REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE'S IDENTIFICATION NUMBER	SUBJECT CODE **0515**	PAPER NUMBER **2**
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GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

ORDINARY LEVEL

SUBJECT TITLE	SUBJECT CODE	PAPER NUMBER
CHEMISTRY	**0515**	**2**
	EXAMINATION DATE: **JUNE 2024**	

Duration: Two and a Half Hours

Enter the information required in the boxes above.

This paper is arranged in three sections, A, B and C.

Section A: ANSWER ALL 5 questions. You will be graded for the best 4 answers

Section B: ANSWER ALL 2 questions in this section.

*Section C: ANSWER 2 **QUESTIONS** OUT OF 3. If you attempt more than 2 questions, only the first two will be considered.*

In calculations, you are advised to show all the steps in your working, giving your answer at each stage.

Calculators are allowed

You are reminded of the necessity for good English and orderly presentation in your answers.

USEFUL DATA:

Relative Atomic Masses

Hydrogen (H) = 1.0
Carbon (C) = 12.0
Oxygen (O) = 16.0
Nitrogen (N) = 14.0

1 Faraday = 96000 coulombs.
Molar volume of a gas at r.t.p. = 24000cm3,
Specific heat Capacity of water = 4.2J/g/°C
Avogadro Number = 6.02×10^{23}
0°C = 273K

FOR EXAMINERS' USE ONLY	
Marked by..... Signature of Examiner: .....Date:.....	***SCORE***
Checked by..... Signature:.....Date:.....	

Turn Over

SECTION A:

*ANSWER **ALL 5** questions. You will be graded for the **best 4** answers*

1. The table below shows some elements on the Periodic Table. The letters are not the usual symbols of the elements.

Element	Mass Number.	Atomic number	Proton number	Neutron number	Electron number
A	35	17	17	**X**	**Y**
B	24	12	12	12	12
C	**Z**	3	3	4	3
D	16	8	8	8	8

a) Complete the table above by giving the values of

i) **X** .....

ii) **Y** .....

iii) **Z** .....

(3 marks)

b) Elements A and B are involved in bonding

i) Give the formula of the compound formed .....

ii) Name the type of bond involved .....

(2 marks)

c) Give the electronic configuration of elements

i) A .....

ii) D .....

(2 marks)

d) To which group of the Periodic Table does elements C and D fall?

i) C .....

ii) D .....

(2 marks)

e) How would the element C be stored in the laboratory? .....

(1mark)

(Total = 10 marks)

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2. This question concerns some elements on the Periodic Table: Sodium, Na, Calcium, Ca, Magnesium, Mg

(a) Using the following elements complete the table below:

Group	Element	General name
I		

(2 marks)

(b) Give one physical property of the group I metals.

.....

(1mark)

(c) Give one chemical property of the elements of group I.

.....

(1mark)

(d) Write equations to show how these elements behave in water.

Na .....

Mg ..... **(2 marks)**

(e) i) Identify a compound of sodium and chlorine commonly used in our homes.

.....

ii) State the bond type in the compound in e (i).

.....

(2 marks)

(f) In the laboratory preparation of a gas, X, NaCl, conc.H_2SO_4 and MnO_2 are mixed:

i) Identify gas x .....**(1mark)**

ii) What is the function of MnO_2: .....**(1mark)**

(Total = 10 marks)

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3. A hydrocarbon has molecular formula C_4H_{10}

(a) i) Write the general formula of the homologous series to which the compound belongs.

.....

ii) Name the homologous series to which the compound belongs .....

.....**(2 marks)**

(b) C_4H_{10} exist in more than one structural form.

i) Draw and name two structural forms of the compound

.....

.....

.....

.....

.....

.....

.....

ii) What name is given to the structural forms?

.....**(5 marks)**

(c) Write a balanced equation for the combustion of C_4H_{10} .....

.....**(2 marks)**

(d) Give one domestic use of C_4H_{10}

.....**(1mark)**

(Total = 10 marks)

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4. (a) An element, W, (where W is not the usual symbol) exhibits isotopy. The isotopes $^{47}_{22}W$ and $^{49}_{22}W$ have relative abundances 60% and 40% respectively.

`i) What is isotopy?

.....

.....

ii) What makes the two isotopes different?

.....

.....

iii) Calculate the relative atomic mass of W.

.....

.....

.....

.....(4 marks)

(b) Consider the reactions.

A: $HCl_{(aq)} + NaOH_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$ $\Delta H = -57.12KJ/mol$

B: $C_2H_5OH_{(l)} + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 3H_2O_{(l)}$ $\Delta H = -1273KJ/mol$

i) Based on the reactants, identify the type of reaction represented by;

A: .....

B: .....

ii) Based on the energy changes, identify the type of enthalpy change represented by A and B.

.....

iii) Define enthalpy change

.....

.....

iv) What volume of carbon dioxide gas will be evolved from reaction B when 5.2g of C_2H_5OH is burnt at room temperature?

.....

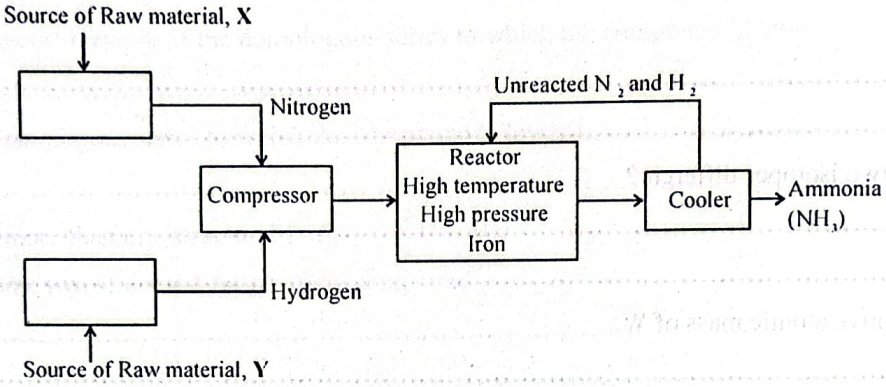
.....

.....

.....(6 marks)

(Total = 10 marks)

5. The flow diagram below shows the main stages in the industrial manufacture of ammonia.



a) Identify the sources of raw materials, X and Y.

X .....

Y .....(2 marks)

b) i) Write a balanced chemical equation for the reaction occurring in the reactor.

.....

ii) What is the function of the Iron in the reactor?

.....

.....

iii) How is the wastage of the unreacted nitrogen and hydrogen minimised?

.....

.....(4 marks)

c) What is the function of the cooler?

.....

.....(1 mark)

d) The ammonia obtained is used to produce the nitrogen fertilizer, ammonium nitrate (NH_4NO_3) (RMM =.80)

i) Name the substance that is reacted with ammonia to form ammonium nitrate.

.....

ii) Calculate the percentage of nitrogen in ammonium nitrate.

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..... (3 marks)

(Total 10 marks)

SECTION B

ANSWER ALL 2 questions in this section

6. A student was provided with three salts, **X**, **Y** and **Z** alongside with some laboratory equipment and the following reagents; Aqueous sodium hydroxide, ($NaOH_{(aq)}$), Aqueous Barium chloride, ($BaCl_{2(aq)}$), Dilute $HCl_{(aq)}$

A series of tests were carried out as shown on the following table.

Study and complete the table.

	TEST PROCEDURE	OBSERVATION	CONCLUSION	
a.	i) To $2cm^3$ of solution **X** is added 5drops of $NaOH_{(aq)}$ and warmed	A colourless pungent gas is evolved that turns damp red litmus paper blue.	... .	**(2 marks)**
	ii) A sample of **X** is strongly heated in a test tube	A brown gas is evolved.	....	**(2 marks)**
b.	i) To $2cm^3$ of a solution of **Y**, is added 2 drops of $NaOH_{(aq)}$		Fe^{2+} ions present	**(1 mark)**
	ii) To $2cm^3$ of a solution of **Y**, is added 2drops of $BaCl_{2(aq)}$ followed by dil HCl	....	SO_3^{2-} ions present	**(2 marks)**
c.	i)	Z gives a brick red flame colour	.....	**(3 marks)**
	ii) To $2cm^3$ of a solution of **Z**,is added 5drops of dil HCl without heating	A gas is evolved which turns lime water milky.	....	**(2 marks)**

d. From the table identify X, Y and Z.

X .....

Y ....

Z ....**(3marks)**

e) To prepare and collect a dry sample of Ammonia gas in the laboratory, the fc lowing equipments and chemicals are provided: Round bottomed flask, delivery tubes, clamp and sta id, drying tower, gas jar, solid NH_4Cl, solid $Ca(OH)_2$ and quicklime CaO. Draw and label the experimental et up you will use.

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.....**(3 marks)**

f) Complete the table on the separation of a mixture.

Separation Technique	Mixture	Physical property of components that enables separation
	Different coloured pigments in chlorophyll/ or in coloured ink	

(2 marks)

(Total 20 marks)

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7. In order to determine the concentration of a dilute acid, a student is provided with the following solutions and equipments: 0.20M NaOH, dilute HCl, Pipette, Burette, Conical flask, phenolphthalein indicator, clamp and stand

a) Draw the set up for the experiment.

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..... **(4 marks)**

b) $25cm^3$ of 0.20M NaOH was transferred into the conical flask and 3 drops of phenolphthalein indicator were added.

i) Name the apparatus used in transferring 0.20M NaOH into the conical flask,

.....**(1 mark)**

ii) State the colour change in the conical flask.

From ..... To .....**(2 marks)**

c) The dilute acid was run from the burette and the results were recorded as shown in the following table:

	Approximate	First accurate	Second accurate
Final burette reading	26.2 cm^3	46.0 cm^3	49.0 cm^3
Initial burette reading	0.2 cm^3	20.9 cm^3	24.1cm^3
Titre/cm^3			

i) Complete the table above

ii) Determine the mean titre.

.....

.....

.....**(4 marks)**

d) Calculate the concentration of the acid if $25cm^3$ of 0.20M NaOH was required.

$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

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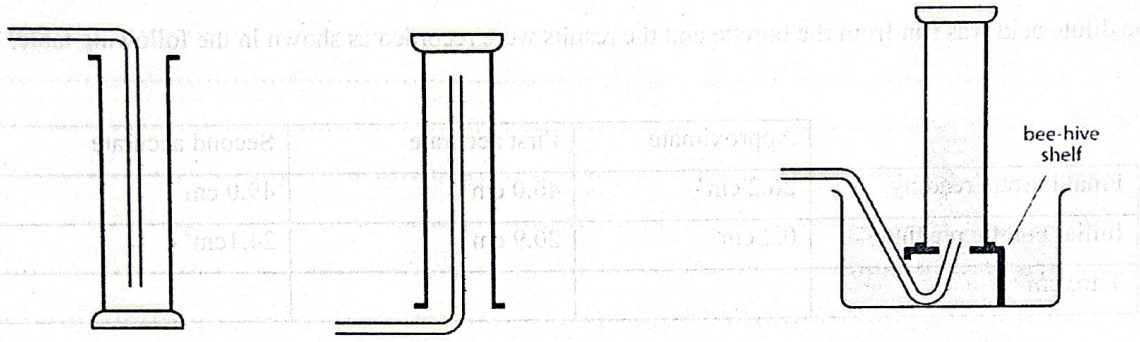
.....**(3 marks)**

e) The diagrams below show different methods for the collection of gases in the laboratory. Study the diagrams and complete the following table.

A **B** **C**



S/N	Diagram	Method of collection	Example of a gas collected by this method
1	A		
2	B		
3	C		

(6 marks)

(Total 20 marks)

SECTION C

ANSWER 2 QUESTIONS OUT OF 3. If you attempt more than 2 questions, only the first two will be considered. Where appropriate, equations and diagrams should be used to illustrate your answer. Write your answers on the sheets that follow **Section C**

8. a) List four factors which affect the rate of chemical reactions.
   b) Using a suitable chemical reaction for each factor, describe how the factor affects the rate of the chemical reactions.

(4, 16 marks)

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9. a) Describe the extraction of Aluminium from a named ore.
   b) State two uses of Aluminium, relating each use to its property.

(16, 4 marks)

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10. Write short notes on each of the following equations. Your notes should include reaction type and observations.

a) $KBr_{2(aq)} + Cl_{2(g)} \longrightarrow 2KCl_{(aq)} + Br_{2(aq)}$

b) $CuO_{(s)} + H_{2(g)} \longrightarrow Cu_{(s)} + H_2O_{(l)}$

c) $CH_2{=}CH_{2(g)} + H_{2(g)} \longrightarrow CH_3CH_{3(g)}$

d) $CH_3CH_2OH_{(aq)} + CH_3COOH_{(aq)} \rightleftharpoons CH_3COOCH_2CH_{3(aq)} + H_2O_{(l)}$

(5, 5, 5, 5 marks)
