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Stream:.....Signature:.....

545/2
CHEMISTRY
Paper 2
2023
2 hours

Uganda Certificate of Education

CHEMISTRY

Paper 2

2 hours

INSTRUCTIONS TO THE CANDIDATES

Section **A** consists of 10 – structured questions. Answer **all** questions in this Section. Answers to Section **A** must be filled in the spaces provided only.

Section **B** consists of 4 semi – structured questions. Attempt any **two** questions from this Section. Answers to this Section must be written in the answer sheets provided. In both Sections, all your working must be clearly shown.

Where necessary use;

[Cu=64; Pb=207; C = 12; H = 1; Fe=56; S=32; O=16]

1 mole of gas occupies 22.4l at s.t.p.

1 mole of gas occupies 24l at room temperature and pressure.

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) A strip of zinc metal was dipped in a solution of copper(II) sulphate.

(i) State what was observed. ($1\frac{1}{2}$ marks)

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(ii) Write the ionic equation for the reaction. ($1\frac{1}{2}$ marks)

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(b) (i) What would be observed if a strip of silver metal was dipped into copper(II) sulphate solution? (01 mark)

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(ii) Explain your answer in (b)(i) (01 mark)

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2. Large scale preparation of nitrogen is done by passing air through solution A and then over heated metal Z.

(a) Identify;

(i) Solution A ($\frac{1}{2}$ mark)

.....

(ii) Metal Z ($\frac{1}{2}$ mark)

.....

(b) State the role of solution A and metal Z in the above process.

(i) Solution A. ($\frac{1}{2}$ mark)

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.....

(ii) Metal Z. ($\frac{1}{2}$ mark)

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.....

(c) Write the equation of reaction that took place when air was passed

(i) Through solution A. ($1\frac{1}{2}$ marks)

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.....

(ii) Over heated metal Z. ($1\frac{1}{2}$ marks)

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3. (a) An element **W** has mass number 27 and 14 neutrons.

(i) Write down the electronic configuration of **W**. (01 mark)

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.....

(ii) **W** combines with oxygen to form compound **R**. write down the formula of **R** and state the type of bond in **R**.

Formula. (01 mark)

.....
.....

Type of bond. ($\frac{1}{2}$ mark)

.....
.....

(b) **R** was dissolved in dilute hydrochloric acid and to the resultant solution was added ammonia solution drop wise until in excess.

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

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(ii) Write the ionic equation to explain the observation in (b) above.

(1½ marks)

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4. 1.5g of a hydrocarbon M consists of 1.2g of carbon.

(a) Calculate the empirical formula of M.

(02 marks)

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(b) 0.125g of hydrocarbon M occupies a volume of 100cm³ at room temperature.

(i) Calculate the relative molecular mass of M.

(1½ marks)

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(ii) Determine the molecular mass of M. (1½ marks)

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5. Classify the following oxides as acidic, basic, neutral, amphoteric or mixed oxides. (05 marks)

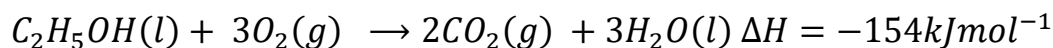
Name of oxide	Type of oxide
Sulphur dioxide.	
Carbon monoxide.	
Copper(II) oxide.	
Aluminium oxide.	
Tri lead tetra oxide.	

6. (a) Define the term heat of combustion. (01 mark)

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(b) Ethanol burns in oxygen according to the following equation.



Calculate the;

(i) Heat evolved when 11.5g of ethanol is reacted with oxygen at s.t.p

(1½ marks)

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(ii) Volume of carbon dioxide produced at s.t.p. (02 marks)

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7. Electrolysis of 1M sulphuric acid was carried out using zinc cathode and copper anode.

(a) State what was observed at the anode. ($\frac{1}{2}$ mark)

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(b) Write equations for the reaction that took place at the;

(i) Cathode. ($1\frac{1}{2}$ marks)

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.....

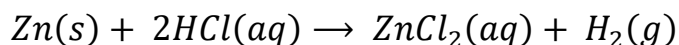
(ii) Anode. ($1\frac{1}{2}$ marks)

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.....

(c) Write equation for the overall cell reaction. ($1\frac{1}{2}$ marks)

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8. Hydrogen is produced in the laboratory according to the equation.



- (a) State three ways in which the rate of reaction of hydrogen can be increased.

(03 marks)

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- (b) Sketch a graph to show how the rate of production of hydrogen varies with time.

(2½ marks)

9. (a)(i) Name one reagent that can be used to identify iodide ions in the laboratory.

(½ mark)

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- (ii) State what would be observed when the solution containing iodide ions is treated with the reagent named in (a)(i) above.

(½ mark)

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(b) Write the equation of reaction that took place in (a)(ii) above. $(1\frac{1}{2} \text{ marks})$

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.....

(c) Chlorine gas was bubbled through a solution of sodium iodide.

(i) State what was observed. $(\frac{1}{2} \text{ mark})$

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(ii) Write equation for the reaction that took place. $(1\frac{1}{2} \text{ marks})$

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10. Polyethene is a plastic made of numerous monomers known as ethene.

(a) Write down the structural formula of ethene. (01 mark)

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(b) Name the homologous series to which ethene belongs. (01 mark)

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(c) (i) State how ethene can be tested in the laboratory. (01 mark)

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(ii) State the conditions under which ethanol can be converted to ethene.

$(1\frac{1}{2} \text{ marks})$

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.....

(iii) Suggest one other use of ethene apart from making Polyethene.

(01 mark)

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SECTION B (30 marks)

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

- 11.**(a)(i) Briefly explain how a pure and dry sample of carbon dioxide can be prepared in the laboratory (diagram not required) (5½ marks)
- (ii) Write the equation for the reaction. (1½ marks)
- (b) State what is observed and write equations where possible when;
- (i) Burning magnesium is lowered in a gas jar containing carbon dioxide. (3½ marks)
- (ii) Carbon dioxide is bubbled through a solution of calcium hydroxide until excess. (4½ marks)
- 12.** Glucose can be converted to ethanol by a catalytic reaction caused by the enzymes produced by yeast.
- (a) Name;
- (i) The reaction in which yeast converts glucose into ethanol. (01 mark)
- (ii) The enzyme produced by yeast during the above reaction. (01 mark)
- (b) Write the equation for the reaction leading to the formation of ethanol by the process named in (a)(i) (1½ marks)
- (c) When ethanol was strongly heated together with concentrated sulphuric acid, gas W was formed.
- (i) Identify gas W. (01 mark)
- (ii) Write the equation for the reaction leading to the formation of gas W. (01 mark)
- (d) (i) Name one reagent that can be used to identify W in the laboratory. (01 mark)
- (ii) State what is observed when the reagent is treated with gas W.

(01 mark)

(iii) Write equation for the reaction that takes place in (d)(ii) above.

(01 mark)

(e) When treated at high pressure and heat, in the presence of a catalyst, W reacts to form a plastic P of high molecular mass.

(i) Identify P. ($\frac{1}{2}$ mark)

(ii) Write the equation leading to formation of P from W. (01 mark)

(iii) State any three uses of P. (03 marks)

(f) Differentiate between thermosetting and the thermo softening plastics

(02 marks)

13.(a) Define the following terms and give one example in each case.

(i) Normal salt. (02 marks)

(ii) Acid salt. (02 marks)

(b) Mention any three methods of preparing salts. ($1\frac{1}{2}$ marks)

(c) Describe how a pure sample of lead(II) chloride can be prepared from lead(II) nitrate. ($6\frac{1}{2}$ marks)

(d) (i) Copper(II) nitrate and zinc nitrate were heated in separate test tubes.

(ii) Write the equation of reaction for the decomposition of zinc nitrate solid.

($1\frac{1}{2}$ marks)

14.(a) Define the term rate of chemical reaction. (01 mark)

(b) State how the following factors affect the rate of the chemical reaction.

(i) Temperature. ($1\frac{1}{2}$ marks)

(ii) Concentration. ($1\frac{1}{2}$ marks)

(c) The table below shows how the variation in volume of hydrogen evolved with time when dilute sulphuric acid was reacted with excess magnesium.

Volume of hydrogen (cm ³)	0	20	35	46	56	72	78	78
Time(s)	0	10	20	30	40	60	80	90

Plot a graph of volume of hydrogen evolved against time. (06 marks)

(d) Use your graph to determine the time taken to collect 65cm³ of hydrogen gas (01 mark)

(e) (i) Draw tangents on your graph at points when time is 20 and 60 seconds and determine the gradients. (03 marks)

(ii) Comment on your results in (e)(i) above. (01 mark)

END