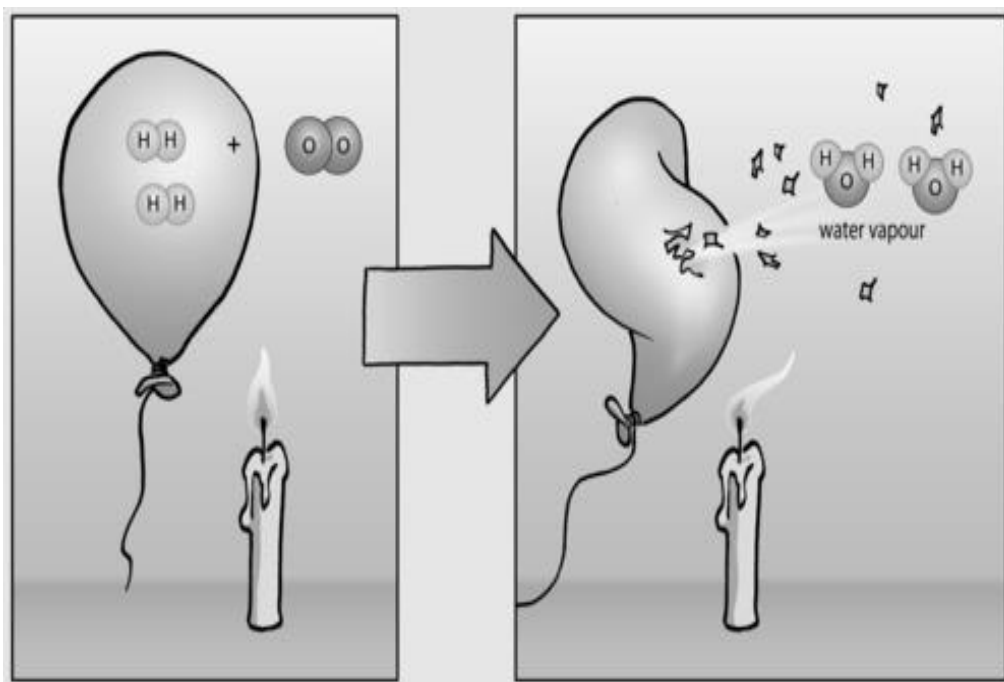

The unbalanced equation for this reaction is:

$$H_2 + O_2 \rightarrow H_2O$$

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.
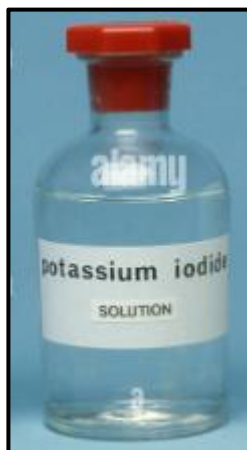
The balanced chemical equation is as follows:

$$Pb(NO_3)_{2(aq)} + 2KI_{(aq)} \rightarrow PbI_{2(s)} + 2KNO_{3(aq)}$$

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

END

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
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*	T^{θ}	273 K
Charge on electron *Lading op elektron*	e	$-1,6 \times 10^{-19}$
Avogadro's constant *Avogadro se konstante*	N_A	$6,02 \times 10^{23}$ mol^{-1}

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

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

TABLE 3: THE PERIODIC TABLE OF ELEMENTS/*TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE*

KEY/*SLEUTEL*

Atomic number
Atoomgetal

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

Approximate relative atomic mass
Benaderde relatiewe atoommassa

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 H 2,1 1																	2 He 4
3 Li 1,0 7	4 Be 1,5 9											5 B 2,0 11	6 C 2,5 12	7 N 3,0 14	8 O 3,5 16	9 F 4,0 19	10 Ne 20
11 Na 0,9 23	12 Mg 1,2 24											13 Aℓ 1,5 27	14 Si 1,8 28	15 P 2,1 31	16 S 2,5 32	17 Cℓ 3,0 35,5	18 Ar 40
19 K 0,8 39	20 Ca 1,0 40	21 Sc 1,3 45	22 Ti 1,5 48	23 V 1,6 51	24 Cr 1,6 52	25 Mn 1,5 55	26 Fe 1,8 56	27 Co 1,8 59	28 Ni 1,8 59	29 Cu 1,9 63,5	30 Zn 1,6 65	31 Ga 1,6 70	32 Ge 1,8 73	33 As 2,0 75	34 Se 2,4 79	35 Br 2,8 80	36 Kr 84
37 Rb 0,8 86	38 Sr 1,0 88	39 Y 1,2 89	40 Zr 1,4 91	41 Nb 92	42 Mo 1,8 96	43 Tc 1,9	44 Ru 2,2 101	45 Rh 2,2 103	46 Pd 2,2 106	47 Ag 1,9 108	48 Cd 1,7 112	49 In 1,7 115	50 Sn 1,8 119	51 Sb 1,9 122	52 Te 2,1 128	53 I 2,5 127	54 Xe 131
55 Cs 0,7 133	56 Ba 0,9 137	57 La 139	72 Hf 1,6 179	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 Tℓ 1,8 204	82 Pb 1,8 207	83 Bi 1,9 209	84 Po 2,0	85 At 2,5	86 Rn
87 Fr 0,7	88 Ra 0,9 226	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