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 (GCE) BOARD
ORDINARY LEVEL EXAMINATION

SUBJECT TITLE	SUBJECT CODE	PAPER NUMBER
CHEMISTRY	**0515**	**2**

EXAMINATION DATE: **JUNE 2021**

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
Copper (Cu) = 64.0
Magnesium (Mg) = 24.0

1 Faraday = 96000 coulombs.
Molar volume of a gas at r.t.p. = 24000cm^3,
Specific heat Capacity of water = 4.2J/g/^{o}C
Avogadro Number = 6.02x10^{23}
O^{o}C = 273K

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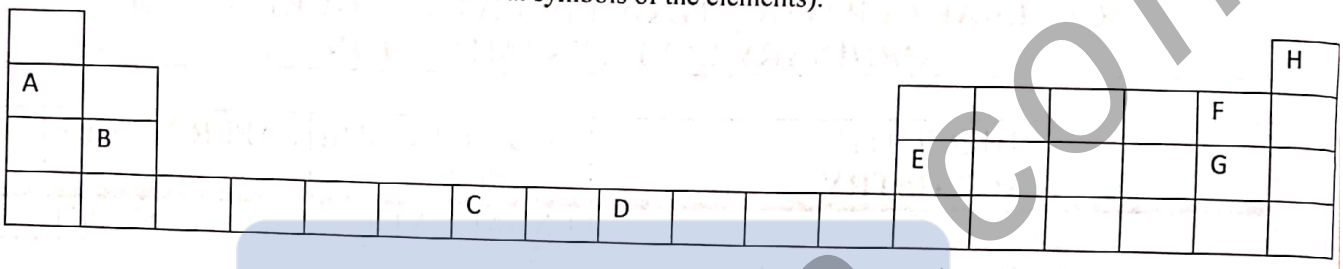
Marked by..... Signature of Examiner: .....Date:.....	***SCORE***
Checked by..... Signature:..... Date:.....	

SECTION A
Answer ALL five (5) questions

1. The following table is a section of the modern Periodic Table. The letters A-H represent elements in their correct positions. (A-H are not the usual symbols of the elements).



a) Using the letters from the table, select an element that is

i) Stored in paraffin oil.

.....

ii) A reddish liquid at RTP.

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

b) Write the electronic configuration of;

i) B: .....

ii) Why is B classified in group II?

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

c) The element, E, has a relative atomic mass of 27. Give the composition of an atom of E.

i) Number of protons.....

ii) Number of electrons.....

iii) Number of neutrons.....

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

d) Two elements X and Y have atomic numbers of 6 and 17 respectively.

i) Write the formula of the compound formed between X and Y.

.....

ii) Identify the bond type in the compound in d(i) above.

.....

e) Sodium chloride has the formula NaCl.

Identify the charge of the metallic ion: ..... **(1 mark)**

(Total = 10 marks)

2. This question concerns the following elements:

Sodium(Na), Silver(Ag), Calcium(Ca), Iron(Fe) and Aluminium(Al)

a) Select from the elements;

i) A transition metal used as a catalyst.

.....

ii) An element that forms an amphoteric oxide.

.....

iii) An element that is a basic constituent of bones.

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

b) Arrange the elements in order of decreasing reactivity, starting from the most reactive.

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

c) The element Calcium (Ca) reacts with dilute hydrochloric acid.

i) State one common observation.

.....

ii) Write a balanced equation for the reaction taking place.

.....

(3marks)

d) State the products formed when a piece of Sodium reacts with water.

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

e) Identify the element that is used for making coins and cups.

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

f) Select an element that gives a characteristic intense yellow flame colour.

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

(Total = 10 marks)

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3. a) Nitrogen and Hydrogen react reversibly as shown by the following reaction.

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH3_{(g)}$; $\Delta H = -94KJ/mol$

i) State one source of ;

Hydrogen: .....

Nitrogen: .....

ii) State what would happen to the equilibrium position when

Pressure is increased .....

Temperature is increased .....

iii) The yield of ammonia (NH_3) can be increased by withdrawing some ammonia from the equilibrium mixture .

Identify and state the principle that accounts for this observation

Principle: .....

Statement.....

.....

..... **(6 marks)**

b) You are given the following reaction :

$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

i) State two factors that will affect the rate of this reaction.

.....

.....

ii) The volume of CO_2 gas produced is recorded from a graduated syringe. State and explain what could be done to the concentration of HCl in order to obtain more $CO_{2(g)}$ within a shorter period.

Statement:.....

Explanation:.....

(4 marks)

(Total = 10 marks)

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4. This question concerns some organic compounds belonging to different homologous series

A: C_3H_7OH B: CH_3COOH C: C_2H_4 D: C_2H_6

a) What is a homologous series?

.....

.....

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

(b) Select from A to D

i) an unsaturated compound .....

ii) a compound that readily undergoes substitution reaction with halogens at rtp

.....

(2 marks)

(c) Compounds A and B react in the presence of concentrated Sulphur acid

i) Write an equation for the reaction .....

ii) Identify the family of organic compounds to which the main product belongs.

.....

(2 marks)

d) i) Give the different structural forms of compound A

.....

.....

.....

ii) How are these structural forms called?

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

e) Identify the reagent that is used to distinguish compound C from compound D and state the observation

Reagent: .....

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

(Total = 10 marks)

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5. a) Define the mole

.....

..... (1 mark)

b) 2.4g of magnesium react with excess dilute hydrochloric acid.

(i) How many moles of magnesium are present in 2.4g? (1 mark)

.....

.....

(ii) Calculate the volume of hydrogen gas evolved at room temperature and pressure when the 2.4g of magnesium completely react.

.....

..... (4 marks)

c) In the extraction of Iron, carbon monoxide is used to reduce haematite (Fe_2O_3)

(i) Write an equation to show how the carbon monoxide is formed in the blast furnace

..... (1 mark)

(ii) Write an equation for the reduction of haematite to Iron.

..... (3 marks)

(d) Identify the substance that is used to remove sandy impurities

..... (1 mark)

(e) Give one use of iron in our homes..... (1 mark)

(Total 10 marks)

SECTION B

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

6. a) Sketch and name the laboratory apparatus used during acid/ base titration to

(i) Transfer 25cm^3 of a base into a conical flask

(ii) Prepare a standard solution.

(4 marks)

b) In a titration experiment, a student transferred 25cm^3 of sodium carbonate solution into a conical flask and titrated with dilute hydrochloric acid run from an equipment, P.

(i) Draw and name equipment P.

(2 marks)

(ii) The following table shows results of two accurate titrations.

Second reading of P	24.8	44.6
First reading of P	2.5	22.4
Titre volume		

Complete the table and determine the volume of dilute hydrochloric acid used.

(2 marks)

Calculate the concentration of sodium carbonate solution if 0.1M HCl was used for the titration.

(2 marks)

iii) Methyl orange is used for this titration. What colour change is observed at the end point?

Initial colour..........

Final colour..........

(2 marks)

iv) During an acid-base titration, how many times do we usually carry out the titration process?

(1 mark)

c).In an experiment to determine the formula of an oxide of copper, the following results were obtained.

Mass of boat alone = 8.320g

Mass of boat and oxide = 10.87g

Mass of boat and copper = 10.368 g

Determine the formula of the oxide of copper.

(4 marks)

d) A gas X is as soluble in water as ammonia.
Draw the apparatus that a student will use to dissolve gas X in water.

(2 marks)

7. A student was provided with three salts A, B and C, alongside some laboratory equipment and the following regents: conc $HCl_{(aq)}$,
Aqueous sodium hydroxide, aqueous barium chloride,
Acidified silver nitrate, and dilute $HCl_{(aq)}$.
A series of tests were carried out as shown on the following table.
Study and complete the table

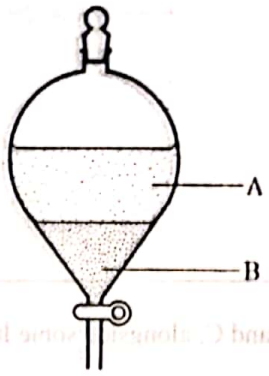
	TEST PROCEDURE	OBSERVATION	CONCLUSION	
(a)	(i) A flame test is carried out on a solid sample of salts A		Presence of calcium ion	(1mark)
	(ii) A Solid sample of salt A is heated in a test tube	A brown gas is evolved		(2marks)
(b)	(i) Salt be B is dissolved in water to give a solution (ii) To $2cm^3$ of solution B is added 2 drops of aqueous sodium hydroxide	A reddish brown precipitate is formed		(1mark)
	(iii) To $2cm^3$ of solution B is added 2 drops of acidified silver nitrate		Presence of Bromide ion	(1mark)
(c)	(i)	A bluish green flame colour is seen		(2marks)
	(ii) To $2cm^3$ of an aqueous solution of salt C is added 2 drops of aqueous barium chloride followed by $2cm^3$ of dil $HCl_{(aq)}$		Presence of sulphite ion	(2marks)
	(iii)To a solid sample of salt C is added 5 drops of dilute HCl	Effervescence, a gas with the smell of burnt matches is evolved		(2marks)

(11 marks)

d) Using the information from the table, identify
A:.....
B:.....
C:.....**(3 marks)**

e) A student is provided with the following; solid sodium chloride, conc H_2SO_4,
2 flat bottomed flasks, thistle funnel, delivery tubes, gas jar. Draw the experimental setup that would be used to
Prepare and collect a dry sample of chlorine gas in the laboratory: **(4 marks)**

f) The following setup is used by a student to separate a mixture of two liquids A and B



Identify a liquid mixture of A and B that can be separated using this method.

A .....

B .....

(2 marks)

(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. The following methods are used to prepare salts in the laboratory :
   Neutralisation
   Action of dilute acids on metals
   Double Decomposition
   a) For each method, name a suitable salt and describe how a pure dry sample is prepared in the laboratory.
   b) State two physical properties of any of the named salts. **(18,2) marks**

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9. a) Ethanol is manufactured from starch by fermentation. With the help of chemical equations, describe the manufacturing process
   b) Give two large scale uses of ethanol obtained in this way. **(18, 2) marks**

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10. You are given the following conversions:

a) $Fe^{2+}_{(aq)} \rightarrow Fe^{3+}_{(aq)}$

b) $I^-_{(aq)} \rightarrow I_{2(s)}$

c) $C_2H_4 \rightarrow C_2H_6$

d) $C_2H_5OH \rightarrow C_2H_6$

Describe how each of the conversion is carried out, showing clearly the reagents used and corresponding reactions.

(5,5,5,5) marks

Question No.....

Write on both sides of this paper

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Question No.....

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