

Name:..... Signature:.....

545/2
CHEMISTRY
Paper 2
S.4 midterm 1
2 hours

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 this question(s) **must** be written in the spaces provided.*

*Section B consists of 4 semi – structured questions. Answer any **two** questions from this section. Answers to the questions **must** be written in the answer booklets provided.*

SECTION A

1. The atomic numbers of elements **Q**, **R** and **T** are 2, 6 and 17 respectively;
(a) State;

(i) The group in the periodic table to which **Q** belongs. (½ mark)

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(ii) The period in the periodic table to which **T** belongs. (½ mark)

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(b) **Q** is generally unreactive. Give a reason. (01 mark)

.....

(c) State one general property of elements in the group to which **T** belongs in the periodic table. (½ mark)

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(d) When **R** combines with **T**, the compound formed is a liquid at room temperature and is insoluble in water;

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

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(ii) Suggest one reason why the compound is not soluble in water. (01 mark)

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2. (a) Zinc carbonate and copper(II) nitrate were separately heated. Write an equation for the reaction that took place.

Zinc carbonate (1½ marks)

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Copper(II) nitrate (1½ marks)

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- (b) Concentrated sulphuric acid was added to copper metal and the mixture heated,
(i) State what was observed. (1½ marks)
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- (ii) Write an equation for the reaction that took place. (1½ marks)
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3. (a) When water was added to solid X, a colourless, odourless gas was evolved that relights a glowing splint.
(i) Name solid X. (01 mark)
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- (ii) Write an equation for the reaction that took place. (1½ marks)
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- (b) State what would be observed if litmus paper was added to the resultant solution in (a) above. (01 mark)
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- (c) Name any other substance that evolves a colourless gas in (a) above. (01 mark)
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4. (a) An organic compound **M** contains 60% carbon, 13.30% hydrogen, the rest being oxygen. Determine the empirical formula of **M**. (03 marks)

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- (b) If the molar mass of **M** is 60g, determine the value of n in the formula $C_nH_{2n+1}OH$. (02 marks)

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5. A clean piece of copper foil was dipped into a solution of silver nitrate;

- (a) (i) State what was observed. (02 marks)

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- (ii) Explain your observation in (a) (i) above. (1½ marks)

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(b) Write equation for the reaction that took place. (1½ marks)

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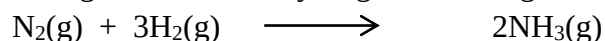
6. (a) (i) State what would be observed when a gas jar of ammonia was inverted over a gas jar containing hydrogen chloride gas. (01 mark)

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(ii) Write equation for the reaction that took place. (1½ marks)

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(b) Nitrogen reacts with hydrogen according to the following equation;



Calculate the volume of ammonia produced at s.t.p when 44.8 dm³ of hydrogen

reacted completely with nitrogen (1 mole of a gas at s.t.p occupies 22.4 dm³)

(2½ marks)

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7. Chlorine gas was bubbled through cold water until there was no further change.
(a) State what was observed (01 mark)

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- (b) Few drops of litmus solution were added to a solution of chlorine in water.
State what was observed. (01 mark)

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- (c) Write equation for the reaction;
(i) Between aqueous chlorine and dilute potassium hydroxide solution. (1½ marks)

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- (ii) That takes place when aqueous chlorine is exposed to sun light. (1½ marks)

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8. (a) (i) An acid **Q**, with the formula $H_xC_yO_z \cdot n H_2O$ contains 26.7% carbon, 2.2% hydrogen and 71.1% oxygen by mass. Determine the empirical formula of **Q** (H=1, C=12, O=16) (02 marks)

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- (ii) Determine the values of x, y and z in the formula of **Q**. ($H_xC_yO_z = 90$) (1½ marks)

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- (b) 20.0cm³ of a solution containing 6.3g of **Q** per litre required exactly 20.15 cm³ of a 0.1 M sodium hydroxide solution for complete neutralization.

- (i) Calculate the concentration of **Q** in moles per dm⁻³ of the solution. p (02 marks)

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- (ii) Deduce the value of **n**. (1½ marks)

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9. (a) Write the structural formula of

(i) ethene

(1 mark)

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(ii) ethane

(1 mark)

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(b) (i) Name one reagent which can be used to distinguish between ethene and ethane. (1 mark)

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(ii) State what would be observed if ethene was treated with the reagent you have named in b (i) above. (1 mark)

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(c) Write equation for the polymerization of ethene (1 mark)

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10 (a) A dilute solution of copper(II) sulphate was electrolyzed for some time using copper electrodes.

(i) To the anode. (01 marks)

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(ii) To the cathode (01 mark)

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- (b) Write equation for the reaction that took place at the anode. (1½ marks)

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- (c) State;

- (i) What was observed at the cathode?

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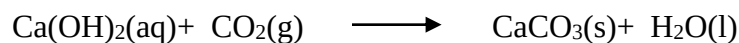
- (ii) How the resulting solution would affect litmus paper after some time. (1 mark)

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SECTION B

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

11. (a) Carbon dioxide can be prepared in the laboratory using calcium carbonate and Substance **T**.
- (i) Identify **T** and write equation leading to the formation of carbon dioxide. (2½ marks)
- (ii) With the aid of a labeled diagram, describe how you would prepare a dry sample of carbon dioxide starting from calcium carbonate. (06 ½ marks)
- (b) When bubbled through calcium hydroxide solution, carbon dioxide reacted to form a white precipitate of calcium carbonate according to the following equation;



Calculate the mass of dry calcium carbonate that would be obtained if 600cm³ of carbon dioxide measured at room temperature was bubbled through calcium hydroxide solution. (Ca = 40, C=12, O=16, 1 mole of a gas occupies 24.0dm³ at room temperature). (02 marks)

- (c) More carbon dioxide was bubbled through a mixture. State what was observed and explain the reaction that took place. *(2½ marks)*
- (d) Burning magnesium was lowered into a jar of carbon dioxide. Write an equation for the reaction that took place. *(1½ marks)*
12. (a) Describe how you would prepare dry crystals of zinc sulphate in the laboratory. *(06 marks)*
- (b) Zinc sulphate crystals were dissolved in water and the resultant solutions divided into three portions.
- (i) To the first portion was added barium nitrate solution. State what was observed
- (ii) Write an equation for the reaction. *(02 marks)*
- (iii) To the second portion was added sodium hydroxide solution dropwise until in excess. State what was observed and write equation(s) for the reaction(s) that took place. *(3½ marks)*
- (c) To the third portion was added sodium carbonate;
- (i) State what was observed. *(01 mark)*
- (ii) Write an equation for the reaction *(1½ marks)*
- (iii) The product in (c) above was strongly heated. Name the residue formed. *(1 mark)*
13. (a) Describe how nitric acid can be manufactured using hydrogen and nitrogen as raw materials. (Illustrate your answer with equations) *(10 ½ marks)*
- (b) Write equations to show the effect of heat on:
- (i) NH_4NO_3 *(1 ½ marks)*
- (ii) $\text{Zn}(\text{NO}_3)_2$ *(1 ½ marks)*
- (c) Potassium nitrate was heated with concentrated sulphuric acid.
- Write equation for the reaction that took place *(1 ½ marks)*

14. a) State the difference between the following terms:
- i) Synthetic polymer and natural polymer (02 marks)
 - ii) Thermosetting polymer and thermo softening polymer (or thermoplastic) (03 marks)
- b) i) State the conditions under which sulphuric acid can react with ethanol to produce ethane. (1.5 marks)
- ii) Write an equation leading to the formation of ethane. (01 mark)
- c) When reacted together, ethene molecules can form a polymer.
- i) Name the polymer (01 mark)
 - ii) Write an equation leading to the formation of the polymer. (01 mark)
 - iii) State one use of the polymer. (01 mark)
- d) Name one ;
- i) Synthetic polymer other than the one you have named in c) above. (01 mark)
 - ii) Natural polymer other than rubber. (01 mark)
- e) State one
- i) Use of each of the polymer you have named in d).
 - ii) Disadvantage of the polymer formed in c)(ii) . (02 marks)

END