

REGISTRATION CENTRE NUMBER	CENTRE NAME	
CANDIDATE'S FULL NAMES		
CANDIDATE IDENTIFICATION NUMBER	SUBJECT CODE 0515	PAPER NUMBER 2
FOR OFFICIAL USE ONLY		
GENERAL CERTIFICATE OF EDUCATION BOARD ORDINARY LEVEL EXAMINATION		
SUBJECT TITLE CHEMISTRY	SUBJECT CODE 0515	PAPER NUMBER 2
EXAMINATION DATE: JUNE 2023		

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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

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 × 10²³

0°C = 273K

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Marked by.....	<u>SCORE</u>
Signature of Examiner:Date:.....	
Checked by..... Signature:.....Date:.....	

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SECTION A

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

1. An element, A, has atomic number 19 and readily reacts with cold water.

(a) i) Write the electronic configuration of A.

.....

ii) Is, A, a metal or a non-metal? Give a reason for your choice.

.....

Reason: (3 marks)

(b) i) Identify the group on the Periodic Table to which the element A, belongs.

.....

ii) Give one other element belonging to this group.

.....

(2 marks)

(c) Using electron dot and cross diagrams only, show how the bond between A and Oxygen is formed.

.....

(3 marks)

(d) State one observation when A reacts with cold water.

..... (1 mark)

(e) Write the formula of the chloride of A.

..... (1 mark)

(Total = 10 marks)

2. Ethanol is a member of a homologous series of organic compounds.

(a) i) What is a homologous series?

.....

ii) To which homologous series does ethanol belong?

..... (2 marks)

(b) Identify the first member of this homologous series.

..... (1 mark)

(c) State the observation when PCl_5 is added to a solution of ethanol.

..... (1 mark)

(d) Give the reagent and reaction conditions necessary to convert:

i) Ethanol to ethene

Reagent: Condition:.....

ii) Ethanol to Ethylethanoate

Reagent:..... Condition:.....

(4 marks)

(e) State one source and one large scale use of ethanol.

Source: Use:.....

(2 marks)

(Total = 10 marks)

3. Carbon exhibits allotropy

(a) i) What is allotropy?

.....
.....
.....
.....
.....

ii) Name two allotropes of carbon and give one physical difference between the two allotropes

- Allotropes:

- Difference:.....

(4 marks)

(b) Carbon dioxide and carbon monoxide are two oxides of carbon

i) Identify a compound that will react with dilute hydrochloric acid to give carbon dioxide

.....

ii) Using an equation only, show how carbon dioxide is converted to carbon monoxide

.....

iii) Briefly describe the chemical test that is used to distinguish between carbon dioxide and carbon monoxide

.....

.....

.....

iv) Give one industrial use of carbon dioxide

.....(5 marks)

(c) Identify the form of carbon that is used as an industrial fuel

.....(1 mark)

(Total 10 marks)

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4. An aqueous solution of copper (II) sulphate is electrolysed using graphite electrodes.

(a) Draw a labelled diagram of the electrolytic cell used.

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.....
.....
.....
.....
.....
.....
.....
.....
.....

(3 marks)

(b) Identify the products formed at each electrode:

Cathode:

Anode:

(2 marks)

(c) The graphite electrodes are replaced with copper electrodes.

i) Write equations for the reactions taking place at each electrode:

Cathode:

Anode:

ii) State the difference in the observations at the anode when the inert electrodes are replaced by copper electrodes.

.....
.....

(3 marks)

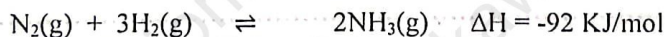
(d) A current of 1.0A is passed through a solution of copper (II) sulphate for 50 minutes. Calculate the quantity of electricity passed in coulombs.

.....
.....
.....

(2 marks)

(Total = 10 marks)

5. The following equation represents a reversible reaction used in an industrial process.



(a) Identify the source of nitrogen and hydrogen

Nitrogen:

Hydrogen:

(2 marks)

(b) What is a reversible reaction?

.....
.....

(1 mark)

(c) What is the enthalpy change for the backward reaction?

.....

(1 mark)

(d) State what will happen to the yield of ammonia, NH_3 when:

i) The temperature is increased

ii) The pressure is decreased

(2 marks)

(e) The reaction is usually catalysed:

i) Identify the catalyst

ii) State the role played by the catalyst.

(2 marks)

(f) State Le Chatelier's principle.

(2 marks)

(TOTAL = 10 Marks)

SECTION B

ANSWER ALL 2 QUESTIONS IN THIS SECTION

6. In order to determine the chemical composition of two salts **A** and **B** and an organic compound **O**, a student carried out a series of tests using the following: aqueous Barium chloride, dilute HCl, aqueous NaOH, solid PbCl_2 , material for flame test and test tubes.

(a) i) A flame test was carried out on salt **A**. A lilac flame colour was observed.

Briefly describe the procedure for flame test.

(2 marks)

What does a lilac flame colour indicate?

(1 mark)

ii) To 2cm^3 of a solution of **A** is added 2-3 drops of aqueous Barium chloride followed by dilute hydrochloric acid. Complete the following table.

Observation	Inference
A white precipitate is formed. The precipitate is insoluble in excess HCl	

(2 marks)

Give the chemical identity of salt **A**:

(1 mark)

(b) i) A solid sample of salt **B** was strongly heated in a test tube. A brown gas was observed. What conclusions can you draw from the observation?

(2 marks)

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- ii) A certain test is carried out on a solution of salt B using aqueous NaOH. A dirty green precipitate is observed. Briefly outline the test procedure and state your conclusion from the results

Procedure:

.....

Conclusion

.....(3 marks)

- (c) i) To 2cm³ of the organic compound O is added a pinch of solid phosphorus pentachloride (PCl₅).

Complete the following table.

Observation	Inferences
White fumes are evolved

(1 mark)

- ii) The compound O has no effect on both blue and red litmus. Identify the family of organic compounds to which O belongs.

.....(1 mark)

- (d). A student investigated the rate of production of carbon dioxide by adding dilute hydrochloric acid to chalk. The volume of carbon dioxide produced over an interval of time is shown on the following table.

Volume of CO ₂ (g)/cm ³	0	20	35	48	60	66	66
Time /s	0	60	120	160	240	300	360

- i) Using the grid provided, plot a graph of volume of CO₂ collected (on the vertical axis) against time.



(4 marks)

ii) Using your graph, determine the time taken for the reaction to come to an end.

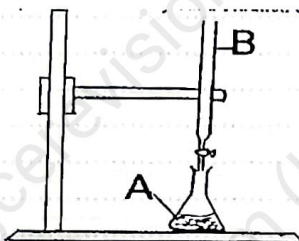
.....(2 marks)

(e) Why do we wear hand gloves while working in the laboratory?

.....(1 mark)

(TOTAL 20 Marks)

7. The following diagram was used by a student to carry out a Titration experiment involving an acid and a base.



(a) Identify the equipment labelled A and B.

A.....

B.....

.....(2 marks)

(b) In which of the apparatus is the indicator usually put during titration?

.....(1 mark)

(c) Why is it always advisable to put the NaOH in apparatus A and not in B?

.....(1 mark)

(d) In one of such experiment, the student used 25cm³ of 0.2M NaOH solution, dilute hydrochloric acid and phenolphthalein indicator.

i) Briefly describe the procedure for the titration.

.....

.....

.....

.....

.....(4 marks)

ii) State the colour change at the end point.

Initial colour..... Final colour.....(2 marks)

iii) If the volume of the dilute hydrochloric acid at the end point was 15cm³, calculate the concentration of the dilute hydrochloric acid.



.....

.....

.....

.....(2 marks)

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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. Using suitable examples and balanced chemical equations, write short notes on each of the following reaction types in Chemistry.

- (a) Thermal decomposition
- (b) Neutralization reaction
- (c) Addition polymerization
- (d) Substitution reaction

(5, 5, 5, 5 marks)

9. (a) Describe an experiment that is used to determine the enthalpy of combustion of ethanol in the laboratory. Your description should end with collection of data.

- (b) In one of such experiments, when 0.4g of ethanol was burnt, the temperature of 200cm³ of water was raised from 25.2°C to 50.0°C. Determine the enthalpy of combustion.

(16, 4 marks)

10. You are given the following equation



- (a) List any three (3) factors that affect the rate of this reaction.
- (b) Describe the effect of change of each of the factors on the reaction rate.
- (c) Name the equipment that can be used to record the volume of carbon dioxide evolved over an interval of time.

(3, 15, 2 marks)