**CHEMISTRY**

**FORM 2**

**TERM 3 2023**

**MARKING SCHEME**

1. Name a method that can be used to separate each of the following substances. (3mks)
2. A mixture of petrol and diesel.

**Fractional distillation**

1. Kerosene and water.

 **Use of a separating funnel**

1. Food coloring ingredients in a sauce.

 **Chromatography**

1. The table below shoes the formulae of elements P, Q, R and S (not actual symbols) and their chlorides.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Elements |  P | Q | R | S |
| Formulae of chlorides | PCl | QCl2 | RCl3 | SCl5 |

1. State the group in which element Q belongs. (1mrk)

 **Group II**

1. Identify one element which is a non-metal. (1mk)

 **Element S**

1. Write down the formulae of P oxide. (1mk)

 **P2O**

1. Hydrogen can be prepared by passing steam over heated Zinc powder as shown in the diagram below

a) Write down the chemical reaction that produces hydrogen gas. (1mrk)

**Zn(s)+ H2O(g) ZnO(s)+H2(g)**

b) Explain why hydrogen should be burned if not collected over water. (1mrk)

 **A mixture of hydrogen and gas explodes.**

c) Give another metal that can be used instead of Zinc. (1mrk)

**Magnesium, Iron, Lead or Copper**

1. A piece of sodium metal was placed in a trough half filled with cold water. State the observations that were made. (3mrks)
* **The metal darts around the water surface.**
* **The metal melts into a silvery ball.**
* **There is production of a hissing sound.**
1. The curves below represents the variation of temperature with time when pure and impire samples of a solid were heated separately.
2. Which curve shows the variation in temperature of the pure solid. Explain (2Mrks)

 **Q. Constant melting points and boiling points**

1. State the effect of impurities in the melting and boiling points of a pure substance. (2Mrks)
2. **Melting point – Lower the melting point.**
3. **Boiling point – Raises the boiling point**.
4. Air was passed through several reagents as shown below;

CHAMBER 4

Heated magnesium

Powder

CHAMBER 3

Heated copper turnings

CHAMBER 2

Concentrated

Sulphuric VI acid

CHAMBER 1

Concentrated

Sodium hydroxide

 AIR Escaping

 Gasses

 a.) Name the main inactive component of air (1mk)

**Nitrogen gas**

 b.) Name the components of air that are removed in the following chambers

1. Chamber 1

**CO2 gas**

1. Chamber 3

**O2 gas**

1. Chamber 4

**N2 gas**

c.) What is the purpose of passing air through concentrated Sulphuric VI acid? (1mk)

**To remove /absorb water vapor/drying agent**

 d.)Write a chemical equation for the reaction which takes place in

1. Chamber 1

**2NaOH9aq) + CO2(g) Na2CO3(s) + H2O(l) penalize ½ if state symbols are**

 **missing/wrong**

1. Chamber 4

**3Mg(s) + N2(g) Mg3N2(s) penalize fully if not balanced**

e.) Explain the observation made in chamber 3 during the reaction. (2mrks)

 **Brown solid changes to black**

 **Brown copper metal oxidised form copper II oxide**

f.)Name one gas which escapes from the scheme above. (1mrk)

 **Argon**

 **Neon**

 **Helium**

7.a) Distinguish between hygroscopy and efflorescence. (2mrks)

**Hygroscopy is a process which salts exposed to the atmosphere become dump.**

**Efflorescence is a process by which salts lose water of crystallization to the atmosphere**.

b.)Starting with lead II oxide describe how you would prepare Lead II sulphate (3mrks)

* **To a given volume of nitric acid, add excess Lead II oxide until some residue is left in the beaker.**
* **Filter to obtain Lead II nitrate solution and Lead II oxide residue.**
* **To the filtrate add excess solution of Na2SO4 to ensure complete precipitation.**
* **Filter to obtain PbSO4as residue and NaNo3 solution as filtrate.**
* **Rinse the residue and dry between filter papers.**

8.a) Describe a chemical test to differentiate between carbon IV oxide and carbon II oxide gas. (2mrks)

**Pass the two gasses separately through Ca(OH)2 solution .White precipitate is observed with Carbon IV oxide while no white ppt is formed with carbon II oxide**

 b.) Give 3 uses of carbon IV oxide gas. (3mrks)

* **As a refrigerating agent for perishable goods.**
* **Used as a fire extinguisher.**
* **Used in manufacture of sodium carbonate in Solvay process**.

9. a) Using dots and crosses to represent electrons, draw a diagram to show bonding in Sodium Chloride

(Nacl)

 (2mrks)

 b.) Both graphite and diamond are allotropes of carbon. Graphite conducts electricity whereas diamond does not. Explain (2mrks)

**The presence of delocalized electrons in the structure of graphite explains its electrical conductivity. Diamond has no delocalized electrons in its structure.**

10. Both ions Y2- and Z2+ have an electron configuration of 2.8.8

 a.) Write the electron arrangement for (2mrks)

 **Y 2.8.6**

 **Z 2.8.8.2**

 b.) What is the mass number of atom Z given that it has 20 neutrons (1mrk)

**40 Protons + neutrons = Mass no**

**20+20 = 40**

11. The diagram on the next page shows a set up which was used by a student to investigate the effect of electricity on molten Lead II Bromide.

1. Explain the observation at the cathode (2mrks)

**Grey deposits of lead beads are deposited at the cathode**

1. Why does solid lead II Bromide not allow the passage of electricity (2mrks)

**Lead II Bromide solid is a molecular substance and does not contain ions which are responsible for electrical conductivity.**

 c.)Write equations to show the reactions taking place

1. At the cathode (1mrk)

**Pb2+ (aq) +2e Pb(s)**

1. At the anode (1mrk)

**2Br –(aq) Br2(l)+ 2e**

12. Study the set up in the next page and answer the questions that follow

 a.)Identify gas X (1mrk)

 **Hydrogen gas**

b.)Write a chemical equation for the reaction liberating gas X (1mrk)

**Zn(s)+ 2HCl(aq) ZnCl2(s) + H2(g)**

c.)Why is it not advisable to use calcium in this method of preparing hydrogen? (2mrks)

 **Reaction of calcium with acids is explosive**

 d.)Give the use of anhydrous calcium chloride in the U-tube (1mrk)

 **To dry hydrogen gas**

1. Name another substance that could serve the same purpose as anhydrous calcium chloride (1mrk)

**Conc.Sulphuric VI acid or Calcium Oxide**.

1. Name the method used to collect gas X (1mrk)

**Upward delivery/downward displacement of air**

13. The grid below shows part of the periodic table. Use it to answer the questions that follow.

1. Which of the elements has the largest atomic radius? Explain (2mrks)

**Q – Has the highest number of occupied energy levels**

1. Identify the most reactive metal. Explain (2mrks)

**Q – Has the largest atomic radius thus valency electrons loosely held**

1. Name the chemical family to which P and Q belong. (1mrk)

 **Alkali metals**

1. Compare the atomic radius of S and U. Explain (2mrks)

**S has large atomic radius than U because U has a higher nuclear charge than S**

1. Select an element that does not form an ion. Explain (2mrks)

**V/W**

**It is stable**

1. *Give* the formula of one stable cation with an electron arrangement of 2.8.8 (1mrk)

 **Q+1**

14.a) Define the term isotope (1mrk)

**Are atoms of the same element with the same atomic number/Number of protons but different mass number.**

b.)Chlorine gas has a mass of 35.5. It is made up of two isotopes 3517CL and 3717CL. Determine the relative abundance of each isotope in the chlorine gas. (3mrks)

**35.5= (X ×35) + (100 – X) 37**

 **100**

**100 × 35.5 = 35x + 3700 – 37x**

 **100 x = 75**

**35.5 = -2x + 3700 75% & 25%**

**3550 = -2x + 3700**

**2x = 3700**

 **-3550**

 **150**

**2x = 150**

**2 2**

15. Write a balanced equation for the decomposition of the following solids (3mrks)

1. PbCO3(s) HEAT **PbO(s) + CO2(g)**
2. Na2CO3. 10H2O(s) HEAT **Na2CO3(s) +10H2O(l)**
3. KNO3(s) HEAT **2KNO2(s) + O2(g)**

16. Though Sodium and aluminium are in the same period and are both metals, aluminium is a better conductor of electricity. Explain (2mrks)

**Conductivity increases with increase in the number of delocalized electrons. Aluminium has more electrons than sodium.**

17. List any five uses of oxygen gas` (5mrks)

* **Used in hospitals by patients with breathing difficulties.**
* **Used by mountain climbers and deep sea divers.**
* **Used to burn fuels.**
* **Used as a reactant in fuel cells.**
* **During steel making, Oxygen is used to remove iron impurities.**