Candidates Name......

Signature......**Random No.**...../...../...../...../...../.....**Personal No**.....

545/2

CHEMISTRY

Paper 2

Aug/Sept.2022

2 hours

CHEMISTRY DEPARTMENT

Resourceful chemistry pre- UNEB set 4

UGANDA CERTIFICATE OF EDUCATION

PAPER 2

TIME. 2 hours

INSTRUCTIONS TO CANDIDATES.

Section **A** *consists of* ***10*** *structured numbers*. *Attempt* **all** *questions in this section. Answers to this section must be written in the spaces provided.*

Section **B** *consists of* **4** *semi-structured questions. Attempt only* **2** *questions from this section. Answers to this section must be written in the answer booklets provided. In both sections*, **All** *working must be clearly shown.*

Where necessary use, (Al = 27, C = 12 , O = 16 , N = 14 , S = 32, Pb = 207)

1 mole of a gas occupies ***24 l*** at room temperature.

1 mole of a gas occupies ***22.4 dm3*** at s.t.p

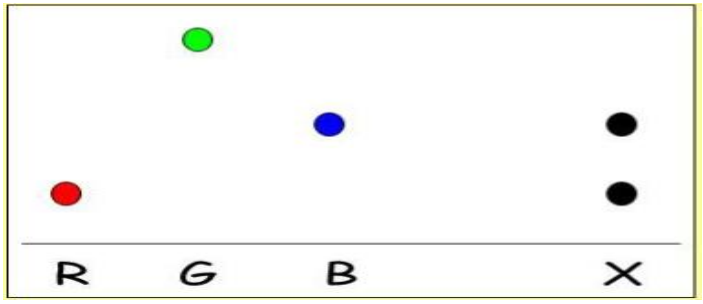
For Examiners Use Only.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

SECTION A (50 marks)

Answer **all** questions in this section

1. (a)The figure below shows the results of an experiment to separate and identify the colours present in ink spot X. R is Red , G green and B is blue



(i) Name the colours that are contained in ink spot X (½ mark)

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(ii) Name the colour that is not contained in ink spot X**.** (½ mark)

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(iii) Name the method of mixture separation used to obtain the colours named in (i) from the ink spot X. (½ mark)

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(iv) Give a reason for the method of mixture separation used. (01 mark)

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(b) (i) What name is given to the bottom line where spots of colours lie above? (½ mark)

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(ii) Why should a pencil be used not a pen to draw the line named In (b) (i) where the spots of colours lie above? (½ mark)

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(c) State one application of the method of mixture separation named in (a) (iii) (½ mark)

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2. One of the conditions necessary for formation of *iron rust* is water.

(a)Name the other condition necessary for formation of *iron* rust. (½ mark)

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(b)Write the chemical formula for iron rust. (½ mark)

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(c)(i)Draw a well labelled set up of apparatus that can be used to show that iron rust can't be formed without the condition stated in (a) (1 ½ marks)

(ii)State the role of each substance in your set up apparatus above which prevents the formation of iron rust. (01 mark)

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(d) Tinplate and galvanization are some of the ways of prevention of iron rust.

(i)State the difference between the two terms. (01 mark)

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(ii)state why galvanization is better than tinplate in prevention of iron rust. (½ mark)

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(e)State one other method that can be used in prevention of iron rust other than those in (d). (½ mark)

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3. (a) State what would be observed if few crystals of each of the following compounds were exposed in open place for about 1 hour.

(i) Sodium nitrate. (01 mark)

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.....

(ii) Anhydrous copper(II) sulphate (01 mark)

.....

(b)Name the process that took place leading to your observation in (a) i.

(½ mark)

.....

(d)Name any one other compound which behaves in a similar way as

(i) sodium nitrate in (a) i. (½ mark)

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.....

(ii)anhydrous copper(II) sulphate in (a) ii. (½ mark)

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4. (a)When 2.31 g of hydrated compound **W2 (SO4)3 •nH20** was strongly heated to constant mass, 1.60 g of water was evolved. **n** is the number of moles of **water *of* crystallization** contained in hydrated compound.

(ii)Calculate the number of moles of *water of* crystallization **, n** in the hydrated compound. (W = 27 , S = 32 , O = 16 , H = 1) (2½ marks)

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(b) 4 drops of calcium hydroxide solution were added to 5cm3 of aqueous solution of hydrated salt in (a)

(i) State what was observed? (½ mark)

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(ii) Write ionic equation of reaction that took place. (1½ marks)

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(5)When excess magnesium powder was added to 250 cm3 of O.5M copper(II) sulphate solution , mixture shaken well and allowed to stand for about 6 hours, blue solution fades and finally a **colourless solution** was formed. **Brown solid** deposited in solution. The resultant mixture becomes warm.

(a)Write ionic equation leading to the formation of

(i) colourless solution. (01 mark)

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.....

(ii) brown solid. (01 mark)

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(b)Name process leading to the formation of,

(i) colourless solution. (½ mark)

.....

(ii) brown solid. (½ mark)

.....

(c) Write ionic equation for the overall reaction that took place. (1½ marks)

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(d)Give a reason why the resultant mixture becomes warm when excess magnesium powder was added to copper(II) sulphate solution. (½ mark)

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6.(a)(i)Write equation of reaction that takes place during fermentation of glucose in presence of yeast. (01 mark)

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(ii)State the purpose of yeast during the fermentation of glucose.(½ mark)

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(b)The product of fermentation of glucose in (a) , can be converted to alkene **Q**.

(i) Name **Q** , and write its structural formula. (01 mark)

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(ii)State the condition(s) of reaction leading to the formation of alkene **Q** from the product of fermentation in (a). (01 mark)

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(iii)Write equation for the reaction leading to the formation of alkene **Q**.

(01 mark)

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(c)When very many molecules of alkene **Q** are joined together under high pressure and temperature in presence of oxygen gas catalyst; a single large complex molecule **R** of larger molecular mass is formed.

(i) Name **R**. (½ mark)

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(ii) Name the process leading to the formation of single large complex molecule **R** from alkene **Q** named in (b) (½ mark)

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(iii)Write equation of reaction that took place leading to the formation of **R**.

(01 mark)

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(iv)Name one use of **R**. (½mark)

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7.(a)Explain why carbon dioxide gas cannot be prepared in the laboratory from lead (II) carbonate and dilute hydrochloric acid. Include equation of reaction that would take place. (03 marks)

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(b)Carbon dioxide was bubbled into lime water for a very short time . The resultant mixture of products was filtered. Name residue formed. (½ mark)

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(c) The residue formed in (b) was dried and then heated strongly until there was no further change.

(i)State what was observed? (½ mark)

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(i)Write equation of reaction that took place. (1½ marks)

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(d)State one industrial application of the decomposition reaction in (c)

(½ mark)

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8. Name the suitable common reagent that can be used to distinguish between each of the following given pairs of ions. State the observation that would be made in each case when the reagent is treated with each ion.

(a)Aluminium ions and zinc ion.

Reagent. (½ mark)

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Observations. (01 mark)

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(b)Sulphate ion and chloride ion.

Reagent. (½ mark)

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Observations (01 marks)

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(c) Hydrogen carbonate ion and carbonate ion.

Reagent. (½ mark)

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Observations (01 mark)

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9. Natural rubber is obtained in form of a liquid sap called *latex* which is extracted from rubber trees. Natural rubber has undesirable properties which must be improved before use.

(a)State any two undesirable properties of natural rubber which make it unfit for use. (01 mark)

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(b) (i)Name the process by which the properties of natural rubber stated in (a) can be improved. (½ mark)

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(ii)State how the process named in (b) is carried out. (½ mark)

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(c)State two reasons why natural rubber is subjected to the process named in (b) before use. (01 mark)

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(d)State any ***one*** use of the type of rubber obtained after natural rubber has been subjected to the process in (a) (½ mark)

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10. (a)Define *rate of chemical reaction* (01 mark)

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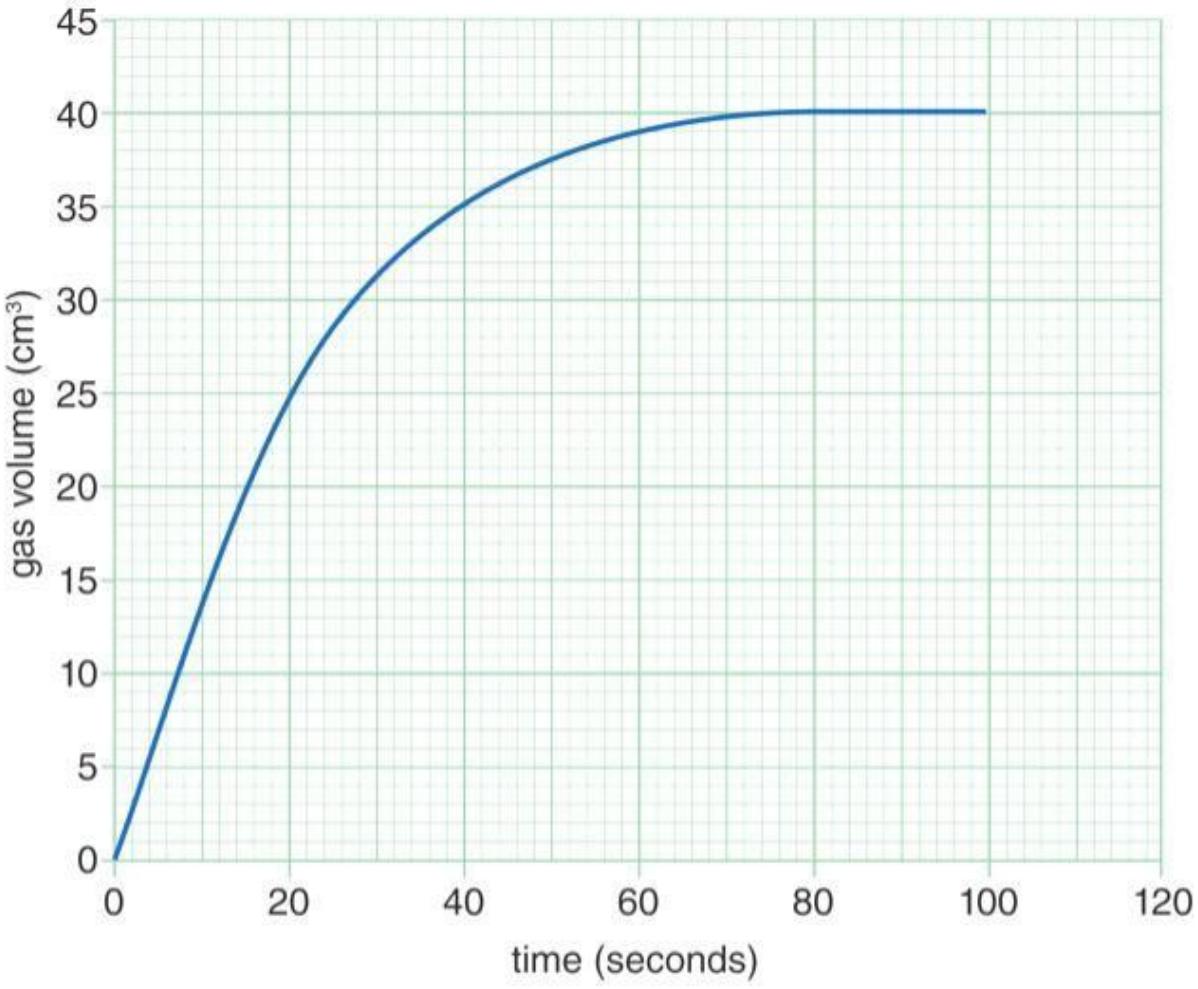
(b)Below is a graph that shows the volume of hydrogen gas produced with time when zinc granules were reacted with O.1 M sulphuric acid at room temperature. Study it and answer the questions that follow.



(i)Describe briefly and give reason for the shape of graph,

- in the first 20 minutes. (1½ marks)

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- from 20^{th} minute to 75^{th} minute. (1½ marks)

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- from 75^{th} minute 98^{th} minute. (01 mark)

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(b (i))Name the catalyst that can be used in the reaction. (½ mark)

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(ii)Sketch on the same graph the curve that would be obtained if the same reaction was repeated in presence of catalyst named in (i) .Name it curve **v**.

(½ mark)

(c)State any one way how the rate of production of hydrogen gas can be increased apart from the conditions in (b) (½ mark)

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SECTION B

Answer any **two** *questions from this section.*

Any additional question(s) answered will not be marked.

11.(a)Define the following terms as used in atomic chemistry.

(i) Atomic mass. (01 mark)

(ii)Atomic number. (01 mark)

(b)The atomic numbers and atomic masses of elements X , Y and Z are 12 , 15, 17 and 24, 31 , 36 respectively.

(i)Write the electronic configuration of each element. (03 marks)

(ii)State the group of the periodic table to which element Y belongs, give a reason for your answer. (01 mark)

(iii)State the periodic of the periodic table to which element X belongs, give a reason for your answer. (01 mark)

(iv)State the number of neutrons of element Y. (½ mark)

(c)Another element W has atomic number 17 and atomic mass 37.

(i)State which of the elements X, Y and Z shows similar chemical properties but with different physical properties with element W.

(½ mark)

(ii)Give a reason for your answer in (c) (i) (½ mark)

(iii)What general term is used to describe the existence of the atom of element W and the atom of element stated in (i) (½ mark)

(d)Elements Z separately reacted with elements X and Y in (b) to form compounds **P** and **Q** respectively.

(i)Write the formula of each compound **P** and **Q** (01 mark)

(ii)using outer most electrons, show how compounds **P** and **Q** are formed. (04 marks)

(iii)State how compound **P** and differs in physical properties. (01 mark)

12.(a) (i)Name the process by which ammonia gas is manufactured on an industrial scale. (½ mark)

(ii)Describe the reactions involved in the process named in (a).(04marks)

(b)Describe how ammonia gas reacts with copper(II) oxide. (04 marks)

(c)Excess ammonia gas was bubbled into aqueous aluminium sulphate.

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

(ii)Write ionic equation of reaction that took place. (1½ marks)

(d)Ammonia gas was completely burnt in 0.6 dm3 of oxygen gas at r.t.p

(i)Write equation of reaction that took place. (1½ marks)

(ii)Calculate the mass of ammonia gas that completely burnt in 0.6dm3 of oxygen gas at r.t.p (02marks)

(e)State one industrial use of ammonia gas. (½ mark)

13.(a) Chlorine can be prepared in the laboratory from manganese(IV) oxide and compound Q.

(i)Name compound Q. (½ mark)

(ii)State the conditions of reaction leading to the formation of chlorine gas from manganese (IV) oxide and compound Q named in (a). (01 mark)

(iii)Write equation for the reaction leading to the formation of chlorine gas from manganese (IV) oxide. (½ mark)

(iv)State the role of Compound Q in the preparation of chlorine gas.

(½ mark)

(b) Draw a well labelled diagram of the set-up apparatus that can be used to prepare a pure dry sample of chlorine gas. (3½ marks)

(c) Explain;

(i) the reason for your choice of drying agent for chlorine gas as shown in you diagram in (b). (01 mark).

(ii)briefly the reason for the method of collecting chlorine gas as shown in your diagram in (b) (01 mark)

(d) Write the equation of reaction to show how chlorine reacts with,

(i) hot concentrated potassium hydroxide solution. (1½ marks)

(ii) warm turpentine, $C_{10}H_{16}$. (1½ marks)

(e) Explain the reaction of chlorine with freshly prepared aqueous solution of Iron(II) chloride. (*03* marks)

(f)State one industrial use of chlorine gas. (½ mark)

14. Cane sugar called *sucrose* $C_{12}H_{22}O_{11}$ is produced from sugarcane plants.

(a)Describe briefly how cane sugar crystals are produced on a large scale.

(*Diagram and equation are not required)* (5½ marks)

(b)(i)Name the substance that can be reacted with cane sugar to form sugar charcoal. (½ mark)

(ii) State the condition(s) under which the substance you have named in (b) (i) reacts with cane sugar crystals to form sugar charcoal. (01 mark)

(iii)State what would be observed and write equation of reaction that would take place when the substance named in (b)(i) is reacted with cane sugar to form sugar charcoal. (03 marks)

(iv)Explain your observation in (iii) above. (02 marks)

(c)State ***one*** use sugar. (½ mark)

(c)Sucrose burns in excess air according to the equation below.

$$C_{12}H_{22}O_{11}(s) + 12O_2(g) \text{ --------} \rightarrow 12CO_2(g) + 11H_2O(l)$$

Calculate the volume of oxygen gas at s.t.p that would be required for complete combustion of sucrose to produce 1354 Kj of heat.

(*molar enthalpy of combustion of sucrose is -5645 Kj per mole, 1 mole of a gas occupies 22.4 dm3 at s.t.p)* (2½ marks)

END.

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