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

SUBJECT TITLE	SUBJECT CODE	PAPER NUMBER
CHEMISTRY	**0515**	**2**
	EXAMINATION DATE: **JUNE 2022**	

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 TWO** questions in this section.*

*Section **C**: ANSWER 2 QUESTIONS OUT OF 3. **If you attempt more than 2 questions, only the first 2 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
Sodium (Na) = 23.0
Copper (Cu) = 64.0
Chlorine (Cl) = 35.5 Potassium (K) = 39.0 Nitrogen (N) = 14.0 Sulphur (S) = 32.0

1 Faraday = 96000 coulombs.
Molar volume of a gas at r.t.p. = 24000cm^3,
Specific heat Capacity of water = 4.2J/g/°C
Avogadro Number = 6.02×10^{23}
O°C = 273K

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

Turn Over

SECTION A:
Answer ALL five (5) questions in this section.

1. The table below gives some information about six elements A,B,C,D and E. These letters are not the usual symbols of the elements. Using only the letters A-E answer the questions that follow

Elements	Atomic number	Electronic Configuration
A		2,8,1
B	12	
C		2,8,4
D	18	
E	17	

a) Give

i) The atomic number of C.....

ii) The electronic configuration of D .....

iii) The electronic configuration of the ion of B .....

(3 marks)

b) Which of these elements does not form compounds?

Give a reason for your answer.

Element.....

Reason.....

(2 marks)

c) (i) Which of the elements is a halogen?

.....

(ii). Write a balanced Chemical equation for the reaction between hydrogen and the halogen in (c)(i)

.....

(3 marks)

d) i) Write the formula of the compound formed between B and E

.....

ii) Identify the bond type in the compound formed in (d)(i)

.....

(2 marks)

(Total = 10 marks)

2. Considering the metals: Copper, Sodium, Magnesium, Potassium, Iron and Zinc

a) Identify a metal

i) Which dissolves in cold water to form an alkali

.....

ii) Which will form a blue hydrated compound

.....

iii) Whose ions cause hardness in water

.....

iv) Which is used as a catalyst

.....

(4 marks)

b) i) State the method by which copper is extracted

.....

ii) Give the main ore from which copper is extracted

.....

iii) Write a balanced equation for the main process of the extraction

.....

(4 marks)

c) Give two uses of copper related to its properties

.....

.....

(2 marks)

(Total = 10 marks)

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3. A current of 2.5 amperes was passed through a solution of the salt of an element, X, for one hour.(X is not the usual symbol of the element). The element X was deposited at the cathode.

a) i) State whether X is a metal or a non metal.

.....

ii) Give a reason for your answer

.....

.....

(2 marks)

b) Calculate;

i) The quantity of electricity in coulombs used in the experiment

.....

.....

ii) The number of Faradays of electricity used during the experiment

.....

.....

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

c) If 10.8g of X were collected during the experiment, calculate the number of moles of X collected (RMM of X =108)

.....

.....

.....

(2 marks)

d) Electrolysis is used to electroplate articles

Draw a diagram to show the set up you would use to electroplate an iron spoon with silver indicating clearly the electrodes and electrolyte.

.....

.....

.....

.....

.....

(3 marks)

(Total = 10 marks)

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4. Nitric acid can be prepared in the laboratory by heating a mixture of Sodium Nitrate ($NaNO_3$) and concentrated Sulphuric acid in a retort flask over a sand-bath. The Nitric acid is then collected in a receiver as a yellow liquid.

a) Write a balanced chemical equation showing the reaction taking place in the flask

.....

(2 marks)

b) Give one precaution that must be taken when preparing the acid and explain.

Precaution.....

Explanation.....

(2 marks)

c) i) Why is the Nitric acid which is collected yellow instead of colourless?

.....

ii) How can the acid be purified?

.....

.....

.....

(2 marks)

d) Give an example of a reaction where nitric acid is acting as an acid

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

e) Give two uses of Nitric acid

.....

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

f). Give one large scale use of nitrogen

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

(Total = 10 marks)

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5. A homologous series of an organic compounds has the general formula $C_nH_{2n+1}OH$

a) Give the general name of members of this homologous series

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

b) i) State one difference between members of this series

.....

ii) What is similar between members of this series

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

c) Members of the homologous series $C_nH_{2n+1}OH$ react with metals such as Sodium

i) Write a balanced equation to show how the second member of the homologous series reacts with sodium.

.....

ii) Name the other product formed in addition to hydrogen

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

d) The second members of this homologous series reacts with Ethanoic acid catalysed by concentrated sulphuric acid

i) What name is given to this type of reaction?

.....

ii) Write an equation for the reaction

.....

iii) What is the name of the organic product formed?

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

e) What general name is given to the homologous series with general formula $C_nH_{2n+1}COOC_nH_{2n+1}$?

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

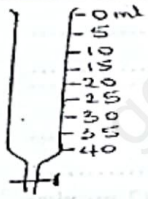
(Total= 10 marks)

SECTION B

Answer BOTH questions in this section in the spaces provided.
Both questions carry equal marks.

6. You are provided with the following laboratory apparatus and reagents.
Pipette, burette, an indicator, dilute hydrochloric acid and 0.1M sodium carbonate, conical flask.
You are required to carry out an experiment to determine the concentration of dilute hydrochloric acid.

a) Identify the following apparatus and give one use of each.

Apparatus	Name	Use
		
		
		

(6 marks)

b) You are expected to transfer 25cm^3 of 0.1M $Na_2CO_{3(aq)}$ into a conical flask and add 3 drops of the indicator. The solution is then titrated with dilute hydrochloric acid till the end point is reached

i) Give a suitable indicator for the titration

.....

ii) What colour change will occur in the conical flask?

Initial colour .....colour at the end point.....

iii) The following table shows the results obtained by the student.

Burette reading	Approximate	First accurate	Second accurate
Final reading	25cm^3	23.5cm^3	23.3cm^3
Initial reading	0.0cm^3	0.0cm^3	0.0cm^3
titre			

From the table above calculate the volume of the hydrochloric acid used

.....

iv). Calculate the concentration of the hydrochloric acid

.....

.....

.....

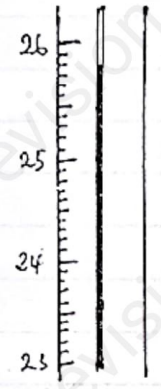
(8 marks)

c) You are to prepare and collect dry samples of chlorine gas ($Cl_{2(g)}$) and Ammonia gas ($NH_{3(g)}$). Give a method that would be used for the collection of each gas

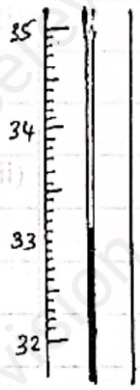
Gases	Method
$Cl_{2(g)}$	
$NH_{3(g)}$	

(2 marks)

d) The following diagram is a section of an apparatus that was used to measure the temperature of a reaction mixture



Temoperature before addition



temperature after addition

(i) Name the apparatus .....

(ii) Complete the following table

Temperature after addition	
Temperature before addition	
Temperature change	

(4 marks)

(Total= 20 marks)

7. Labels fell off from 3 identical bottles containing the following chemicals: Calcium chloride, Sodium Sulphate and Iron (II) bromide.

In order to identify the content of each bottle, a student was provided with the following reagents: aqueous Barium Chloride, aqueous Sodium hydroxide, aqueous Silver nitrate, Dilute HCl and material for flame test.

Complete the following tables that show the procedure used by the student and the observations.

(a)

BOTTLE	Procedure	Observation
Containing Calcium chloride	(i)	(i)
	(ii)	(ii)

(4 marks)

(b)

BOTTLE	Procedure	Observation
Containing Sodium Sulphate	(i)	(i)
	(ii)	(ii)

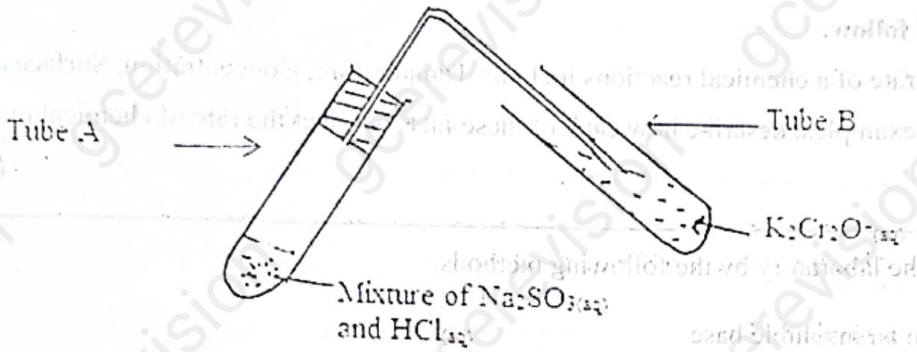
(5 marks)

(c)

BOTTLE	Procedure	Observation
Containing Iron(II) Bromide	(i)	(i)
	(ii)	(ii)

(4 marks)

(d) The following setup was used to prepare and test for a gas in the laboratory



(i) What do you observe in the tube containing $K_2Cr_2O_7$ solution?

.....

(iii) Identify the gas produced in the first test tube A

.....

(iii) State one physical test for the gas produced in test tube A

.....

(3 marks)

e) A student is given the following mixtures

(i) Ethanol/water (ii) Powdered Suphur/ Iron fillings (iii) Solid NH_4Cl / NaCl

Complete the following table by suggesting the method of separation.

Mixture	Method of separation
Ethanol/water	
Powdered Suphur/ Iron fillings	
Solid NH_4Cl / NaCl	

(3 marks)

(f) Identify the equipment that is used to protect the eyes in the laboratory.

.....

(1mark)

(Total 20 marks)

SECTION C

Answer ONLY TWO questions in this section. If you attempt more than two 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.

8. Factors which affect the rate of a chemical reactions include: Temperature, Concentration, Surface area and catalyst. Using different examples, describe how each of these factors affect the rate of chemical reactions.

(20 marks)

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9. Salts can be prepared in the laboratory by the following methods.
   a) Neutralisation
   b) Action of an acid on an insoluble base
   c) Double decomposition

   Using a suitable example in each case, describe how a pure dry sample of each salt can be prepared

(7,7,6 marks)

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10. The manufacture of H_2SO_4 requires SO_2 as one of the raw materials.

    a) Identify two principal sources of SO_2

    b) Name the other raw material and its source, and describe how sulphuric acid is obtained in the industry.

    c) Give two large –scale uses of Sulphuric acid.

(2,16, 2 marks)