MUKONO EXAMIANTION COUNCIL

UGANDA ADVANCED CERTIFICATE OF EDUCATION

CHEMISTRY

PAPER ONE

2 HOURS 45 MINUTES

1. The standard electrode potentials for some half cells are given below.

Half cell E°/V

SO42- (aq), H+ (aq) / SO32-(aq)/pt +0.20V

SO32- (aq) H+ (aq), / Scs / pt + 0.46

1. Write the cell notation for the cell formed when the two half cells are joined

(1½ mk)

1. Write the cell reaction (1 mk)
2. State the term given to the type of reaction (1 mk)
3. Show that the reaction in (ii) is feasible (1 mk)
4. (a) State Raoult’s Law of lowering of vapour pressure (1 mk)

(b) When 12.19g of a non volatile solute, P was dissolved in 200g of water, the vapour pressure of the solution was lowered by 1.72 mmHg at a certain temperature.

(i) Determine the relative molecular mass of P (vapour pressure of water at the same temperature is 92.52 mm Hg) (3 mks)

(ii) State assumption s you have made in(i) (2 mks)

1. Complete the following organic reactions and in each name the main organic product.
2. CH3COCH3 1. CH3CH2MgBr (1 mk)

2. H2O/H+

Name:

(b) CH3CH=CHCH3 MnO4(aq)/OH(aq) (1 mk)

Name:

(c) (CH3Coo)2 CA Heat (1 mk)

Name

(d) CH3CHO NaoH(aq) (1 mk)

Cold

Name:

1. 20cm3 of an organic compound Q, CxHyO were exploded with 195cm3 of oxygen. After cooling to room temperature, the residual gas occupied 175cm3. On treatment with concentrated potassium hydroxide solution the volume reduced to 55cm3
2. (i) Write equation for reaction of Q and excess oxygen. (1 ½ mks0

(ii) Calculate the molecular formula of Q (3 mks)

1. Q burns with a yellow sooty flame. Identify Q (½mk)
2. Write equation for the reaction between Q and bromine water. (1 mk)
3. (a) Define the term “standard enthalpy of formation” (1 mk)
4. (i) Draw a Born – Haber cycle for the formation of ethyne (2 mks)

(ii) The enthalpies of combustion of carbon, hydrogen and ethyne are – 393.5, -285.8 and -1310kJmol-1 respectively. Calculate the heat of formation of ethyne. (2 mks)

1. A compound, R is a green solid which dissolves in water to give a green solution. The solution of R formed a red precioilate with butanedioxine solution and a reddish – brown solution when a few drops of Iron(iii) chloride solution were added to it. When R was heated with concentrated sulphuric acid, methanoic acid was formed.
2. Identify R ( ½ mks)
3. Write equation for the reaction that took place when R was heated with concentrated Sulphuric acid (1 ½ mks)
4. Write equation for the reactions that take place when ammonia solution is added drop wise to a solution of R (3 mks)
5. Name a reagent (s) that can be used to distinguish between the following ions. In each case state what would be observed if each ion is separately treated with the reagent.
6. Ba2+ and Ca2+ (1 ½ mks)

Reagent:

observations

1. CH3COO and CCo (1 ½ mks)

COo

Reagent:

observations

1. AL3+ and Zn2+ (1 ½ mks)

Reagent:

Observations:

1. (a) Explain what is meant by the term steam distillation. (1 ½ mks)

(b) State conditions for a substance to be separated by steam distillation. (1 ½ mks)

(c) At 760mmHg steam distillation of nitrobenzene takes place at 98°C. if the vapour

pressure of water at the same temperature is 709mmHg. Calculate composition of

the distillate as a percentage by mass. (3 mks)

1. Draw the structure adoptee by the following acids and name the shapes adopted.

(4 ½ mks)

|  |  |  |
| --- | --- | --- |
| Acid | Structure | Shape |
| H2CO3 |  |  |
| H2SO3 |  |  |
| HCLO4 |  |  |

**SECTION B (54 MARKS)**

**Attempt six questions only**

1. The data in the table below was obtained for the reaction

3A Product

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (hours) | 1.3 | 2.0 | 4.0 | 5.3 |
| Log10(A) | -0.24 | -0.33 | -0.57 | -0.74 |

1. Plot a graph of log10 (A) against time. (3 mks)
2. From the graph, determine the
3. Initial concentration of A (1 mk)
4. Order of reaction and give a reason. (1 ½ mks)
5. Calculate the
6. Rate constant (2 mks)
7. Half life of the reaction. (1 ½ mks)
8. (a) State three factors that affect molar conductivity of electrolytes (1 ½ mks)

(b) The graph below shows the variation of molar conductivity of a strong electrolyte with dilution.

Briefly explain the shape of the graph. (2 ½ mks)

(c) the molar conductivity of nitric acid, potassium nitrate and potassium fluoride are 421, 145 and 129……….-1cm2mol-1 respectively at infinite dilution.

(i) Molar conductivity of hydrofluoric acid at infinite dilution. ( 2mks)

(ii) The dissociation constant, ka of a 0.1M hydrofluoric acid solution (The electrolytic conductivity of hydrofluoric acid is 3.15 x 10-5……………-1cm-1

1. 7.44 of a compound Y contains carbon hydrogen and nitrogen only. Yon combustion liberated 21.12g of carbon dioxide and 896 cm3 of nitrogen gas at s.t.p
2. Determine the empirical formula of Y. (3 mks)
3. When vaporized 0.1g of Y occupied 40.5cm3 at 184.1°C and 760 mmHg. Determine the molecular formula of Y. (2 ½ mks)
4. Y burns with a sooty flame and the PH of its aqueous solution is greater than 7. Write the molecular structure of Y. (1 mk)
5. Y was reacted with nitric (iii) acid at 5°C and the product treated with 2-napthol,

04

1. State what was observed (½ mk)
2. Write equations for the reactions that took place. (2 mks)
3. (a) Write the electronic configuration of manganese (Atomic number of Mn = 25)

(1mk)

(ii) State three characteristics of manganese as a transition element. (1 ½ mks)

(b) State what would be observed when an aqueous solution of sodium hydroxide is added to a solution of manganese (ii) chloride and write equations of reaction that take place. (4 ½ mks)

(c) A mixture of lead (ov) oxide and concentrated nitric acid was added to the solution of manganese (ii) chloride and the mixture heated. Write the equation of reaction that takes place.

1. (a) Write equation for the reaction between hot concentrated sodium hydroxide solution with
2. Aluminium oxide (1 ½ mks)
3. Bromine (1 ½ mks)
4. Beryllium (1 ½ mks)

(b) Write equation for the reaction between water and the hydride of

(i) Sodium (1 ½ mks)

(ii) Silicon (1 ½ mks)

(iii) Sulphur (1 ½ mks)

1. Nitrogen and hydrogen react to form ammonia according to the following equation.

N2(g) + 3H2(g) ⇌ 2NH3(g) DH = -92kJmol-1

Stoichiometric amounts of nitrogen and hydrogen were reacted at a pressure of 200 atmospheres. When equilibrium had been attained the mixture contained 40% ammonia.

1. (i) Write the expression for the equilibrium constant KP. ((½ mk)

(ii) Calculate the value of the equilibrium constant, KP at temperature. (4 mks)

1. State what would happen to the position of the equilibrium and in each case give a reason if
2. The temperature of the system is increased. (1 ½ mks)
3. The pressure of the system is increases. (1 ½ mks)
4. Iron is added to the system. (1 ½ mks)
5. (a) Write the name and formula of the ore of aluminium. (1 mk)

(b) During the extraction of aluminium, the ore is first treated with sodium hydroxide followed by aluminium hydroxide.

(i) State the purpose of adding sodium hydroxide solution. (1 ½ mks)

(ii) Write an equation for the reaction between the ore and sodium hydroxide solution. (1 ½ mks)

1. Briefly explain how aluminium can be obtained after the ore has been treated as in (b) (4 mks)
2. Carbondioxide was used instead of aluminium hydroxide in (b). Write an equation for the reaction that took place. (1 ½ mks)
3. By means of equations show how the following compounds can be formed.
4. phenol from propan -2- ol (3 mks)

OH

1. SO3Na from hexane (3 mks)
2. CH = NOH from ethyne (3 mks)