**233/1**

**CHEMISTRY PAPER 1**

**Time: 2 hours**

**MOMALICHE 10 CYCLE 2**

Name ………………………………… Index Number……………………/………………..

Signature ………………………………..

School………………………………………………………………………………………..

Date …………………/…….………/…………

**INSTRUCTIONS TO CANDIDATES**

* 1. *Write your name and index no in the spaces provided above.*
  2. *Sign and write the date of exam in the spaces provided above.*
  3. *Answer all the questions in the spaces provided after each.*
  4. *Mathematical tables and silent electronic calculators may be used.*
  5. *All working must be clearly shown where necessary.*
  6. *This paper consists of 12 printed pages. Candidates should check to ensure that all pages are printed as indicated and that no questions are missing.*
  7. *All answers should be written in English.*

#### For Examiner’s Use Only

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Grand Total**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

1. Metal **Q** displaces metals **T** and **U** from their oxides but does not displaces metal **R.** Metal **T** displaces **U**

form its oxide. Arrange the metals according to their reactivity starting with the strongest reducing agent. (1 mark)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. Chlorine gas can be prepared in the laboratory using the following two methods;

*Solid substance X and concentrated Hydrochloric acid*

*Solid substance X, concentrated sulphuric (VI) acid and solid Sodium Chloride.*

1. Name the solid substance X (1 mark)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. What is role of concentrated sulphuric acid in the reaction? (1 mark)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. State how dry chlorine gas is collected. (1 mark)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. A white crystalline solid Q when heated to forms a brown gas, colourless gas that relights a glowing wooden splint and a yellow residue which turns white on cooling. Aqueous solution of Q forms white precipitate which dissolves excess aqueous ammonia solution to form a colourless solution P.
2. Write the name and chemical formulae of complex ion in solution P. (2 marks)

#### Name;

……………………………………………………………………………………………………..

#### Chemical formula;

…………………………………………………………………………………………………….

1. State the observation made when the aqueous solution of P is reacted with few drops of sodium

hydroxide. (1 mark)

……………………………………………………………………………………………………………

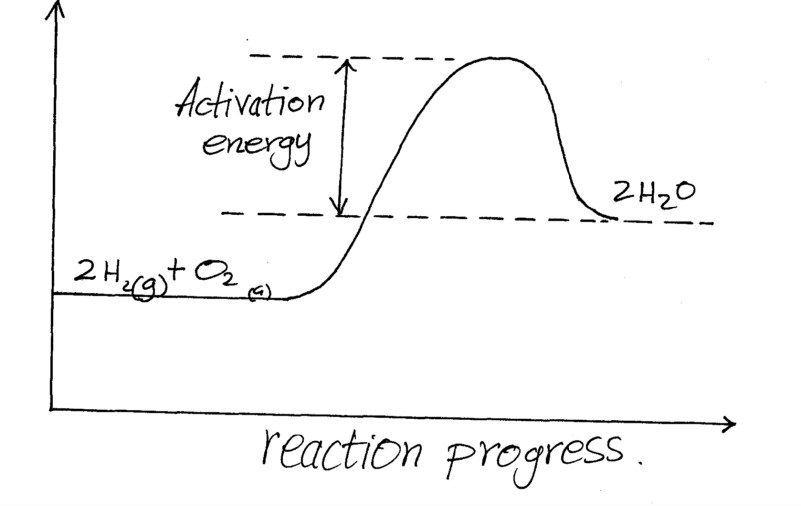
……………………………………………………………………………………………………………

4(a) Define term Lattice energy (1 mark)

………………………………………………………………………………………………………………

…………………………………………………………………………………………………………

b) The reaction between hydrogen gas and oxygen releases energy. A student drew the reaction profile for the reaction between hydrogen gas and oxygen gas.



State two errors made when drawing the reaction profile. ***(2mks)***

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Ammonia gas is one of the substances recycled in the Solvay process.
2. Other than water name another substance that is recycled in the process. (1 marks)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. Write a balanced chemical equation for the reaction that regenerates Ammonia gas in the process.

(1 mark)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. State an industrial use of the only waste product in the Solvay process. (1 mark)

……………………………………………………………………………………………………………

1. Lead (II) iodide is a toxic bright yellow solid which was used as a paint pigment known as ‘iodine yellow’. Describe briefly how you would prepare lead (II) iodide in the laboratory starting with lead (II) oxide. (3 marks)

……………………………………………………………………………………………………………………

…………………………………………………………………………………………………………………..

……………………………………………………………………………………………………………………

……………………………………………………………………………………………………………………..

…………………………………………………………………………………………………………………..

1. 5.0g of zinc carbonate were allowed to react with 25cm3 of 1M hydrochloric acid until there was no further reaction. Calculate the volume of gas that was formed at s.t.p. (Zn = 65.4, O = 16, C = 12, molar gas volume at s.t.p = 22400 cm3) (3 marks)
2. Atoms of element P can be represented as

23 *P* . Element P reacts with sulphur to form a yellow solid.

Using dots (•) and crosses (**X**) to represent electrons, draw the structure of the yellow solid. (S=16).

11

1. marks)
2. The curve shown below shows the variation of time against temperature for the reaction between

sodium thiosulphate and hydrochloric acid.

#### Time(s)

**Temperature (°C)**

* 1. Explain the shape of the curve. ***(2 marks)***

……………………………………………………………………………………………

* 1. Other than temperature name **one** factor that affects the rate of reaction***. (1 mark)***

…………………………………………………………………………………………….

1. Magnesium ribbon was added to a solution of hydrogen chloride in methylbenzene. Another piece of Magnesium ribbon was added to hydrogen chloride in distilled water. State and explain observations made. (2 marks)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

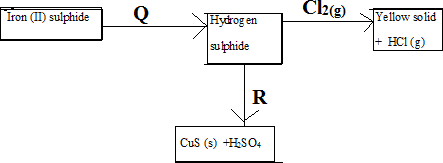
…………………………………………………………………………………………………………

1. State **two** differences between luminous and non luminous flame of the Bunsen burner. (2 marks)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

…...…………………………………………………………………………………………………………

1. A fuel gas contains 50% of hydrogen gas and 44% of carbon (II) oxide by volume. The rest of is incombustible. Calculate the volume of gas that remains at room temperature when the 100 cm3 fuel gas was ignited. (3 marks)
2. Study the diagram below and answer the questions that follow.
3. Name substances; ( 1 mark)

Q………………………………………………………..

R………………………………………………………..

1. Write the equation for the reaction that leads to the formation of the yellow solid. (1 mark)

……………………………………………………………………………………………………………

1. Using a chemical test, describe how you would distinguish between hydrogen sulphide and sulphur (IV) oxide. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. A gas occupies a volume of 400cm3 at 227oC and 760mmHg.What will be the temperature of the gas when the volume and pressure of the gas is 100cm3 and 380mmHg respectively. (2 marks
2. For each of the following experiments, give the observations, and the type of change that

occurs (Physical or chemical) (3 marks)

|  |  |  |
| --- | --- | --- |
| **Experiment** | **Observation** | **Type of change** |
| A few drops of concentrated sulphuric acid added to small amounts of sugar |  |  |
| A few crystals of Iodine are heated gently in a test tube |  |  |
| A few crystals of copper (II) Nitrate are heated strongly in a test tube. |  |  |

1. (a) Define solubility of a solute. (1 mark)

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

b) The solubility of potassium nitrate is 120g/100g of water at 80 oC and 70g/100g of water at

20oC.What mass of the salt would crystallize if 80g of potassium nitrate solution saturated at 80 oC was cooled to 20 oC

( 2Marks)

1. Zinc metal reacted with dilute hydrochloric acid. The gas produced was then passed over heated copper

(II) oxide in a combustion tube.

1. State two precautions that must be considered when the gas reacts with copper (II) Oxide in the combustion tube. (2 marks)
2. Write a balanced chemical equation between zinc and dilute hydrochloric acid. (1 mark)
3. The table below shows ammeter readings recorded when two equimolar solutions were tested separately.

|  |  |
| --- | --- |
| **Electrolyte** | **Current (A)** |
| **Dilute Sulphuric (VI) Acid** | 7.210 |
| **Ethanoic Acid** | 4.011 |

1. Explain the difference in the ammeter readings. (2marks)

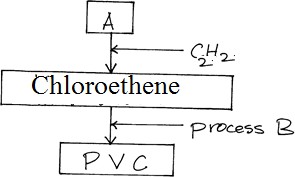
……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Compare the reactivity of equal length of magnesium ribbon with each of the electrolytes. (1 mark)

……………………………………………………………………………………………………………

1. Study the scheme below and answer questions that follow



1. Identify reagent A. ***(1mk)***

………………………………………………………………………………………………………………

1. Name process B ***(1mk)***

………………………………………………………………………………………………………………

1. What does PVC stand for? ***(1mk)***

………………………………………………………………………………………………………………

1. One of the disadvantages of hard water is wastage of soap.
2. State one other disadvantage (1mk)
3. The table below shows tests carried out in a sample of water and the results obtained.

|  |  |  |
| --- | --- | --- |
| **Sample** | **Results** | **observations** |
| A | Addition of sodium  hydroxide drop wise until excess | Whit precipitate which dissolves in excess |
| B | Addition of excess ammonia solution | White precipitate |
| C | Addition of dilute nitric  (V) acid followed by barium chloride | White precipitate |

1. Identify the **anion** present in the water sample ***(1 Mark)***

………………………………………………………………………………………………..

1. Write an ionic equation for the reaction in **C *(1 Mark)***

………………………………………………………………………………………………

1. A piece of sodium was burnt in excess oxygen gas. The product obtained was shaken with water to make a solution.
2. Write a balanced equation for reaction between the product formed and water. (1 mark)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. State and explain the observation made when red and blue litmus papers are dipped into the solution.

(2 marks)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Aluminium chloride and sodium chloride are both chlorides of period 3 elements in the periodic table. Use this information to explain the following observations.
2. A solution of Al2Cl6 in water turns blue litmus paper red while that of sodium Chloride does not.

(1½ marks)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………….

1. Sodium chloride has a melting point 801oC is while Al2Cl6 sublimes 183oC. (1½ marks)
2. The ionization energies of elements A and B are 495.9kJ/mol and 739.9kJ/ mol respectively.

Both elements are in the same group of the periodic table.

1. What is ionization energy? (1 mark)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. Compare the reactivity of elements A and B . Explain your answer. (2 marks)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

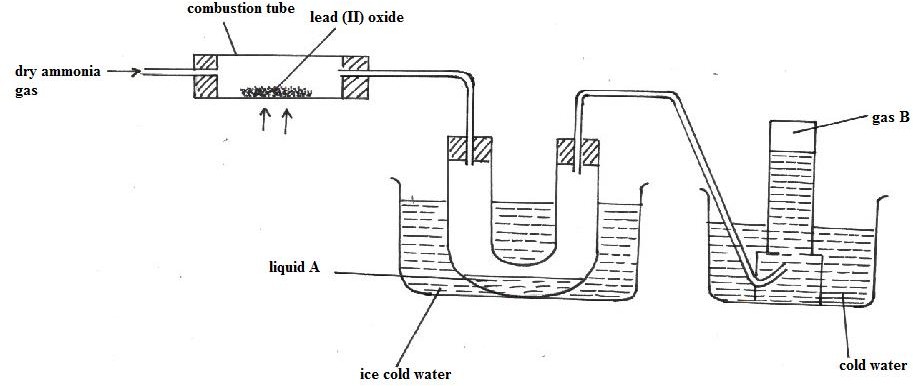
1. Study the information given in the table below and answer the questions below.

|  |  |
| --- | --- |
| Bond | Bond energy(kJ/mol) |
| C-H | 413 |
| H-Cl | 431 |
| C-Cl | 346 |
| Cl-Cl | 244 |
| C – C | 347 |

1. Calculate the enthalpy change for the reaction below.

C2H6 (g) + Cl2 (g) → CH3CH2Cl (g) + HCl (g) (2 marks)

1. State a condition required for the reaction in (a) above to take place. (1 mark)
2. The diagram below represents a set-up that can be used to obtain nitrogen gas in the laboratory. Use the information

on the diagram to answer the questions that follow

1. Describe the chemical test for liquid A. (1 mark)
2. What observation is made in the combustion tube during the reaction? (1 mark)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. State two uses of gas B. (1 mark)

……………………………………………………………………………………………………………

…………………………………………………………………………………………………………

1. a) State Graham’s law of diffusion. ***(1mk)***

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

b) 50cm³ of nitrogen (ii) oxide was allowed to diffuse through a porous membrane in 20 seconds. Calculate the time taken by equal volume of carbon (ii) oxide to diffuse through the same membrane. (C=12, N=14, O=16). ***(2mks)***

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

1. Nitrogen (IV) oxide dissolves and reacts with Sodium hydroxide solution to form two salts and water.
2. What is the nature of Nitrogen (IV) oxide? {1 mark}

……………………………………………………………………………………………………………

1. Write the Ionic equation for the reaction that takes place. {1 mark}

……………………………………………………………………………………………………………

……………………………………………………………………………………………………………

1. When powdered brass was reacted with excess dilute sulphuric (VI) acid, a solid residue was left.
2. Name the residue. (1 mark)
3. Explain why the residue was left. (1 mark)
4. State another observation made (1 mark)
5. During manufacture of sulphuric (vi) acid, sulphur (iv) oxide is oxidised to sulphur (vi) oxide in the presence of vanadium oxide catalyst as shown below:



The reaction is carried out at a pressure of 3 atmospheres and a temperature of 4500C. State and explain the effect on the yield of sulphur (vi) oxide if the reaction is:

1. Carried out at 3 atmospheres and 6000C. ***(2mks)***

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

1. In absence of a catalyst. ***(2mks)***

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………

………………………………………………………………………………………………………………