545/2

CHEMISTRY

Paper 2

Jul/Aug 2019

2 Hours

MUKONO EXAMINATION COUNCIL

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.*

All answers must be written in the spaces provided herein.

*Section **B** consists of **4** semi-structured questions*

*Answer **any 2** questions from this section.*

Answers to this section must be written in foolscaps provided.

*In both sections all working **must** be clearly shown*

[H = 1, C = 12, O = 16, N = 14, Zn = 65, P = 31, S = 32, Mg = 24, Cu = 64]

1 mole of a gas occupies 24dm^3 at room temperature

1 mole of a gas occupies 22.4dm^3 or 22,400cm^3 at s.t.p.

For Examiner's Use only														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

SECTION A

*Attempt **all** questions in this section.*

1. Potassium manganate(VII) was reacted with compound X in a test tube and yellow-green gas evolved.

   a) (i) Identify compound X? ***(½ mark)***

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   (ii) Name gas that was evolved. ***(½ mark)***

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   b) (i) Write equation of reaction that lead to formation of gas you have named in a(ii) above. ***(1 ½ marks)***

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   (ii) State the possible conditions for the above reaction. ***(1 mark)***

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   c) Write equation for the reaction of hot iron wire with the gas you have named in a(ii) above. ***(1 ½ marks)***

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2. Oxidation and reduction are two chemical processes which always occur together.

   a) Give differences between oxidation and reduction in terms of electrons. ***(02 marks)***

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   b) Write the equations of the following half reactions and in each case state whether the reaction is oxidation or reduction.

   (i) Conversion of chlorine molecule to chloride ions. ***(1 ½ marks)***

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(ii) Conversion of iron (II) ions to iron (III) ions. ***(1 ½ marks)***

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3. A stream of dry ammonia gas was passed over strongly heated lead (II) oxide in a combustion tube.

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

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

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b) Aqueous ammonia solution was added to a mixture of iron (II) sulphate and copper (II) sulphate until in excess. After thorough shaking the mixture was filtered.

(i) Identify the metal ion in the residue. ***(01 mark)***

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(ii) Identify the metal ion in the filtrate. ***(01 mark)***

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4. Sulphur (IV) oxide reacts with oxygen in the contact process according to the following equation.

$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)} \quad H = {}^{-}192KJmol^{-1}$

a) State the conditions needed to increase the yield of sulphur (VI) oxide. ***(1 ½ marks)***

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b) Write equations of reactions leading to the production of sulphuric acid from sulphur (VI) oxide. ***(03 marks)***

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c) State one use of sulphuric acid. ***(01 mark)***

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5. A piece of sodium metal was burnt in a limited oxygen supply.

a) State what was observed. ***(01 mark)***

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

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c) Water was added to the product (b) above.

(i) Write equation for the reaction that occurred. ***(1 ½ marks)***

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(ii) State what was observed in (c) above. ***(01 mark)***

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6. Hydro carbon Z contains 85.7% by mass of carbon and the rest being hydrogen. Formular mass of Z is 84 grams.

a) Calculate the empirircalformular of Z. ***(02 marks)***

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b) Determine the molecular formular of Z. ***(1 ½ marks)***

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c) (i) Write the structural formular of Z. ***(01 mark)***

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(ii) State what is observed when Z is bubbled through Bromine water. ***(01 mark)***

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7. a) 100cm^3 of molar sulphuric acid was added to 18.6g of copper (II) carbonate for complete reaction according to the following equation.

$H_2SO_{4(aq)} + CuCO_{3(s)} \longrightarrow CuSO_{4(aq)} + H_2O_{(l)} + CO_{2(g)}$

Note:

(Cu = 64, C = 12, H = 1, O = 16, S = 32, 1 mole of gas at s.t.p occupies 22.4 litres)

Calculate the volume of the gaseous product at s.t.p. ***(02 marks)***

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b) Briefly explain why dilute sulphuric acid hardly reacts with limestone effectively to form carbon dioxide. ***(02 marks)***

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8. Element T belongs to group II of the periodic table.

a) (i) State the type of bond that can exist in the chloride of T? ***(01 mark)***

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(ii) Write the formular of the ion formed by T? ***(01 mark)***

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b) The nitrate of element T was strongly heated until no further change.

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

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

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9. a) Write equation for the reaction between aqueous hydrochloric acid and marble stones? ***(1 ½ marks)***

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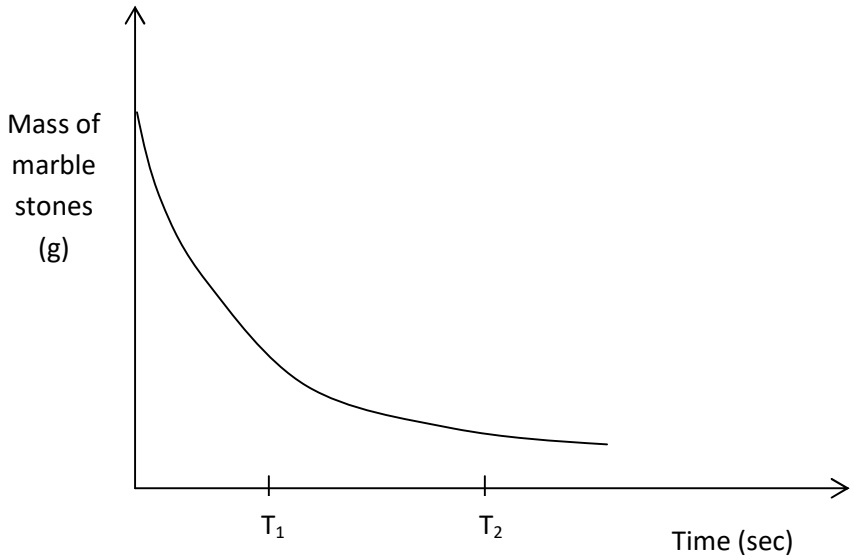
b) Sketch graph below shows variation in the mass of marble stones with time when excess dilute hydrochloric acid was added to some marble stones.



(i) Show how the rate of reaction at time t_1 seconds can be determined (your answer should include units.) ***(1 ½ marks)***

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(ii) The rate of reaction at time T_2 seconds was found to be slower than that at T_1. Give a reason. ***(01 mark)***

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c) Other than changes in mass of marble stones, suggest one property which can be used to determine the rate of the same reaction. ***(01 mark)***

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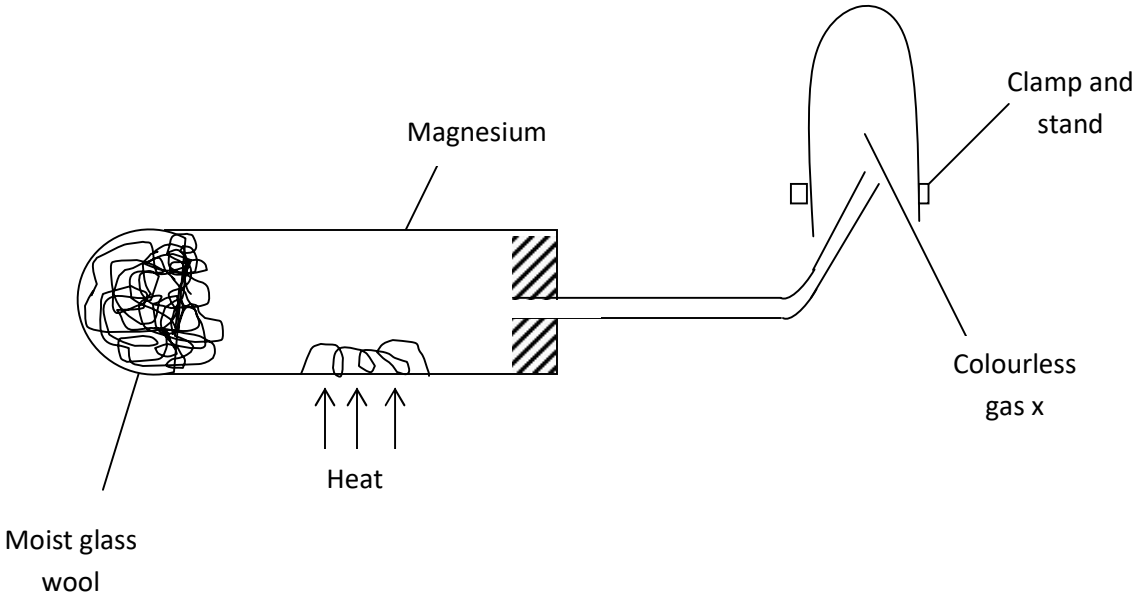
10. Heating of clean magnesium ribbon in steam produced a white solid and a colourless gas x as shown in the figure below.



a) Write the equation for the reaction that took place ***(1 ½ marks)***

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b) Identify gas x and the white solid formed. ***(01 mark)***

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c) State why gas x is collected as shown in the diagram above. ***(01 mark)***

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d) White powder/ solid formed in the reaction was reacted with water.

(i) Write equation of reaction for the reaction that occurred. ***(1 ½ marks)***

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SECTION B

Answer any 2 questions

11. a) (i) State two properties which show that air is a mixture. ***(02 marks)***

(ii) Name two other gases other than oxygen that are constituents of air and give their approximate percentages in air. ***(02 marks)***

b) Describe an experiment to determine the percentage of oxygen in air. Show how the percentage can be calculated from the results. ***(8 ½ marks)***

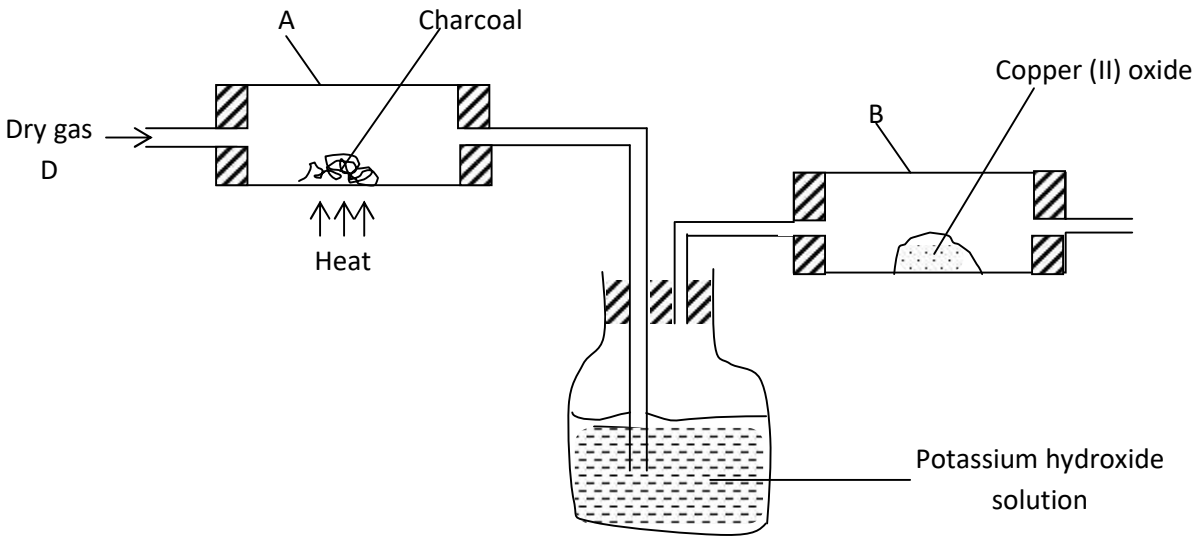
c) (i) State what is observed when burning iron is lowered into a gas jar full of oxygen.

(1 ½ marks)

(ii) Write the name and formular of the product of the reaction between iron and oxygen.

(01 mark)

12. An experiment was carried out to prepare and investigate effects of one gas of carbon on copper (II) oxide as indicated in the diagram below.



a) (i) Name gas D. ***(½ mark)***

(ii) Write an equation for the reaction that occurred in tube A ***(01 mark)***

b) (i) Explain using an equation the role of potassium hydroxide solution in this experiment.

(02 marks)

(ii) State what was observed in tube B. ***(01 mark)***

(iii) Write an equation and name the type of reaction that took place. ***(1 ½ marks)***

c) (i) What precautions should be carried out in this experiment? ***(½ mark)***

(ii) Give one industrial application of carbon monoxide gas. ***(½ mark)***

d) Using equations, briefly describe what happens when;

(i) Burning magnesium is lowered into a gas jar full of carbon dioxide gas. ***(5 ½ marks)***

(ii) Excess carbon dioxide is bubbled into a solution of calcium hydroxide and then heated. ***(2 ½ marks)***

13. Two gases L and M have the following descriptions;
    - L does not burn
    - L fumes in moist air
    - M can burn in air enriched with oxygen.
    - M can turn moist red litmus paper to blue.

    a) (i) Identify gas L and M.

    (ii) Name the drying agent used during the laboratory preparation of gas L and gas M.

    b) Write an equation for the laboratory preparation of gas L and gas M.

    c) Write an equation for the combustion of M in the presence of platinum catalyst.

    d) L was bubbled through silver nitrate solution.

    (i) State what was observed.

    (ii) Write equations for the reactions that took place.

    e) M was dissolved in water to form an aqueous solution. A portion of the resultant solution was added to zinc sulphate solution drop wise until in excess.

    (i) State what was observed.

    (ii) Write equations for the reactions that took place.

14. Copper is extracted from an ore, but in the final stage it is obtained by roasting copper (II) sulphide in a stream of limited air supply.

    a) (i) Write an equation for the reaction that takes place.

    (ii) Name and write the formular of the commonest ore from which copper is extracted.

    b) Write the equation for the initial roasting process of the ore you have named in a(ii) above.

    c) (i) What is the name of the chemical process by which copper (I) sulphide is converted to copper?

    (ii) Write the equation for the reaction occurring during the chemical process you have named in c(i) above.

    d) (i) Name the process by which impure copper is purified.

    (ii) Draw a labeled diagram for the purification process.

    (iii) State three uses of copper.

End -