Name……………………………………………………… Personal No…………………………

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**545/2**

**CHEMISTRY**

**Paper 2**

**Uganda Certificate of Education**

CHEMISTRY

**Paper 2**

2 hours

**INSTRUCTIONS TO CANDIDATES:**

*Section* ***A*** *consists of* ***10*** *structured questions. Attempt* ***all*** *questions in this section.*

*Answers to the 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 booklets provided.*

*In both section* ***all*** *working* ***must*** *be clearly shown.*

*C = 12, O = 16, H = 1, C l = 35, Na = 2, N = 14*

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

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

|  |
| --- |
| **For Examiner’s Use Only** |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Total  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | **Turn Over**  |  |

**SECTION A**

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

1. (a) Name the compound formed when a mixture of iron and sulphur is heated.

 (½ mark)

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 (b) State what is observed when a piece of a magnet is passed over;

 (i) a mixture of iron and sulphur. (01 mark)

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 (ii) compound formed (½ mark)

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 (c) (i) Dilute hydrochloric acid was added to a mixture of iron and sulphur. State

 What was observed. (02 marks)

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 (d) Write the equation for the reaction that takes place when dilute hydrochloric acid is added to the compound formed in (a). (1½ marks)

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2. The number of protons in atoms W, X, Y and Z are 6, 9, 13 and 17 respectively.

 (a) (i) Identify the atoms of elements which are in the same group in the periodic table. (01 marks)

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 (ii) State the period in the periodic table to which element with atom W belongs. (½ mark)

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 (b) Write the formula of the

 (i) ion of atom X (½ mark)

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 (ii) compound formed when atom Y reacts with atom Z. (01 mark)

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 (c) Atom Z can react with atoms W and Y to form compounds Q and R respectively. Giving a reason, state which one of the compounds

 (i) can conduct electricity in solution or molten state. (01 mark)

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 ………………………………………………………………………………………...

 (ii) has a lower solubility in water. (01 mark)

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3. A hydrocarbon X molecular mass 42 contains 85.7% carbon

 (a) (i) Calculate the empirical formula of X (C = 12, H = 1) (02 marks)

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 (ii) Determine the molecular formula of X. (01 mark)

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 (b) Write the structural formula of X. (01 mark)

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 (c) Bromine water was added to X.

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

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

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4. (a) Electroplating is one of the application of electrolysis.

 (i) Define the term electrolysis (1 ½ marks)

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 (ii) State any two other application of electrolysis. (01 mark)

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 (b) Draw a labeled diagram of the set up of the apparatus used during electroplating a spoon with silver. (2 ½ marks)

5. (a) Other than vigorous effervescence, state what would be observed if dilute hydrochloric acid was added drop wise until in excess to

 (i) zinc powder. (01 mark)

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 ………………………………………………………………………………………...

 (ii) copper (II) carbonate (01 mark)

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 (b) The resultant solution from (a) (i) was dilute with water and to a small amount of the solution, ammonia solution was added drop wise until in excess.

 (i) State what was observed. (1 ½ marks)

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 (ii) Write the formula of the species present in the final solution when excess ammonia solution is added. (01 mark)

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6. (a) Chlorine gas was bubbled into a test tube containing a saturated solution of potassium iodide.

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

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

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 (iii) Write an ionic equation for the reaction that took place. (1 ½ marks)

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 (b) (i) State what is observed when a solution containing silver ions is added to a solution of chloride ions. (½ mark)

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

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7. Manganese (IV) oxide is used in the laboratory preparation of both chlorine and oxygen.

 (a) Name one other substance which together with manganese (IV) oxide can be used in laboratory preparation of

 (i) chlorine gas (½ mark)

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 (ii) Oxygen gas (½ mark)

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 (b) State the role of manganese (IV) oxide in the reaction (a) during the laboratory preparation of

 (i) chlorine gas (01 mark)

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 (ii) oxygen gas (01 mark)

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 (c) Write equation for the reaction of manganese (IV) oxide with the substance you have named in (a) (i) leading to the formation of chlorine (1½ marks)

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8. The diagram below shows a set up of apparatus that was used to make an electrochemical cell for comparing the reactivities of copper and ion.

 (a) Identify

 (i) solution Y ………………………………………………….. (½ mark)

 (ii) electrode X …………………………………………………. (½ mark)

 (b) (i) Indicate the direction of electron flow on the diagram. (½ mark)

 ………………………………………………………………………………………...

 (ii) State the purpose of the salt bridge. (01 mark)

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 ………………………………………………………………………………………...

 (c) Write the overall equation for the reaction taking place in the cell.

 (1 ½ marks)

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9. (a) State what is observed when

 (i) concentrated nitric acid is added to sulphur. (01 mark)

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 (ii) Dilute hydrochloric acid added to lead (II) nitrate solution and mixture warmed. (1½ marks)

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 (b) Write equation for the reaction that takes place in (a) (i) and (ii)

 (a) (i) (1 ½ marks)

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1. (ii) (1 ½ marks)

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

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1. When 2g of carbon was burnt in excess oxygen, the heat produced raised the temperature of 500g of water by 19oC. Calculate the heat of combustion of carbon. (3½ marks)

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**SECTION B**

*Answer two questions from this section*

11. (a) (i) Draw a labeled diagram of the set up of apparatus that can be used in the laboratory preparation of nitric acid. (03 marks)

 (ii) Write equation for the reaction leading to formation of nitric acid in (a) (i).

 (1 ½ marks)

 (b) Write equation for the reaction that occurs when nitric acid

 (i) decomposes (01 mark)

 (ii) is added to zinc carbonate. (01 mark)

 (c) Nitric acid was added to lead (II) oxide

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

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

 (d) Crystals obtained from the resultant solution in (c) were heated strongly until there was no further change in a test tube.

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

 (ii) Write equation for the reaction that took place. (1 ½ marks)

 (e) When 40.0cm3 of 2M nitric acid was mixed with 40.0cm3 of a 2M sodium hydroxide at an initial temperature of 25.8oC, the temperature of the solution rose to ToC. Determine the value of T (SHC of water 4.2j g-1 k-1 density of water = 1gcm-3 and enthalpy of neutralization of nitric acid by sodium hydroxide = 56.5kJ mol-1. (03 marks)

12. Iron (III) oxide (haemitite) is one of the common ores of iron from which iron can be extracted using a blast furnace.

 (a) Name one

 (i) common ore of iron other Iron (II) oxide. (01 mark)

 (ii) major impurity that can b found in the ore you have named in (a) (i).

 (01 mark)

 (b) Outline the reaction which occurs in the blast furnace during the extraction of iron from iron (III) oxide. (6 ½ marks)

 (c) (i) Name the major components of stainless steel. (½ mark)

 (ii) State one use of stainless steel. (½ mark)

 (iii) Give a reason why stainless steel is more used than pure iron. (01 mark)

 (d) Most common compound of iron are either of Iron (II) or Iron (III).

 (i) State the colour of the compounds in aqueous solution. (01 mark)

 (ii) State what is observed and write equation(s) for the reaction that takes place when Iron (II) sulphate crystals FeSO4.7H2O are heated gently and then strongly until there is no further change. (3½ marks)

13. (a) Describe how you would prepare zinc sulphate crystals in the laboratory starting from zinc granules. (4½ marks)

 (b) The crystals in (a) were dissolved in water to form an aqueous solution. The solution was divided into portions. State what was observed when

 (i) ammonia solution was added to the first portion drop wise until in excess.

 (02 marks)

 (ii) 2 drops of barium nitrate solution was added followed by dilute nitric acid.

 (1½ marks)

 (iii) Write ionic equation for the reaction that took place in (b)(i). (1½ marks)

 (iv) Name and write the formula of the species formed at the end of the reaction. (02 marks)

 (c) A solution containing Lead (II) was added to aqueous solution of zinc sulphate write equation for the reaction that took place . (1½ marks)

1. A part from ammonia solution, state one other reagent that can be used to distinguish between zinc ions and lead (II) ion in solution. In each case state what would be observed. (1½ marks)

14. (a) (i) What is rate of reaction? (01 mark)

 (ii) How does particle size affect rate of reaction? Explain your answer.

 (04 marks)

 (b) The table below shows results for time taken for sulphur to form when various concentrations of sodium thiosulphate were used.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Concentration of sodium thiosulphate M | 0.3 | 0.6 | 0.8 | 1.2 | 1.6 |
| Time t for sulphur to form (seconds) | 71 | 20 | 15 | 10 | 6 |
| 1/t (per second) | 0.014 | 0.05 | 0.07 | 0.10 | 1.667 |

1. Plot the graph of 1/t on vertical axis against concentration of sodium thiosulphate. (04 marks)
2. State from the graph, how rate of the reaction varies with concentration of sodium thiosulphate. Explain your answer. (04 marks)

 (c) Name one reagent that you would use to test for sulphurdioxide and state what would be observed if the reagent was used. (1 ½ marks)

***END***