**NAME………………………………………………………ADM………………….CLASS………………….**

**CHEMISTRY**

**FORM 3**

**MID TERM 3 2022**

1. The set up below can be used to prepare oxygen gas. Study it and answer the questions that follows:
2. Identify X (1mks)

**Water**

1. What property of oxygen makes it impossible to be collected as shown in the above set up? (1mk)

**Oxygen is slightly soluble in water**

1. State two uses of oxygen (1mks)
* **Used in welding and cutting of metals. (Oxy – acetylene)**
* **Used in hospitals to aid patients with respiratory problem.**
1. Potassium sulphate solution was prepared and divided into two portions. The first portion gave a white precipitate when reacted with barium nitrate. On addition of dilute hydrochloric acid, the white precipitate disappeared.
2. Write the formula of the compound formed as the white precipitate. (1mks)

 **BaSo3**

1. Write the equation for the reaction between dilute hydrochloric acid and the compound whose formula is written in (a) above. (1mk)

**BaSo3 (s) + 2HCl(aq)  BaCl2(aq) + So2(g) + H2O(l)**

1. What observation would be made if one drop of potassium dichromate solution was added to the second portion followed by dilute hydrochloric acid? (1mks)

**Potassium dichromate changes from orange to green.**

1. .
2. The electronic arrangement of ion of element Q is 2.8.8. If the formula of the ion is Q3- state the group and period to which Q belongs. (1mk)

**Group V**

**Period 3**

1. Helium, neon and argon belong to group VIII of the periodic table. Give;
2. The general name of these elements. (1mk)

**Noble gasses**

1. One uses of these elements. (1mk)

**Used to fill light bulbs**

1. A student used the set up shown in the diagram below in order to study the reactions of some metals with steam. The experiment was carried out for ten minutes.
2. What observation would be made if gas F is ignited? (1mk)

**The gas burns with a blue flame**

1. When the experiment was repeated with iron powered instead of magnesium ribbon, very little gas F was obtained.
2. Give a reason for this observation. (1mk)

**The iron is less reactive than magnesium.**

1. What change in the conditions of the experiment should the student have made in order to increase the volume of gas F produced? (1mk)

**Heat the iron powder**

1. .
2. State any two differences between luminous and non – luminous flame. (2mks)

|  |  |
| --- | --- |
| **Luminous** | **Non luminous** |
| **It is sooty** | **It is not sooty** |
| **Not very hot** | **Very hot** |

1. Explain how the hotness of a Bunsen flame can be increased. (1mk)

**By keeping the air hole fully open**

1. Hydrogen chloride gas can be prepared by reacting sodium chloride and an acid.
2. Write an equation for the reaction between sodium chloride and the acid. (1mk)

**NaCl (s) + H2 =SO4 (aq) NaHSO4 + HCL(g)**

1. Give two chemical properties of hydrogen chloride gas. (1mk)
* **Hydrogen chloride reacts with ammonia to form white fumes of NH4Cl**
* **Hydrogen chloride react with iron to form iron (ii) chloride and hydrogen.**
1. State two uses of hydrogen chloride gas. (1mks)
* **Used in large scale manufacture of hydrochloric acid**
* **Used in the manufacture of polymers such as Pvc**
1. In an experiment to investigate the conductivity of substances, a student used the set up below.

The student noted that the bulb did not light.

1. What had been omitted in the set up? (1mk)

**Source of heat**

1. Explain why the bulb light when the omission is collected. (2mks)

**The solid PbBr2 melts to form Pb2+ and Br – that conduct electric current. Hence bulb lights due to presence of mobile ions.**

1. Dry carbon (II) oxide gas reacts with heated lead (II) oxide as shown in the equation below. PbO(s) + CO(g) Pb (s) + CO2 (g)
2. Name the process undergone by the lead (II) oxide. (1mk)

**Reduction**

1. Give a reason for your answer in (a) above. (1mk)

**Removal of oxygen fronm a substance is reduction lead ion gained electrons to become lead metal. Gaining of electrons is reduction**

1. Name another gas that can be used to perform the same function as carbon (II) oxide. (1mk)

**Hydrogen or ammonia**

1. The table below gives atomic numbers of elements represented by letter A, B,C, and D.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | A | B | C | D |
| Atomic number | 15 | 16 | 17 | 20 |

Use the information to answer the questions that follow.

1. Name the type bounding that exist in the compound formed when A and D react. (1mk)

**Ionic or electrovalent bonding**

1. Select the letter that represents the best oxidizing agent. Give a reason for your answer. (2mks)

**Element C, this is because it has 7 electrons in the outermost energy level and hence easily gains an electron to complete the octet.,**

1. The diagram below represents a relationship between the physical states of matter.
2. Identify the process R,V,W and U. (2mks)

**R: melting**

**V: Boiling or Vaporization**

**W: Condensation**

**U: Freezing**

1. Name one substance which can undergo process represented by letter S and T. (1mk)

**Iodine**

**Benzoic acid crystals**

**Dry ice (solid carbon (iv) oxide**

**Ammonium chloride**

1. Starting with copper metal, describe how a sample of crystals of copper (II) chloride may be prepared in the laboratory. (3mks)
* **Heat copper in air to form copper (ii) oxide.**
* **Add dilute hydrochloric acid (CHL) to the oxide to get copper (ii) Chloride solution and filter**
* **Concentrate the filtrate and leave to crystallize.**
* **Dry crystals at room temperature in between filter papers.**
1. .
2. State Boyles’ law. (1mk)
* **The volume of a fixed mass of a gas is inversely proportional to its pressure at constant temperature.**
1. A gas occupies 500cm3 at 200c and 100000pa. what will be its volume at 100c and 101325pa.

**V1= 500cm3 T1 = 20 + 273 = 293k P1 = 100,000Pa**

**V2 = ? T2 = 10 + 273 = 283K P2 = 101,325Pa**

**P1V1 = P2V2 => V2 = P1V1T1 = 100000 X 500 X 283 = 476.6 cm3**

 **T1 T2 T1P2 293 X 101325**

1. Bromine reacts with ethane as shown below

C2 H6 + Br2 C2 H5 Br + HBr

1. What condition is necessary for this reaction to occur? (1mk)

**Presence of U.V – light**

1. Write the structural formula of compound C2H5Br in the equation above. (1mk)

 **Br H**

**H – C – C – H**

 **H H**

1. State one major use of hydrogenation process. (1mk)

**Convert oils to fats during manufacture of margarine**

1. Give the following substance; - wood ash, lemon juice, and sodium chloride
2. Name one commercial indicator that can be used to show whether wood ash, lemon juice and sodium chloride are acidic, basic or neutral. (1mk)
* **Litmus solution**
* **Phenolpthaleum**
* **Methyl orange**
1. Classify the substance in (a) above as acids, bases or neutral (2mks)

**Acid : Lemon juice**

**Base: wood ash**

**Neutral: Sodium chloride**

1. .
2. Ammonia gas was passed into water as shown below.
3. Explain why the PH of the solution is above 7. (1mk)

**Ammonia, being basic dissolves in water to give a basic solution**

1. What is the use of the inverted funnel? (1mk)

 **To prevent sucking back of water as ammonia is very soluble.**

1. Explain why a high temperature is required for nitrogen to react with oxygen. (1mk)

**High temperature is required to break the strong triple covalent bonds between nitrogen atoms.**

1. The data given below was recorded when metal M was completely burnt in air. M is not the actual symbol of the metal. (R.A.M; M =56, O =16)

 Mass of empty crucible and lid = 10.24g

Mass of crucible, lid and metal M = 10.352g

Mass of crucible, lid and metal oxide = 10.4g

1. Determine the mass of metal M. (1mk)

**10. 352 – 10.24 = 0.112g**

1. Determine the mass of oxygen. (1mk)

**10.4 – 10.352 = 0.048g**

1. Determine the empirical of the metal oxide. (2mks)

**Element M O**

**Mass 0.112 0.048**

**Moles 0.0112 : 56 0.048 : 16**

 **0.002 0.003**

 **2 3**

**Empirical formula M2O3**

1. The structure of methanoic acid is as follows

 O

H – C

 O - H

1. How many bonds have taken part in bonding to form this structure? (1mk). B5 **Bonds**
2. How many electrons have taken part in bonding? (1mk)

**5 x 2 = 10 electrons**

1. When magnesium metal is burnt in air, it reacts with both oxygen and nitrogen gases giving a white ash. Write two equations for the reactions that take place. (2mks)

**2Mg (s) + O2 (g) 2MgO(s)**

**3Mg (s) + N2(g) Mg3 N2(s)**

1. The table below gives the atomic numbers of element W, X, Y and Z. the letters are not the actual symbols of the elements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | W | X | Y | Z |
| Atomic number | 9 | 10 | 11 | 12 |

1. Which one of the elements is least reactive? Explain. (1mk)

**X is least reactive; the outer energy level is full**

1. .
2. Which two elements would react most vigorously with each other? (1mks)

**W and Y**

1. Give the formula of the compound formed when the elements in b(i) react. (1mk)

**YW**

1. .
2. What is meant by Isomerism? (1mk)

**Isomerism is a state where compounds with the same molecular formula have different structural formula.**

1. Give the systemic names of the following organic compounds.
2. CH3 – C(CH3) (Br) – CH (Br) CH3)

**2,3 – dibromo – 2 – methyl butane.**

1. CH3 – CH - CH CH2 CH3

CH CH3

1. **Methyl pentan – 2 - 01**
2. ,
3. Give a reason why concentrated sulphuric (vi) acid is not used to dry ammonia gas. (1mk)

**Being acidic, it would react with the basic ammonia**

1. Name one suitable agent for ammonia gas. (1mk)

**Calcium oxide**

1. In a laboratory experiment hydrogen gas was passed over heated copper (II) oxide as shown in the diagram below.

 Describe a chemical test that can be used to identify the product E.

**Add the product to anhydrous copper (ii) sulphate which turns from white to blue or use anhydrous cobalt (ii) Chloride which turns blue to pink**

1. State and explain what would happen if a dry red litmus paper was dropped in a gas jar of dry chlorine. (2mks)

**The litmus remains red. This is because dry chlorine does not bleach.**

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

**At constant temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density.**

1. The molar masses of gases W and X are 16.0 and 44.0 respectively. If the rate of diffusion of W through a porous material is 12cm3/sec. calculate the rate of diffusion of X through the same material. (2mks)

**Rate of W = RMM of X => 12 = 44**

**Rate of X RMM of W X 16**

* **X = 7.23.6cm3/ sec**
1. The isotopes of oxygen are 1618O and 188O.
2. What are Isotopes? (1mk)

**Isotopes are atoms of the same element having different mass numbers.**

1. Determine the number of neutrons in 188O. (1mk)

**18 – 8 = 10 neutrons**

1. When potassium nitrate is heated, it produces potassium nitrite and gas C.
2. Identify gas C (1mk)

**Oxygen**

1. Name the type of reaction undergone by potassium nitrate. (1mk)

**Thermal decomposition**

1. Carbon and sulphur exhibit allotropy.
2. Name the two allotropes of sulphur. (1mk)

**Rhombic sulphur**

**Monoclinic sulphur**

1. Which allotrope of carbon is the only non – metal electrical conductor? (1mk)

**graphite**

1. When solid A was heated strongly, it gave water and a solid residue. When water was added to the solid residue, the original solid A was formed.
2. What name is given to the process described? (1mk)

**Reversible chemical change**

1. Give one example of solid A. (1mk)

**Hydrated copper (ii) sulphate**

1. Oleum (H2S2O7) is an intermediate product in the Industrial manufacture of sulphuric (vi) acid.
2. How is Oleum converted into sulphuric (vi) acid. (1mk)

**By adding water to the Oleun carefully**

1. Give one use of sulphuric (vi) acid. (1mk)
* **Making fertilizers**
* **Manufacture of paints**
* **Manufacture of detergents**
1. The table below shows the first ionization energy of elements B and C.

|  |  |
| --- | --- |
| Element  | Ionisation energy KJmol-1 |
| B | 494 |
| C | 736 |

What do these values suggest about the reactivity of B compared to that of C? (2mks)

 **The energy required to remove the outermost electron is lower for B than for C, therefore B is more reactive than C.**