Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

AMATHOLE EAST

GRADE 10

PHYSICAL SCIENCES P2 (CHEMISTRY)

FINAL EXAMINATION

NOVEMBER 2024

MARKS: 100

TIME: 2 HRS

This question paper consists of 11 pages

INSTRUCTIONS AND INFORMATION

1. Answer ALL questions

2. You may use an approved scientific calculator

3. All information sheets, with formulae are included at the end of the paper.

4. Number the questions as they are numbered in the question paper

5. Show ALL formulae and substitutions in ALL calculations

6. Round off your final numerical answers to a minimum of two decimal places where applicable

7. 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 answer and write only the letter(A-D) next to the question number (1.1 - 1.10) in the **ANSWER BOOK**, for example 1.11 C

1.1 Which of the following is a homogenous mixture?

A Sand and water
B Milk and corn flakes
C Sugar solution
D Sodium chloride (2)

1.2 The particles of a solid ...

A move haphazardly.
B Do not move at all.
C Move over one another.
D Vibrate around fixed position in the crystal. (2)

1.3 When atom X of an element in Group 17(VII) ionises to become X^- the ...

A Mass number of X increases.
B Atomic number of X decreases.
C Number of electrons decreases.
D Number of electrons increases. (2)

1.4 The molecular formula of a certain compound is $C_4H_{10}O_2$

A C_2H_6O
B $C_2H_4O_2$
C C_2H_5O
D $C_2H_6O_2$ (2)

1.5 Which of the following has the highest ionisation energy?

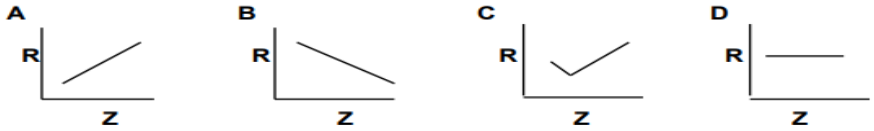
A Potassium
B Lithium
C Caesium
D Sodium (2)

1.6 Which one of the following statements if correct? 1 mole is equal to...

i) 44 g of CO_2
ii) 32 g of O_2
iii) 14 g of N_2

A i and iii
B i and ii
C iii
D i, ii and iii (2)

1.7 Which graph represents atomic radius, R, versus atomic number, Z, for the elements in period 2?



1.8 The tendency of an atom in a molecule to attract the bonding electrons is known as...

A Atomic radii
B Electron affinity
C Electronegativity
D Ionisation energy (2)

1.9 The balanced chemical equation represents the reaction between methane (CH_4) and steam (H_2O):

$$CH_4(g) + H_2O(g) \rightarrow CO(g) + 3H_2(g)$$

The volume of methane (in m3) needed to form 150 cm^3 of hydrogen at the same temperature and pressure is...

A 25
B 50
C 75
D 150 (2)

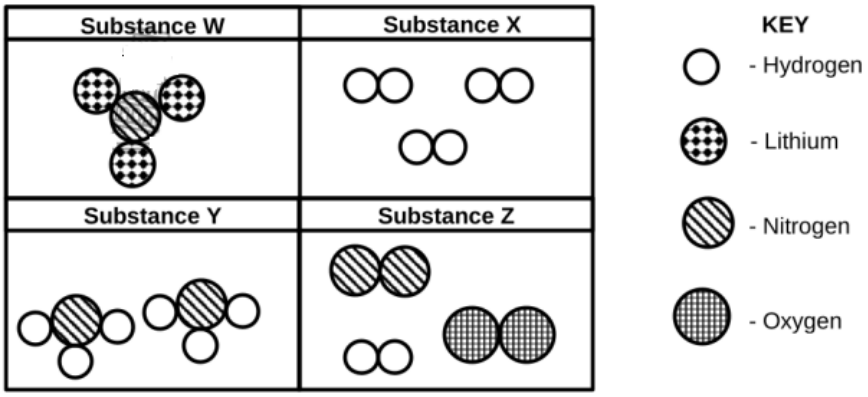
1.10 The formula for Epsom Salt is $MgSO_4.7H_2O$. the mass (in grams of Epsom Salt needed to prepare 1dm3 of solution with concentration of 0.1 $mol.dm^{-3}$ is...

A 12
B 15
C 19.2
D 24.6 (2)

[20]

QUESTION 2

Four different substances **W, X, Y** and **Z** are represented in the table below.



2.1 Is Substance **X** an element or a compound?
Give reason for the answer. (2)

2.2 Write down the letter of the substance that represents a mixture (1)

2.3 Write down the common name of Substance **Y** (1)

2.4 Draw the Lewis structure of Substance **Y** (2)

2.5 Identify the type of chemical bond between the atoms in substance **W** (1)

2.6 Hydrogen gas and Nitrogen gas reacts to produce Substance **Y**

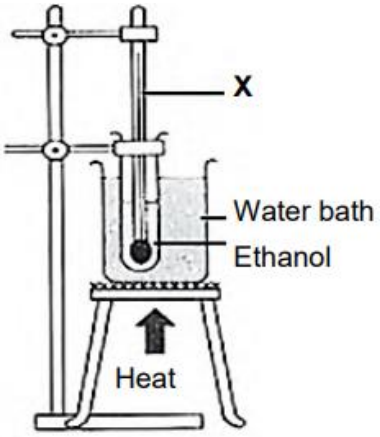
2.6.1 Write down the balanced chemical equation for the reaction that takes place. (3)

2.6.2 Is this synthetic or decomposition reaction?
Give reason for the answer. (2)

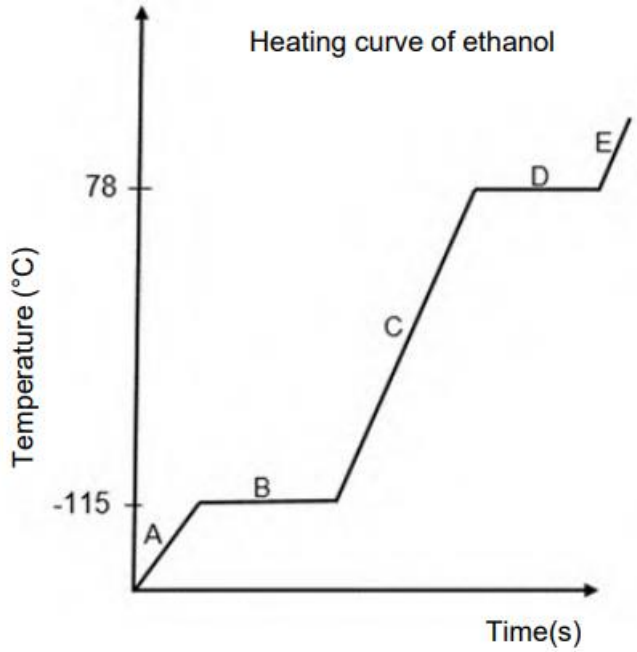
2.6.3 Use the balanced chemical equation from Question 2.6.1 to prove that the law of conservation of mass in this reaction. (3)
[15]

QUESTION 3

The grade 10 learners conducted an experiment to investigate the effect of the increase in the temperature over a period of time at standard pressure.



The graph below was drawn using the results obtained.



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

3.2 Write down the followings:

3.2.1 Dependent variable (1)

3.2.2 Independent variable (1)

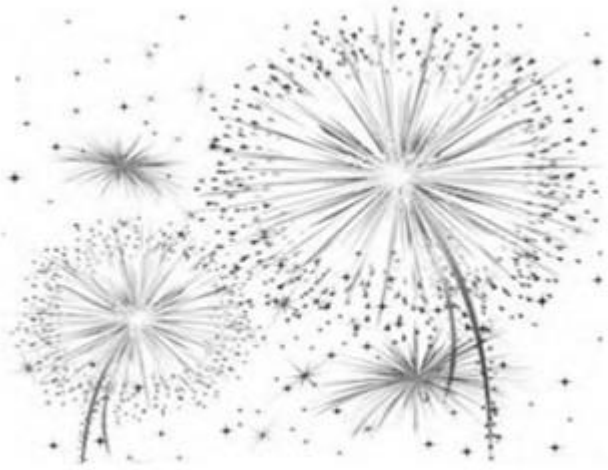
3.2.1 Controlled variable. (1)

3.3	Give the name of apparatus X	(1)
3.4	In what phase is ethanol at room temperature	(1)
3.5	Explain, using Kinetic molecular theory, what is happening at section B	(3)
3.6.	Will water or ethanol boil first at standard pressure? Explain the answer.	(3)

[13]

QUESTION 4

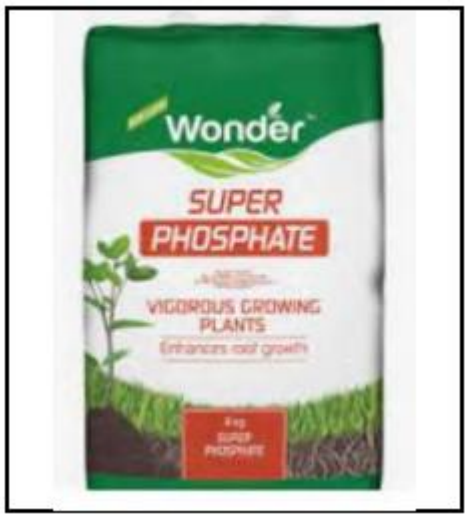
Strontium is best known for the brilliant reds it produces from its salts in fireworks and
flares.



Strontium is an element on the Periodic Table in period 5 group 2. The four isotopes of strontium have isotopic mass numbers of 84, 86, 87 and 88 and relative abundance of 0,56%, 9,86%, 7% and 82,58% respectively.

4.1	Define the term isotope	(2)
4.2	Write down the symbol of strontium.	(1)
4.3	How many valence electrons does strontium have?	(1)
4.4	Compare atomic radius of strontium and magnesium.	(2)
4.5	Calculate the relative atomic mass of strontium.	(3)

4.6 Nitrogen is the nutrient that is most essential to plant growth. One such fertiliser contains ammonium phosphate, $((NH_4)_3PO_4)$.



4.6 Calculate the percentage of nitrogen in this fertiliser. (3)

4.7 The manufacturing process of fertilisers uses a compound containing 82,24% nitrogen and 17,76% hydrogen.

Name this compound by using a calculation. (6)
[18]

QUESTION 5

The table below shows the first and second ionisation energies of elements in period one

	FIRST IONISATION ENERGY ($kJ.mol^{-1}$)	SECOND IONISATION ENERGY ($kJ.mol^{-1}$)
Li	520	7 297
Be	899	1 757
B	801	2 427
C	1 086	2 352
N	1 402	2 854
O	1 214	3 391
F	1 681	3 381
Ne	2 080	3 964

5.1.1 Explain why there is a general increase in the first ionisation energy on going from left to right across the period. (2)

5.1.2 It is observed that the second ionisation energy of Li (Lithium) is considerably higher than Be (Beryllium). Explain this observation. (2)

5.1.3 Write down the name of the group of the elements have the highest first ionisation energy in the period. (1)

5.2 Write down the chemical formula for:

5.2.1. Magnesium oxide (1)

5.2.2 Calcium carbonate (1)

5.2.3 Iron (iii) oxide (1)

5.3 Write down the name of $(NH_4)_2SO_4$ (2)

[10]

QUESTION 6

6.1 Define the term *one-mole* of substance (2)

In the reaction below, 3 g of Na_2CO_3 were reacted with hydrochloric acid solution and an effervescence is observed.

$Na_2CO_3 + HC\ell \rightarrow NaC\ell + CO_2 + H_2O$

6.2 Calculate the molar mass of Na_2CO_3. (2)

6.3 Calculate the number of moles of the 3 g of Na_2CO_3 used. (3)

6.4 Determine the number of oxygen atoms present in the 3 g of Na_2CO_3 used. (4)

[11]

QUESTION 7

Suphur dioxide (SO_2) reacts with oxygen (O_2) to form sulphur trioxide (SO_3) in the balanced equation below.

$$2SO_2\,(g) + O_2(g) \rightarrow 2SO_3(g)$$

In one such reaction 2,45 dm^3 sulphur trioxide (SO_3) is formed at STP.

7.1 State Avogadro's Law in words (2)

7.2 Calculate the:

7.2.1 Number of moles SO_3 that formed. (4)

7.2.2 Mass of SO_2 that reacted (3)

7.2.3 Number of oxygen (O_2) molecules reacted (4)
[13]

GRAND TOTAL [100]

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

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