**NAME: …………………………………………………….CLASS: …….. ADM.NO. : ………..**

**CHEMISTRY PAPER 1**

**END TERM EXAM TERM 1 -2022**

**FORM FOUR**

**TIME:**

**Answer All questions in the spaces provided.**

1. (a) Hydrogen gas is one of the lightest gases known. Explain why it is not preferred in weather balloons. (1mk)

(b) Give any two large scale uses of hydrogen gas. (2mks)

1. A compound with a general formula X(OH)3 reacts as shown by the equations below.

X(OH)3(s) + OH-(aq) → [X(OH)4]-(aq)

X(OH)3(s) + 3H+(aq) → X3+(aq) + 3H2O(l)

1. What name is given to compounds which react like X (OH)3? (1mk)
2. State any two elements whose hydroxides behave like that of X. (1mk)
3. The diagram below represents a paper chromatogram of pure substances R, P and Q. A mixture S contains R and Q only. Indicate on the diagram the chromatogram of S. (2mks)

Origin

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

(b) 100cm3 of Carbon (IV) oxide diffuses through a porous plate in 30 seconds. How long will it take 150cm3 of nitrogen (IV) oxide to diffuse across the same plate under similar conditions? (C=12, N=14, O=16) (3mks)

1. Starting with solid Zinc oxide, describe how a pure sample of zinc carbonate can be prepared. (3mks)
2. (a) The structure of ethanoic acid is;

H O

H C C

O – H

H

State the number of electrons used in bonding in a molecule of ethanoic acid. (1mk)

(b) Give the name of the following organic compounds. (2mks)

1. CH3 – CH – CH – CH2 – CH3

CH3 CH3

1. CH3C(CH3)(Br) CH2CH3
2. A current of 0.5A was passed for 64.33 minutes to deposit 1.2g of metal Q. Calcualte the number of Faradays required to deposit one mole of Q. (RAM of Q=120, 1F=96,500C) (3mks)
3. (a) Name the type of artificial radioactivity represented by each of the following nuclear equations. (2mks)

(b) Complete the diagram below to show how alpha particles and gamma rays can be distinguished. (2mks)

Source of radiation

Paper

Metal foil

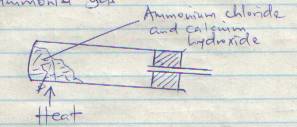
Lead block

1. (a)A white solid M was heated. It produced a brown gas A and a colourless gas B. The residue left was yellow after cooling.
2. Name gases A and B. (2mks)

A –

B –

1. Write a balanced chemical equation for the decomposition of solid M.(1mk)
2. Below is a set-up for laboratory preparation of ammonia gas.



1. Complete the set-up to show how a sample of dry ammonia gas can be collected. (2mks)
2. Write an equation for the reaction. (1mk)
3. Elements X and Y have atomic numbers of 12 and 16 respectively. Using dots (.) and crosses (x), show how bonding takes place. (2mks)
4. Aqueous ammonia solution is passed through a colourless solution Y. A white precipitate which dissolves in excess ammonia to form a colourless P solution is formed.
5. Identify the cation present. (1mk)
6. Write down the formula of;
7. White precipitate. (1mk)
8. Complex ion in solution P. )1mk)
9. The table below shows pH values of solutions A, B, C and D. The solutions tested were sodium chloride, soap solution, potassium hydroxide and aluminium chloride. Complete the table by identifying the solution tested. (2mks)

|  |  |  |
| --- | --- | --- |
| Solution | pH | Name of solution |
| A | 8.5 |  |
| B | 3.0 |  |
| C | 7.0 |  |
| D | 13.0 |  |

1. When 0.6g of element M was completely burned in oxygen, all the heat evolved was used to heat 500cm3 of water, the temperature of the water rose from 23.0oC to 32oC. Calculate the relative atomic mass of element M given that the specific heat capacity of water is 4.2Jg-1K-1, density of water is 1.0gcm-3 and molar heat of combustion of M is 380KJ/mol. (3mks)
2. (a) What is an electrolyte? (1mk)

(b) State how the following substances conduct electricity.

1. Molten sodium chloride. (1mk)
2. Copper metal. (1mk)
3. Hydrogen and bromine react according to the equation.

H2(g) + Br2(g) → 2HBr(g)

Use the bond energies given below to calculate the heat of formation of hydrogen bromide. (3mks)

**Bond Energy (KJ/mol)**

H – H 436

Br – Br 192

H – Br 368

1. Solid A forms a mixture with liquid B. State two properties of substance A that would make decantation the method of choice for separating the mixture. (2mks)
2. Sulphur (IV) oxide gas was bubbled through a solution of water and litmus solution.
3. State what was observed. (1mk)
4. Write an equation for the reaction. (1mk)
5. (a) What causes water hardness? (1mk)

(b) State two methods that can be used to remove permanent hardness in water. (2mks)

(c) State one advantage of drinking hard water. (1mk)

1. Graphite is one of the allotropes of carbon.
2. Name one other element which exhibits allotropy. (1mk)
3. Explain why graphite is used to make pencil leads. (2mks)
4. A form four student in an attempt to prevent rusting, put copper and zinc in contact with iron as shown below.

Iron

Iron

Zinc

Copper

X

Y

1. State what would happen in set up X and Y after one week. (2mks)
2. Explain your answer in diagram Y. (1mk)
3. What name is given to the above method? (1mk)
4. Urea, (NH2)2CO, is prepared by the reaction between ammonia and carbon (IV) oxide.

2NH3(g) + CO2(g) → (NH2)2CO(aq) + H2O(l)

In one process, 680kg of ammonia were reacted with excess carbon (IV) oxide. Calculate the mass of urea that was formed. (H=1.0, C=12.0, N=14.0, O=16.0 and R.M.M of ammonia = 17) (3mks)

1. Aqueous hydrogen chloride reacts with potassium manganate (VII) to produce chlorine gas, while a solution of hydrogen chloride in methylbenzene has no effect on potassium manganate (VII). Explain this observation. (2mks)
2. Explain the following:
3. Aluminium carbonate does not exist. (2mks)
4. Hydrochloric acid is not used to acidify potassium manganate(VII). (2mks)
5. Naturally occurring magnesium consists of three isotopes: 78.6% 24Mg, 10% 25Mg and 26Mg. calculate to one decimal place, the relative atomic mass of magnesium. (3mks)
6. Under certain conditions, carbon (IV) oxide reacts with water to form methanol (CH3OH) and oxygen as shown below

2CO2(g) + 4H2O(l) 2CH3OH(l) + 3O2(g) ∆H=+1452KJ

What would be effect on the yield of methanol if the temperature of the reaction mixture is increased? Explain. (2mks)

1. Use the cell representation below to answer the questions that follow.

Cr(s) |Cr3+(aq) || Fe2+(aq) |Fe(s)

1. Write the equation for the cell reaction. (1mk)
2. If the e.m.f of the cell is 0.30volts and the Eθ value for Fe2+(aq) | Fe(s) is -0.44 volts, calculate the Eθ value for Cr3+(aq)|Cr(s). (2mks)
3. Explain why the boiling point of ethanol is higher than that of hexane. (Relative molecular mass of ethanol is 46 while that of hexane is 86) (2mks)