545/2
Chemistry
Paper 2
2 Hours

ASSOCIATION OF SECONDARY SCHOOLS HEADTEACHERS OF UGANDA (ASSHU) NTUNGAMO

NTUNGAMO DISTRICT JOINT MOCK EXAMINATIONS 2023

Uganda Certificate of Education

CHEMISTRY

545/2

PAPER 2

DURATION: 2 Hours

INSTRUCTIONS TO CANDIDATES

Section **A** consists of 10 structured questions. Answer **ALL** questions in this section. Answers to these questions **MUST** be written in the spaces provided.

Section **B** consists of 4 semi-structured questions. Answer any **two** questions from this section. Answers to these questions must be written in the answer booklet(s) provided.

In both Sections, all the working must be clearly shown.
Where necessary;
1 mole of gas occupies 24l at room temperature.
1 mole of gas occupies 22.4l 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: (50 MARKS)

Answer all questions in this Section.

1. (a) State a method by which each of the following mixtures can be separated.

   (i)   Oxygen and nitrogen   (1 mk)

   ....

   (ii)   Iron (II) Chloride and Iron (II) oxide.   (1 mk)

   ....

   (b) Give a reason why it is possible to separate the mixture in (a) (ii) using the method you stated.   (1 mk)

   ....

   ....

   (c) Sea water contains mainly Sodium Chloride and traces of Potassium Bromide. State one practical method that can be used to obtain the following from sea water.

   (i)   Chlorine   (1 mk)

   ....

   (ii)   A reasonably pure sample of Sodium Chloride.   (1 mk)

   ....

2. Table 1 below shows the group and period in the Periodic Table to which elements **X** and Y belong. Study the table and answer the questions that follow.

   Table 1

Element	Group	Period
X	II	3
Y	VI	2

   (a) State the number of electrons in the atom of **Y**.   (1 mk)

   ....

(b) Write the electronic configuration of the ion that can be formed by the atom of **X**. (1 mk)

....

(c) Element **X** reacted with element **Y** to form a compound **Z**.

    (i)   Using the outermost shell electrons only, draw a diagram to show how **Z** is formed. (1 mk)

    (ii)   State the type of bond in:

        Z .... (1 mk)

        atoms of **X** .... (1 mk)

3. An oxide of phosphorous, **T** contains 43.7% phosphorus.

    (a) (i) Calculate the empirical formula of **T**
          (P=31, O=16) (3 mks)

....

....

....

....

....

....

....

      (ii) Determine the molecular formula of **T**

          (Relative formula mass of **T**=284) (1 mk)

....

....

(b) **T** was dissolved in water and the resultant solution tested with Litmus paper.
    (i)   Write equation for the reaction between **T** and water. (1 ½ mks)

....

....

(ii)   State what was observed on the Litmus Paper.   (1 mk)

....

....

4. (a) Write an ionic equation for the reaction that occurs in the Laboratory
       preparation of carbondioxide.   (1 mk)

....

....

   (b) Name a substance used to dry Carbondioxide and give a reason for
       your answer.   (2 mks)

....

....

   (c) State;

       (i)   Why Carbondioxide is used in fire extinguishers?   (1 mk)

....

....

       (ii)   The effect of increased concentration of Carbondioxide on the
              environment.   (1 mk)

....

....

5. (a) What is meant by the term had water?   (1 mk)

....

....

   (b) Name **two** cations and **two** anions present in hard water.
   (i)   Cations ....
   (ii)   Anions ....   (1 mk)
   ....   (1 mk)

(c) Barium Nitrate solution followed by dilute nitric acid was added to a sample of hard water. State what was observed. (1 mk)

....

....

6. An Iron spoon was coated with Copper atoms by electrolysis.

(a) Name the:

(i) Anode used .... (½ mk)

(ii) Cathode used .... (½ mk)

(iii) Electrolyte used .... (1 mk)

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

(i) anode (1 mk)

....

(ii) cathode (1 mk)

....

(c) (i) Name the process that took place at the Cathode. (½ mk)

....

(ii) State **one** use of the process in (c)(i). (½ mk)

....

7. Ammonia gas is prepared in the Laboratory by heating a mixture of Ammonium Chloride and Calcium Hydroxide. The gas evolved is passed through a tower packed with Calcium Oxide before it is collected using upward delivery.

(a) (i) Write an equation for the reaction that leads to the formation of Ammonia. (1 ½ mks)

....

....

(ii) State why Ammonia is passed through a tower packed with Calcium Oxide. (½ mk)

....

....

(iii) Give a reason why Ammonia is collected by upward delivery method. (½ mk)

....

....

(b)(i) Name a reagent that can be used to identify Ammonia gas. (1 mk)

....

(ii) State what would be observed if Ammonia was treated with the reagent you named in (b)(i). (1 mk)

....

(c) Name the catalyst used in the oxidation of Ammonia during the manufacture of Nitric acid. (½ mk).

....

8. The molecular formular of an organic compound, **M** is C_2H_6.

(a) (i) Write the structural formula of **M**. (1 mk)

....

....

(ii) Name **M** .... (1mk)

(iii) Name the group of organic compounds to which **M** belongs. (½ mk)

....

(b) It is not wise to burn **M** in a living room with closed windows and doors. Explain. (1 mk)

....

....

(c) State **one** use of **M**. (1 mk)

....

9. Hydrochloric acid reacts with Sodium Sulphite to form a gas **Q**.

(a) Identify **Q** (1 mk)

....

(b) State the conditions under which the reaction takes place. (1 mk)

....

....

(c) Write an ionic equation for the reaction leading to the formation of **Q**. (4 mks)

....

....

(d)(i) Name **one** reagent that can be used to identify **Q**. (½ mk)

....

(ii) State what would be observed if **Q** was tested with the reagent you have named in (d)(i) . (1 mk)

....

....

10. (a) State what is meant by the term enthalpy of combustion. (1 mk)

....

....

....

(b) Carbon burns in oxygen according to the following equation:

$$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} \quad \Delta H = -393 kJmol^{-1}$$
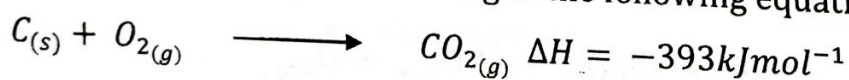
Calculate the;

(i) Amount of heat evolved when 3.6g of carbon is burnt completely in oxygen. (C=12) (2 mks)

....

....

....

....

(ii) Volume of oxygen at s.tp that would be required to produce 78.6 kJ of heat.

(1 mole of gas occupies 22.4 dm³ at s.t.p)   (2 mks)

....

....

....

....

SECTION B (30 MARKS)

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

11. (a) Define the term salt.   (1 mk)

(b) Write equation for the Laboratory preparations of the following salts:

    (i) Sodium Sulphate   (1 ½ mks)

    (ii) Iron (III) Chloride   (1 ½ mks)

(c) (i) With the aid of an equation, describe how a pure dry sample of Lead (II) Nitrate crystals can be prepared in the Laboratory starting from Lead (II) Oxide.   (6 mks)

(ii) When Lead (II) Nitrate is heated strongly, it decomposes according to the following equation:

$$2Pb(NO_3)_{2(s)} \longrightarrow 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$$
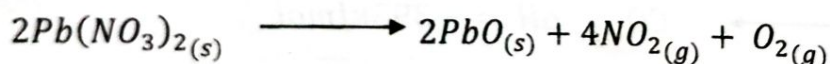
If 3.31g of Lead (II) Nitrate was strongly heated, calculate the total volume of gaseous products at room temperature?

$(Pb = 207, N = 14, O = 16;$ 1 mole of gas occupies 14l at room temperature)

(2 mks)

(d) (i) Name **one** reagent that can be used to distinguish between Aluminium ions and Lead (II) ions.   (½ mk)

(ii) State what would be observed and write equation for the reaction that takes place if any, when the reagent you named in (c)(i) is treated separately with Aluminium Ions and Lead (II) Ions.   (2½ mks)

12. (a) Outline the **Large Scale** preparation of oxygen. (4 mks)

(b) (i) Draw a labelled diagram of the set up of the apparatus for the Laboratory preparation of oxygen using Sodium Peroxide. (2½ mks)

(ii) Write equation for the reaction leading to the production of oxygen in (i). (1½ mks)

(c) State **one biological** use of oxygen. (1 mk)

(d) State the conditions and write the equation for the reaction of oxygen and;
   (i)   Sulphur (2 mks)
   (ii) Iron (4 mks)

13.(a) (i) Describe how Sodium Hydroxide can be manufactured using the mercury cathode cell.
[Your answer should include equations of the reactions, but not diagram] (7 mks)

(ii) State one use of the product formed at the anode and one use of the byproduct. (2 mks)

(iii)   State **one** industrial use of Sodium Hydroxide. (1 mk)

(b) State how Sodium Hydroxide can react with the following substances, and in each case write equation for the reaction:

   (i)   Sulphuric acid (2 mks)
   (ii) Aluminium Sulphate solution (3 mks)

14. (a) What is meant by **rate of a chemical reaction**? (1 mk)

(b) State **two** ways by which the rate of a reaction between Magnesium ribbon and dilute Sulphuric acid can be determined. (2 mks)

(c) Explain how particle size affects the rate of a reaction. (2 mks)

(d) The table below shows the variation in the concentration of Hydrogen Peroxide with time when a sample of Hydrogen Peroxide was mixed with Iron (III) Chloride at room temperature.

Concentration of hydrogen peroxide $(mol\ dm^{-3})$	0.05	0.10	0.15	0.20	0.25
Time, t (s)	53	26	17	13	10.5
$\frac{1}{t}(s^{-1})$					

(i) Copy and complete the table above by computing and filling in the values of $\frac{1}{t}$

(2½ mks)

(ii) Plot a graph of $\frac{1}{t}$ against concentration of hydrogen peroxide.

(3 ½ mks)

(iii) Using your graph, deduce how the rate of the reaction varies with the concentration of hydrogen peroxide.

(1 mk)

(iv) Determine the slope of the graph.

(2 mks)

(v) State **two** ways by which the rate of the reaction in (b) could be made faster.

(1 mk)

END