P525/2
CHEMISTRY
Paper 2
11th August 2025
2 Hours 30 Minutes

KAMPALA WAKISO GIANT SCHOOLS' ASSOCIATION (KWGSA)

National Joint Mock Examination 2025

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 2

2 Hours 30 Minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of **two** *sections* **A** *and* **B**

Answer any **five** *questions from both sections choosing* **three** *from Section* **A** *and* **two** *from section* **B**

Proper display of all workings is required.

Silent non-programmable scientific electronic calculators may be used.

Molar gas volume at stp is 22.4*litres*

Gas constant, R, = 8.314 $JK^{-1}mol^{-1}$

Standard temperature = 273K

Standard pressure =101325 Nm^{-2}

Any extra question(s) attempted will not be marked

SECTION A

Attempt any **three** *questions*

1. (a) A compound **T** contains 62.07% Carbon, 10.34% Hydrogen and the rest being Oxygen. 0.3771g of **T** occupies a volume of 72.8cm^3 at s.t.p. **T** does not burn with a sooty flame. Calculate the molecular formula of **T**. (C=12, H=1, O=16) (06 Marks)

(b) Hydrolysis of **T** yielded compound **A**, $C_4H_{10}O$ and **B**, $C_2H_4O_2$. Both **A** and **B** react with metallic sodium, **B** react with sodium Carbonate but **A** did not.

(i) Identify the compound **B**

(ii) Write the names and structural formulae of all possible isomers of **A**.(04 marks)

(iii) Name the reagent that can be used to distinguish between the isomers in b(ii) and state what would be observed if the reagent is reacted separately with each of the isomers.

(c) When **A** was warmed with acidified Potassium permanganate solution, there was no observable change.

(i) Identify compound **A**. (01 mark)

(ii) Write the structural formulae of **A**. (01 mark)

(d) (i) Write the equation and mechanism for the reaction between **A** and concentrated Sulphuric acid. (03 marks)

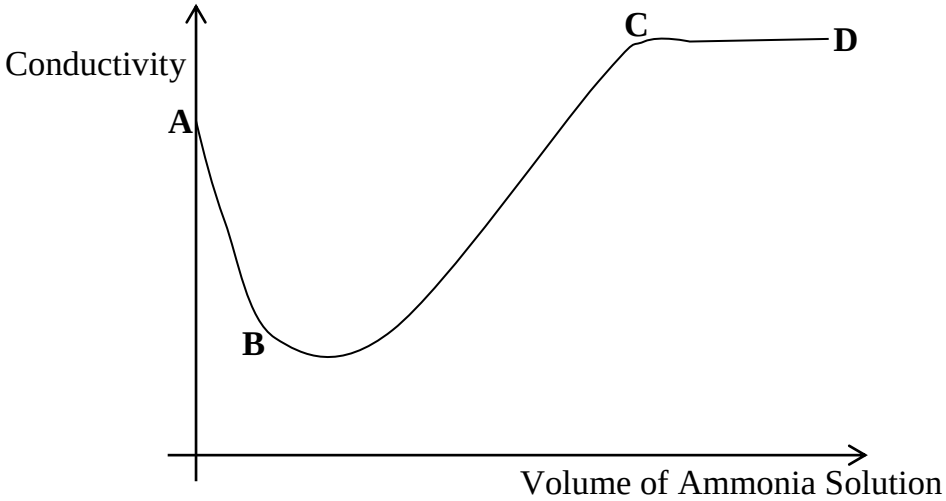
(ii) Write the IUPAC name of the product in d(i). (01 mark)

2. (a) Define the following terms

(i) Conductivity (02 marks)

(ii) Molar Conductivity (02 marks)

(b) The graph below shows the change in conductivity when 0.03M ethanoic acid is titrated with 0.5M ammonia solution.



Explain the shape of the graph. (06 Marks)

(c) At 25^0C the molar conductivity of lead nitrate, Potassium iodide and Potassium nitrate are 266.8, 290.0, 299.8$\Omega^{-1}cm^2.mol^{-1}$ respectively.

At the same temperature, the conductivity of the saturated solution of lead (II) Iodide is 6.82 x $10^{-6}\Omega^{-1}cm^{-1}$. Calculate the;

(i) Solubility of lead (II) Iodide at 25^0C in $moldm^{-3}$. (05 marks)

(ii) solubility product of Lead (II) Iodide at 25^0C. (03 marks)

(d) The ionic conductivity rubidium ion and Potassium ion are 208.3$\Omega^{-1}cm^{-2}mol^{-1}$ and 100.8$\Omega^{-1}cm^{-2}mol^{-1}$ respectively. Explain why the ionic conductivity of rubidium ions is higher than that of sodium ions. (03 marks)

3. Explain the following observations

a) A solution of Sodium thiosulphate becomes cloudy with formation of yellow thiosulphate becomes cloudy with formation of yellow precipitate on standing in air. (03 marks)

(b) Sodium Chloride melts at 800^0C whereas aluminium Chloride sublimes at 180^0C. (04 marks)

(c) Although Zinc belong to d-block elements in the periodic table but it does not behave as a typical transitional metal. (04 marks)

(d) When concentrated hydrochloric acid is added to copper (II) sulphate solution, the blue solution turns to yellow and on addition of water, the solution turns to black. (04 marks)

4. Describe how;

(a) Impure copper can be obtained from copper Pyrites (*your answer should include equations)* (09 marks)

(b) The percentage purity of copper can be determined in the laboratory by titrimetric method. (06 marks)

SECTION B

Answer any **two** *questions*

5. (a) (i) Describe an experiment which can be carried out to determine the solubility product of calcium iodate. (7½ marks)

(ii) The solubility product of calcium iodate is 1.69 x $10^{-9}mol^3l^3$ at 25^0C.
Calculate the concentration of iodate ions in saturated solution of calcium iodate at 25^0C. (3½ marks)

(iii) State **three** factors that can affect the value of solubility product. (1½ marks)

(b) (i) 0.1 mole of Calcium nitrate was added to a litre of saturated solution of calcium iodate and rhe mixture stirred. Calculate the mass of calcium iodate which was precipitated. State any assumptions you have made. (4½ marks)

(ii) Triphosphate ions form a soluble complex with calcium ions. State what would happen when triphosphate ions are added to a saturated solution of Calcium iodate and give a reason for your answer. (02 marks)

(c) State **two** applications of solubility product. (01 mark)

6. Describe without equations how much each of the following compounds can be manufactured.

(a) Benzoic acid from benzene. (2½ marks)
(b) Hexane from 1-bromopentane. (01 mark)
(c) Ethyne from ethanol. (04 marks)
(d) Propanoic acid from bromoethane. (02 marks)
(e) Amino ethane from ethane. (5½ marks)
(f) Mothylethanoate from bromoethene (4½ marks)

7. (a) Aluminium can be extracted from Bauxite which is impure hydrated aluminium oxide. Describe how;

(i) Pure aluminium oxide is obtained from bauxite. (10 marks)
(ii) aluminium is obtained from pure aluminium oxide. (*your answer should include equations)* (3½ marks)

(b) Discuss the reactions of aluminium with hydrochloric acid, sulphuric acid and nitric acid. (3½ marks)

(c) Explain why aluminium utensils should not be washed using soap solutions. (03 marks)

(d) Comment on the answers you have obtained in b(ii) and c(iv) above. (1½ marks)

8. (a) Ethanol reacts with ethanoic acid to form ethyl ethanoate according to the following equation

$CH_3CO_2H(l) + CH_3CH_2OH(l) \rightleftarrows CH_3CO_2CH_2CH_3(l) + H_2O(l)$ ΔH is negative

(i) State the conditions for the reaction. (01 mark)
(ii) Describe how the equilibrium constant $\boldsymbol{K_C}$ for the reaction can be determined by titrimetric method. (08 marks)

(b) Explain what would happen to the equilibrium constant if;

(i) a catalyst was added (03 marks)
(ii) the temperature was increased. (03 marks)

(c) A mixture of 0.69g of ethanol and 0.9g of ethanoic acid were allowed to react at 90^0C until equilibrium was reached. Calculate the mass of ethylethanoate formed at equilibrium. ($\boldsymbol{K_C}$ = 3.6) (04 marks)

END