Name……

Sign ……

Random No.						Personal No.		

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

545/2

CHEMISTRY

Paper 2

Jul/Aug 2022

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. (a) What is meant by the term **Matter**? (01mark)

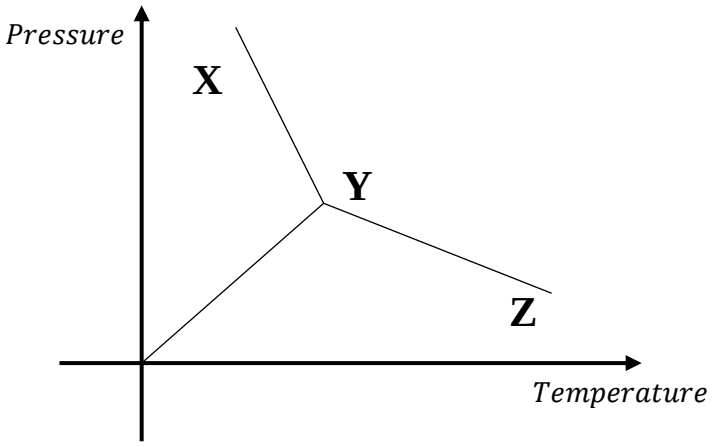
……

..……..

(b) Name any **one** state of matter. (0½mark)

……

(c) The graph below shows the different states of matter represented by letters; **X**, **Y** and **Z** under different conditions of temperature and pressure



With a reason, give the state of matter represented by letter;

(i) **X**

State (0½mark)

……

Reason (01mark)

……

(ii) **Z**

State (0½mark)

……

Reason (01mark)

……

(d) Mention the process by which **Y** can be converted to **X** (0½mark)

……

2. (a) In lake Katwe, sodium chloride exists together with sodium carbonate in the same solution.

(i) State the best method that can be used to separate the two salts. (01mark)

……

(ii) Give a reason why it is possible to separate the two salts by the method you have stated in a(i) above. (01mark)

……

(b) Chromatography is one of the methods used to separate components of mixtures
(i) Give **one** example of a mixture that can be separated by chromatography. (01mark)

……

(ii) State the principle behind separation of the mixture named in b(i) above by chromatography (01mark)

……

(c) Give **two** examples of substances which sublime when heated (01mark)

……

3. Atoms of elements **W**, **X** and **Z** are represented by $^{24}_{12}W$, $^{36}_{17}X$ and $^{12}_{6}Y$

(a) Write the electronic configuration of;

(i) atom of **Y** (0½mark)

……

(ii) ion of **X** (0½mark)

……

(b) With a reason, state the;

(i) group in the periodic table to which **Y** belongs.

Group (0½mark)

……

Reason (0½mark)

……

(ii) period in the periodic table to which **W** belongs.

Period (0½mark)

……

Reason (0½mark)

……

(c) (i) Using valence electrons only, show how **W** and **X** combine to form a compound. (01½mark)

(ii) State the type of bond that exists in the compound formed in c(i) above (0½mark)

……

4. You are given the following list of gases.
Hydrogen, Ammonia, Carbon monoxide, Hydrogen Sulphide, Carbon dioxide, Sulphur dioxide and Nitrogen. Which of the gas(es) given in the list;
(a) can reduce copper(II) oxide? (01½marks)

……

……

……

(b) is/are collected by upward delivery? (02marks)

……

……

……

……

(c) allow burning Magnesium to continue burning in them? (01mark)

……

(d) has/have a characteristic rotten egg smell? (0½mark)

……

5. In the laboratory preparation of Hydrogen gas, Copper(II) sulphate solution was added to the reaction mixture.

(a) State why Copper(II) sulphate solution was added to the reaction mixture (0½mark)

……

(b) (i) Write an equation for the combustion of Hydrogen. (01½marks)

……

……..……

(ii) State **one** way by which purity of the product of the reaction in b(i) above can be determined accurately. (0½mark)

……

(c) Dry Hydrogen gas was passed over strongly heated Lead(II) oxide.

(i) State what was observed (01mark)

……

(ii) Write the equation for the reaction that took place (01½marks)

……

……..……

6. The table below shows part of the periodic table. The symbols used are not the usual symbols of the elements.

	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1	X	V				S	R	
2	W		U		T			P
3							Q	

(a) Which of the elements is/are;

(i) alkali metal(s)? (01mark)

……

……..……

(ii) halogen(s)? (0½mark)

……

(b) Write down the formula of the compound formed when;

(i) V reacts Q (01mark)

……

(ii) U reacts with S (01mark)

……

(c) (i) Which of the elements Q and R is more reactive? (0½mark)

……

(ii) Give a reason for your answer in c(i) above (01mark)

……

7. (a) State what would be observed if to an aqueous solution of lead(II) nitrate was added to;

(i) potassium chloride solution and warmed (01mark)

……

(ii) sodium iodide solution (01mark)

……

(b) Write an ionic equation for the reaction in a(i) and a(ii) before warming

(i) a(i) (01½marks)

……

……..……..

(ii) a(ii) (01½marks)

……

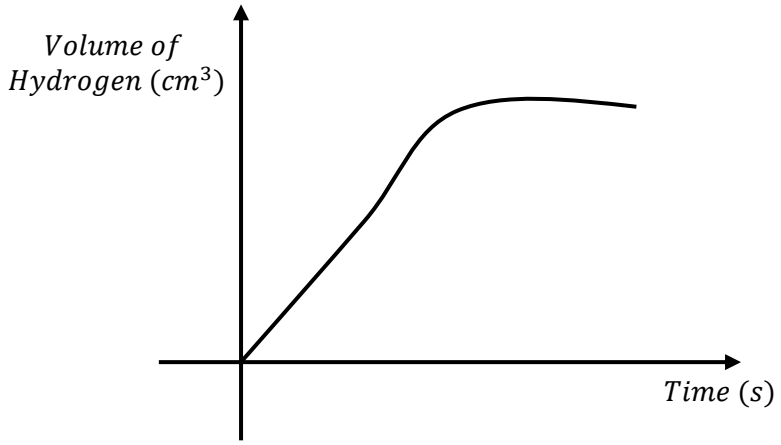
……..……

8. (a) Write the equation for the reaction between zinc and dilute sulphiric acid to produce hydrogen (01½marks)

……

..……

(b) The graph below shows the variations of volume of Hydrogen evolved with time when a certain volume of dilute sulphiric acid was added to a known mass of zinc granules at room temperature.



(i) Draw on the same graph above, the sketch for the reaction that would be expected to occur if the experiment was repeated using a fresh, but the same volume of sulphiric acid added to the same quantity of zinc granules that had been mixed with copper(II) sulphate solution. (0½mark)

(ii) State **three** ways by which reaction results with sketch graphs almost similar to the one you have drawn could be obtained (03marks)

……

……..……

……..

9. (a) State the word that is used to mean manufacture of soap (0½mark)

……

(b) Three water samples **A**, **B** and **C** were treated with soap solutions. The volume of soap solutions required to form permanent foam are given in the table below.

Water sample	**Volume of soap required before boiling (cm^3)**	**Volume of soap required after boiling (cm^3)**
A	10	10
B	50	15
C	50	50

With a reason, which of the samples contain

(i) Calcium hydrogen carbonate

Sample (0½mark)

……

Reason (01mark)

……

(ii) Calcium sulphate

Sample (0½mark)

……

Reason (01mark)

……

(iii) no calcium or magnesium ions
Sample (0½mark)

……

Reason (01mark)

……

……

10. (a) Define the term **Oxide**. (01mark)

……

..……..

(b) When excess carbon monoxide was passed over 4.64g of a heated sample of an oxide of iron, 3.36g of solid residue remained.
(i) Calculate the formula of the oxide of iron (O = 16, Fe = 56) (02½marks)

……

..……..

……

..……..

……

..……

……

……

……

(ii) Write the equation for the reaction between carbon monoxide and the oxide of iron.

(01½marks)

……

..……

SECTION B (30 MARKS)

*Answer only **two** questions from this section*

11. (a) Sulphur is allotropic.

(i) What is meant by the term **Allotropy**? (01mark)

(ii) State two allotropes of sulphur (01mark)

(b) With the aid of a well labelled diagram, describe how sulphur can be extracted from its deposits. (06marks)

(c) Sulphur can react with nitric acid under laboratory conditions

(i) State the conditions for this reaction (01mark)

(ii) Write the equation for the reaction that takes place (01½marks)

(d) In the contact process, the reaction between sulphur dioxide and oxygen is revisable and exothermic.

(i) State **two** conditions for maximum yield of sulphur trioxide. (01mark)

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

(e) (i) State the suitable reagent that can be used to test for sulphur dioxide gas and state what is observed if the reagent is treated with sulphur dioxide. (01½marks)

(ii) Mention **one** use of sulphur. (0½mark)

12. The formula of three organic compounds **P**, **Q** and **R** are **CH_3CH_3**, **$CH_2 = CH_2$** and **CH_3CH_2OH** respectively

(a) State the names of the compound (01½marks)

(b) To which class of the organic compounds does each compound belong?(01½marks)

(c) Which of the above compounds undergo;

(i) Polymerization (01mark)

(ii) Dehydration (01mark)

(d) Write the structure of the;

(i) Product of polymerization in c(i) above (01mark)

(ii) Organic product formed in c(ii) above (01mark)

(e) Explain how a pure dry sample of **Q** can be prepared from the laboratory.
(Diagram **NOT** required) (05marks)

(f) **Q** was dissolved in liquid bromine.

(i) State what was observed (0½mark)

(ii) Write the equation for the reaction that took place (01½marks)

(g) Mention **one** use of;

(i) **Q** (0½mark)

(ii) **R** (0½mark)

13. (a) Copper(II) carbonate was heated strongly. State what was observed and write the equation for the reaction that took place. (02½marks)

(b) Describe how a pure dry sample of copper(II) sulphate – 5 – water can be prepared in the laboratory, starting from copper(II) oxide. (08½marks)

(c) Copper(II) sulphate – 5 – water was dropped into concentrated sulphiric acid. State what was observed and briefly explain your observation. (02marks)

(d) Write an ionic equation to show the reaction that would take place if, to a solution of copper(II) ions was added;

(i) few drops of ammonia solution (01½marks)

(ii) clean piece of magnesium ribbon (01mark)

14. (a) Explain;

(i) What is meant by the term **'Rate of a chemical reaction**' (02marks)

(ii) the effect of concentration of reactant on the rate of a chemical reaction. (02marks)

(b) The table below shows the time taken for reaction of a certain substance **Z** to go to completion when solutions containing various concentrations of **Z** were used

Concentration of Z (moldm^{-3})	0.1	0.3	0.4	0.6	0.8
Time, t for completion of reaction (s)	120	40	30	20	15
Reciprocal of time, $\frac{1}{t}$ (s^{-1})					

(i) Copy and complete the table above for the values of $\frac{1}{t}$ for each time. (02½marks)

(ii) Plot a graph of $\frac{1}{t}$ (Along vertical axis) against concentration of **Z** (04marks)

(iii) Deduce from your graph how the rate of the reaction varies with concentration of **Z** (01mark)

(c) (i) Draw a sketch graph to show how volume of carbon dioxide would vary with time if excess dilute hydrochloric acid was added to a certain mass Wg of marble chips and label it **X** (01mark)

(ii) Draw on the same axes in c(i) the sketch graph you would expect if equal molar volume of the hydrochloric acid was added to Wg of finely ground marble chips and label it **Y** (01mark)

(d) (i) State **one** factor which can affect the rate of a chemical reaction other than concentration and the factor investigated in (c) above (0½mak)

(ii) Mention the effect of the factor you have stated in d(i) above on the rate of chemical reaction. (01mark)

END