Name.....

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Random No.						Personal No.		

(Do not write your school/centre/name or number anywhere on this booklet)

545/2

CHEMISTRY

Paper 2

Jul/Aug 2023

2 hours

BUSOGA REGION JOINT EXAMINATION BOARD

Uganda Certificate of Education

CHEMISTRY

PAPER 2

2 hours

INSTRUCTIONS TO CANDIDATES

*Section **A** consists of **10** structured questions*
*Answer **all** questions in this section*
*Answers to these questions **must** be written in the spaces provided*
*Section **B** consists of **4** semi-structured questions. Attempt any **two** questions from this section*
*Answers to the questions **must** be written in the answer booklet provided*
*In both sections **all** working must be shown clearly*
Where necessary use;
(H=1, O= 16, N=14, Na=23, C=12, S=32, Cl=35.5, K=39)
1 mole of a gas occupies 24.0 litres at room temperature
1 mole of a gas occupies 22.4 litres at s.t.p

FOR EXAMINERS' USE ONLY														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	**Total**

SECTION A (50MARKS)

*Answer **all** questions in this section*

1. The table below shows the method of obtaining pure substances from different mixtures and the property that enables the isolation of a pure substance from the mixture. Complete the table. (05½ marks)

Method	**Mixture**	**Useful property that enables separation**
	Soya bean seed oil in water	
	Butter from milk	
Hand sorting		Components have big solid Particles of different shape or colour
Fractional crystallization		
		On heating the mixture, one component changes to gas but one remains as a solid

2. (a) When lead (II) nitrate solution was added to solution of compound **J**, a white precipitate was formed, dissolved on heating and recrystallized on cooling.

(i) Identify the anion in **J**. (0½ mark)

.....

ii) Write ionic equation for the formation of the white precipitate. (01½ marks)

.....

.....

(b) (i) Name the reagent used to confirm the anion in **J**. (0½ mark)

.....

(ii) State what would be observed when the named reagent in (b) (i) is added to a solution of **J**. (01mark)

.....

(iii) Write ionic equation for the formation of what is observed in (b) ii).

(01½ marks)

……

……

3. (a) The electronic configuration of the ion of an alkaline metal **M** is 2:8. Write the;

(i) The electronic configuration of the atom of alkaline metal **M**. (0½ mark)

……

(ii) The formula of the ion of the alkaline metal **M** (0½ mark)

……

(b) State why the element **M** is called an alkaline metal (01 mark)

……

(c) Metal **M** was dropped in dilute Sulphuric acid

(i) State what was observed. (01 mark)

……

(ii) Write an equation for the reaction that occurred. (01½ marks)

……

……

4. Two equal lengths of burning magnesium ribbon were introduced separately into gas jars, one containing nitrogen and the other oxygen.

(a) State the jar in which the burning of magnesium ribbon took a shorter time to be completed. (0½mark)

……

(b) Give reason to your answer in (a) (01mark)

……

(c) Write equation for the reaction that would take place when water was added onto the product in the gas jar containing:

(i) oxygen (01½marks)

……

……

(ii) nitrogen. (01½ marks)

.....

.....

(d) State **one** industrial use of nitrogen (0½ mark)

.....

5. 25.0 cm^3 of 0 12 M sodium hydroxide was neutralized by 30.0 cm^3 of a dibasic acid. The acid solution contains 6.3 g of the acid per litre of solution. Calculate the,

(a) molarity of the acid. (03 marks)

(1 mole of acid reacts with 2 moles of sodium hydroxide)

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(b) the relative formula mass of the acid (02 marks)

.....

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.....

6. When calcium turnings were added into water in a beaker, bubbles of a colourless gas, **X**, and a cloudy solution were observed.

(a) Identity:

(i) gas **X** (0½ mark)

.....

(ii) the cloudy solution. (0½ mark)

.....

(b) Write equation for the reaction leading to the formation of gas **X.** (01½ mark)

……

……

(c) State;

(i) how gas **X** could be identified in the laboratory. (01½ marks)

……

……

(ii) **One** laboratory use of the resultant solution in the beaker. (01 mark)

……

7. (a) Name **one** substance in each case, which is a;

(i) carbonate that shows no change in mass when heated. (0½ mark)

……

(ii) compound that when heated turns directly into gas(es) without first melting. (01mark)

……

(iii) nitrate, which when heated, produces oxygen as the only gaseous product; (0½ marks)

……

(b) Write equation for the reaction that would take place if each of the following mixtures was heated;

(i) Iron and water. (01½ marks)

……

……

(ii) Iron and chlorine (01½ marks)

……

……

8. Ethanol formed from glucose can be converted to ethene as shown below

$$C_6H_{12}O_6 \xrightarrow{\text{Stage A}} C_2H_5OH \xrightarrow{\text{Stage B}} C_2H_4$$

(a) Name the process that takes place in

(i) Stage **A** (0½ mark)

.....

(ii) Stage **B** (0½ mark)

.....

(b) State;

(i) One other product formed together with ethanol in stage **A** (0½ mark)

.....

(ii) the conditions for the conversion in stage B (01½ marks)

.....

.....

.....

(c) Ethene can be converted to a complex compound of relative molecular mass 22400.

(i) Write the structural formula of the complex compound. (01 mark)

.....

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.....

(ii) Calculate the number of moles of ethene that make up the complex compound (01 mark)

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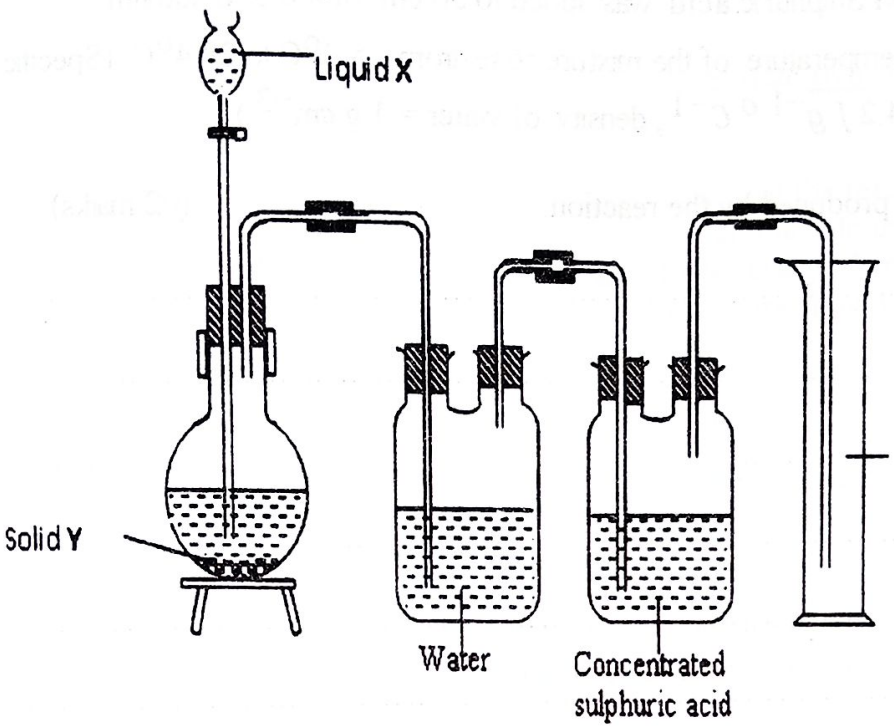
9. **Figure1** below is a setup used to prepare gas in the laboratory. Study it and answer the questions that follow.



(a) Name any two gases that are prepared using the set up in figure one. (01mark)

……

……

(b) Write equations to show how each of the gases in a) above is produced

(03 marks)

……

……

……

……

(c) Explain the role of water in the preparation above. (01 mark)

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10. (a) Write an ionic equation for the reaction between dilute Sulphuric acid and dilute sodium hydroxide solution. (01½ marks)

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(b) When 50 cm^3 of 0.25 M Sulphuric acid was added to 50 cm^3 of a 0.5 M sodium hydroxide solution, the temperature of the mixture rose from 25.0°C to 28.4°C. (Specific heat capacity of water = $4.2\ J\ g^{-1}\ ^{o}C^{-1}$, density of water = 1 g cm^{-3}).
Calculate

(i) amount of heat produced by the reaction. (02 marks)

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(ii) the molar enthalpy of neutralization of sodium hydroxide (02 ½ marks)

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SECTION B (30 MARKS)

Answer only two questions from this section

11. (a) (i) Outline an experiment which can be carried out to show that the rate of the reaction between Zinc and dilute hydrochloric acid depends on the surface area of zinc. **(No equations or diagrams required)** (07 marks)

(ii) Other than the surface area of the zinc, state **two** conditions that would affect the rate of reaction in a(i) (01 mark)

(b) In an experiment to investigate the rate of the reaction of calcium carbonate with dilute hydrochloric acid, a flask containing calcium carbonate crystals and dilute hydrochloric acid was weighted after every 10 minutes for a total time internal of 50 minutes. The results obtained are shown in the table below.

Time (minutes)	0	10	20	30	40	50
Mass	95.9	64.5	39.0	24.4	15.0	11.9

(i) Plot the graph of mass of flask + contents against time. (04 marks)

(ii) Determine the rate of the reaction after 15.0 and 27.5 minutes respectively and comment on your results. (03marks)

12. (a) A piece of clean iron metal was left exposed to damp air over night for a number of days and it became coated with a reddish-brown solid.

(i) Write the chemical name and formula of the reddish brown coating. (02marks)

(ii) With the aid of a labelled diagram, describe an experiment to show that the presence of moisture is necessary for the formation of reddish-brown coating on iron. (05marks)

(b) Briefly explain how each of the following method prevents an iron objects from rusting.

(i) Galvanization. (02marks)

(ii) Painting. (02marks)

(c) Suggest one way in which rusting of moving parts of machinery and cutlery can be prevented. (01mark)

(d) The reddish brown coating in (a) was removed from the iron and dilute nitric acid added to it in a test tube followed by dilute ammonia solution dropwise until in excess.

(i) State what was observed (01½ marks)

(ii) Write an ionic equation for the reaction that occurred. (01 ½ marks)

13. (a) Explain how dry crystals of copper(II) Sulphate can be prepared in the laboratory starting from copper (II) oxide. (06½marks)

(b) Explain how each of the following are obtained from copper (II) sulphate (02marks)

(i) Copper (II) oxide. (03marks)

(ii) Copper metal.

(c) State what would be observed if to copper (II) Sulphate solution was added ammonia solution drop wise until in excess (01½mark)

(d) A clean iron nail was dipped in copper (II) Sulphate solution and left to stand for some time. State what was observed and write an ionic equation for the reaction. (02marks)

14. (a) Oxygen can be prepared in the laboratory by action of manganese(IV) on hydrogen peroxide.

(i) Write an equation for the reaction that takes place. (01½marks)

(ii) Name one other pair of substance from which oxygen can be prepared in the laboratory. (01mark)

(iii) Describe how a dry sample of oxygen can be prepared from the pair of substance named in (a) ii) (**No diagram is required**). (03½ marks)

(b) What would be observed and write the equation for the reaction that takes place when the following were plunged into a jar of oxygen.

(i) Burning sulphur. (02marks)

(ii) Burning magnesium. (02marks)

(d) During the manufacture of oxygen on large scale from air, water vapour and carbon dioxide are removed before the remaining components of air are separated.

(i) State how each of the named components of air (water vapour and carbon dioxide) above are removed from air. (02 mark)

(ii) Briefly describe how oxygen is separated from the remaining components of air. (02 mark)

(iii) Give **one** industrial applications of oxygen obtained in (01mark)

END