GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

NOVEMBER 2020

GRADE 10

PHYSICAL SCIENCES (CHEMISTRY)
PAPER 2

TIME: 1½ hours

MARKS: 70

7 pages, 1 data sheet and 1 periodic table

b.o.

INSTRUCTIONS AND INFORMATION

1. Write your name on the ANSWER SHEET.
2. This question paper consists of SEVEN questions. Answer ALL the questions in the ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. You may use a non-programmable calculator.
5. You may use appropriate mathematical instruments.
6. You are advised to use the attached DATA SHEETS.
7. Show ALL formulae and substitutions in ALL calculations.
8. Round off your FINAL numerical answers to a minimum of TWO decimal places.
9. Give brief motivations, discussions, et cetera where required.
10. Write neatly and legibly.

QUESTION 1: MULTIPLE CHOICE QUESTIONS

Various options have been provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question numbers (1.1 to 1.5) in the ANSWER BOOK, e.g. 1.6 D.

1.1 Air can be classified as a/an…

A homogeneous mixture.
B element.
C heterogeneous mixture.
D compound. (2)

1.2 According to the Kinetic Molecular Theory the particles of a solid ...

A vibrate in their fixed positions and have a fixed shape.
B are free to move and are compressible.
C are free to move and have a fixed shape.
D vibrate in their fixed positions and are compressible. (2)

1.3 Which one of the following electron configuration notations represent an ion of a halogen?

A $1s^2\ 2s^2\ 2p^6\ 3s^2$
B $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
C $s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
D $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ (2)

1.4 There are … atoms of hydrogen in 2 moles of NH_3.

A 5×10^{23}
B $3{,}1 \times 10^{23}$
C $3{,}61 \times 10^{24}$
D 4×10^{23} (2)

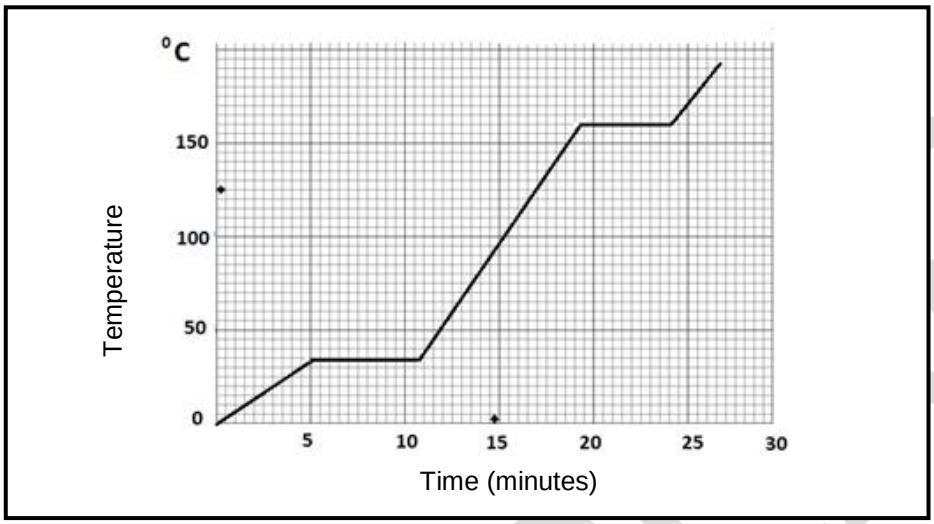
1.5 The percentage hydrogen in C_2H_4 is …

A 4 %.
B 85, 71 %.
C 66,67 %.
D 14,29 %. (2)

[10]

QUESTION 2

2.1 The heating curve of a substance is shown below.



2.1.1 Write down the physical state of the substance at t = 15 minutes. (1)

2.1.2 What is the *boiling point* of any substance? (2)

2.1.3 Give the value and unit of the freezing point for the substance in the graph. (2)

2.1.4 How will the average kinetic energy of the particles of this substance be affected between:

(a) t = 0 minutes and t = 5 minutes (1)
(b) t = 5 minutes and t = 10,5 minutes (1)

(Write down only INCREASE, DECREASE or REMAINS THE SAME.)

2.1.5 Refer to the Kinetic Molecular Theory to fully explain the answer to QUESTION 2.1.4 (b). (3)
[10]

QUESTION 3

3.1 Complete the table below. Write only the answer next to the question number (3.1.1 – 3.1.5).

Element	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons
Potassium	19	39	3.1.1	3.1.2	3.1.3
Magnesium ion	12	3.1.4	12	12	3.1.5

(5)

3.2 Lithium occurs as two isotopes in nature. 7 % lithium-6 atom and 93 % lithium-7 atom.

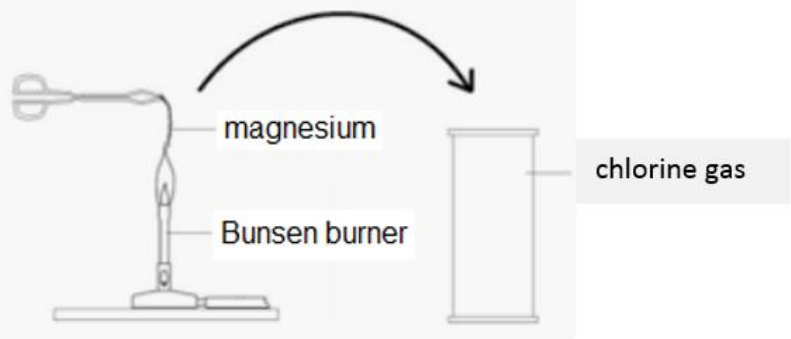
3.2.1 Define the term *isotopes*. (2)

3.2.2 Calculate the relative atomic mass of lithium. (3)

[10]

QUESTION 4

Magnesium reacts with chlorine gas to form magnesium chloride.



4.1 Define the term *ionic bond*. (2)

4.2 Write down the chemical formula of magnesium chloride. (2)

4.3 For the chlorine atom:

4.3.1 Draw the Aufbau diagram. (3)

4.3.2 Write down the valence electrons. (1)

4.4 Write down the *electron configuration* notation (sp notation) of magnesium. (2)

4.5 Show the formation of magnesium chloride by using the **Lewis dot diagrams**. (4)

[14]

QUESTION 5

The empirical formula of a certain compound needs to be determined.

The compound has 62,5 % of Pb; 8,45 % of N and 29,05 % of O.

5.1 Define the term *empirical formula.* (2)

5.2 Determine the empirical formula of this compound. (6)
[8]

QUESTION 6

Consider the following chemical reactions.

A: $SO_2(g) + O_2 \rightarrow SO_3(g)$
B: $KC\ell O_3(s) \rightarrow KC\ell(s) + O_2(g)$
C: $A\ell + Fe_2O_3 \rightarrow Al_2O_3(s) + Fe(s)$
D: $C_2H_6(g) + O_2(g) \rightarrow CO_2 + H_2O(g)$
E: $2NaBr(aq) + C\ell_2(g) \rightarrow 2NaC\ell(aq) + Br_2(\ell)$

6.1 Balance equations A, B, C and D by writing out the full equation in your answer sheet. (4)

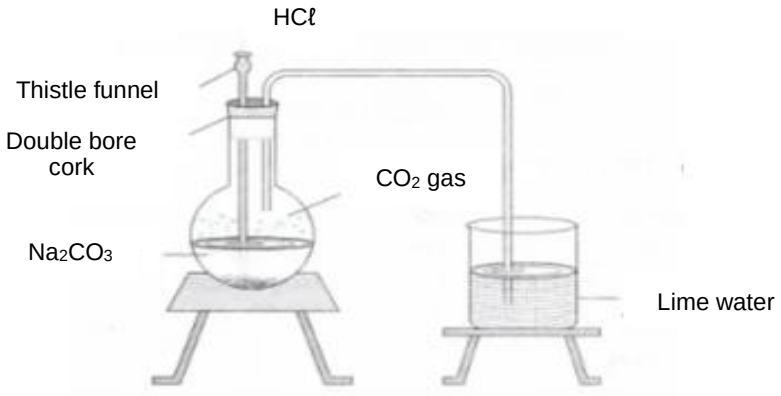
6.2 State the *Law of constant composition*. (2)

6.3 Show by calculation that the mass is conserved in reaction E. (5)
[11]

QUESTION 7

33,5 g sodium carbonate reacts with 500 cm^3 hydrochloric acid according to the balanced equation.

$$Na_2CO_3(s) + 2HC\ell(\ell) \rightarrow 2NaC\ell(aq) + CO_2(g) + H_2O(g)$$



7.1 What does *(aq)* mean? (1)

7.2 Calculate the number of moles of sodium carbonate. (3)

7.3 By using the mole ratio of the reactants, determine the number of moles of the 500 cm^3 hydrochloric acid that reacted completely with the 33,5 g sodium carbonate. (2)

7.4 What is the function of the lime water shown in die diagram? (1)
[7]

TOTAL: 70

END

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 2 (CHEMISTRY)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
VRAESTEL 2 (CHEMIE)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$
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	$22{,}4\ dm^3 \cdot mol^{-1}$

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