

Name Centre/Index No.....

SchoolSignature

P525/2

Chemistry

Paper 2

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UGANDA MARTYRS S.S NAMUGONGO,
ST JOSEPH'S S.S NAGGALAMA,
SEETA HIGH SCHOOL (MAIN)
&
SEETA HIGH SCHOOL – MUKONO
(UNNASE)

UACE JOINT MOCK EXAMINATIONS 2010
P525/2 CHEMISTRY
PAPER 2
TIME: 2 ½ HOURS

Instructions to Candidates

This paper consists of two sections A and B

*Answer **three questions** in section A and **two questions** in section B*

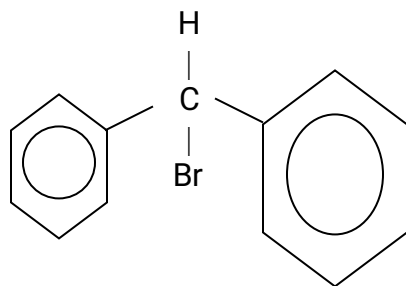
Start each question on a fresh sheet of paper

SECTION A:

Attempt 3 questions in this section.

1. (a) The principal ore from which zinc is extracted is zinc blende (ZnS)
 - (i) Briefly explain how the ore can be concentrated and converted into an oxide. (4 ½ marks)
 - (ii) The oxide obtained in (i) above is impure. Outline how pure zinc metal can be obtained from the oxide using electrolysis. (5 marks)
- (b) 4.0g of an ore of zinc was dissolved in excess aqueous ammonia and the resultant solution shaken with 200cm^3 trichloromethane. The mixture was allowed to stand until two layers separated. 20cm^3 of the organic layer required 10.0cm^3 of 0.02M hydrochloric acid for complete neutralization. 20cm^3 of the aqueous layer required 9.0cm^3 of 1M hydrochloric acid. Given that Zn^{2+} form a complex of coordination number four with ammonia ligands in aqueous layer.
 - (i) Suggest the most suitable indicator for the titration. (1 mark)
 - (ii) Write the equation for the reaction taking place during the titration. (1 mark)
 - (iii) Calculate the percentage of zinc in the ore. (Partition coefficient of ammonia between water and trichloromethane is 25.0 at 25°C) (6 marks)
- (c) Zinc powder was added to a solution of sodium nitrate in excess sodium hydroxide and the mixture heated.
 - (i) State what was observed. (1 mark)
 - (ii) Write the ionic equation for the reaction taking place. (1½ marks)
2. Write equation indicating conditions to show how the following conversions can be effected.

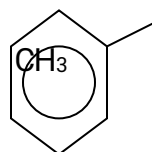
(a)



from Ethyne. (4 marks)

(b) Ethyl methylamine from bromoethene (2 ½ marks)

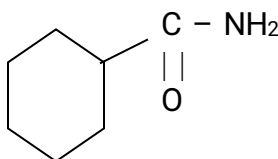
(c) marks)



NH -

from benzoic acid (3 ½ marks)

(d) 2 - iodo - 3 - methyl butane from bromomethane (4 marks)

(e)  from cyclohexanol (3 ½ marks)

(f) 1,2 -dichloro ethane to ethanal oxime (2 ½ marks)

3. (a) Explain the factors that affect the solubility of a sparingly soluble salt. (5 marks)

(b) Describe an experiment you would carry out to determine the solubility product of calcium iodate (V). (7 marks)

(c) Calculate the solubility of calcium iodate (V) in

(i) water

(ii) 0.2 Mol dm⁻³ calcium hydroxide solution. (K_{sp} of calcium iodate (V) = 1.95 x 10⁻⁶ mol³ dm⁻⁴) (7 marks)

(d) Account for the differences in the solubilities in (c) above. (1 mark)

4. Explain the following observations

(a) Hydrochloric acid is used to acidify potassium dichromate solution but not potassium permanganate solution. (3 marks)

(b) The acid strength of hydrofluoric acid increases with increasing concentration of the acid. (3 marks)

(c) Propanone like all other carbonyl compounds undergoes nucleophilic addition reactions and not electrophilic addition. (3 marks)

(d) On addition of ammonia solution into a solution of Aluminium sulphate, a white precipitate is formed. However, when ammonia is added in the presence of ammonium chloride, no precipitate forms. (4 marks)

(e) When hydrogen sulphide gas is passed through a neutral solution of iron (III) sulphate, a yellow precipitate is formed and the brown solution turns green. (3 marks)

- (f) Osmotic pressure method is preferred for the determination of relative molecular masses of polymers to freezing point depression. (4 marks)

SECTION B:

Attempt any two questions from this section

5. (a) With the aid of examples, distinguish between
 (i) Nucleophilic substitution reaction
 (ii) Electrophilic addition reaction
 (Write the mechanism for a (i) and equations for both)
- (b) An organic compound W contains 60% carbon, 13.35% hydrogen and the rest oxygen
 if the vapour density of W is 30, determine its molecular formula of W. (5 marks)
- (c) W reacts with sodium metal with effervescence of a gas. Write the structural formulae
 and IUPAC names of the two possible isomers of W. (2 marks)
- (d) W reacts with iodine solution in sodium hydroxide to form a yellow precipitate
 (i) Identify W (½ mark)
 (ii) Write equation for the reaction between W and iodine in sodium hydroxide solution (1 mark)
- (e) W can be oxidized using acidified chromium (VI) oxide to form compound R. R forms a yellow precipitate with Brady's reagent in presence of an acid
 (i) Write equation for the reaction between R and Brady's reagent in acidic media (1 mark)
 (ii) Indicate the mechanism for the reaction in (e) (i) (4 ½ marks)
6. (a) What is meant by the following terms
 (i) ionization (1 mark)
 (ii) Dissociation (1 mark)
- (b) State three factors that affect the molar conductivity of an electrolyte. (3 marks)
- (c) The electrolytic conductivities of the solution formed when potassium hydroxide

solution is titrated with 20cm³ of 0.1M hydrochloric acid are given in the table below

Volume of KOH added /cm ³	4	10	14	20	22	28	34
KΩ ⁻¹ cm ⁻¹	185	165	145	135	135	145	155

(i) Plot a graph of conductivity against volume of potassium hydroxide added (3 marks)

(ii) Explain the shape of your graph (4 marks)

(iii) Determine the volume of potassium hydroxide solution required to reach the end point. (1 mark)

(iv) Calculate the pH of the solution when 32 cm³ of potassium hydroxide solution added.

(d) Explain why the conductivity of sodium hydroxide solution is higher than that of potassium hydroxide solution. (2 marks)

7. (a) Chlorine, potassium manganate (vi) and copper (1) salts in aqueous solution undergo disproportionation.

(i) Explain what is meant by the term disproportionation. (2 marks)

(ii) Describe how each of the substances in (a) above undergoes disproportionation.

State the conditions and write equation for the reaction in each case. (7 marks)

(iii) State two practical applications of disproportionation reactions (1 mark)

(b) Chlorine reacts with heated sodium metal to form anhydrous sodium chloride

which readily dissolves in water to form a solution of pH = 7.0

Describe an experiment to determine the percentage of sodium chloride in an impure solid sample of sodium chloride using titration. (5 marks)

(c) To an aqueous solution of sodium chloride, silver nitrate solution was added to

form a white precipitate X which dissolved in excess ammonia solution to

give a colourless solution Y. (5 marks)

- (i) Write the formula of the white precipitate X and the colourless solution Y. (1 ½ marks)
- (ii) Write ionic equations to show how X and Y are formed (3 marks)
- (iii) Give the I.U.P.A.C name of solution Y. ½ marks)
8. (a) Explain what meant by the terms
- (i) Enthalpy of solution (2 marks)
- (ii) Enthalpy of hydration (2 marks)
- (b) State two factors that affect the enthalpy of hydration. (2 marks)
- (c) Describe how you would determine the standard enthalpy of solution of potassium iodide. (7 marks)
- (d) The lattice energy of potassium iodide is $+649 \text{ KJmol}^{-1}$. The enthalpy of hydration of potassium ion is -321 KJmol^{-1} and that of iodide ions is -296 KJmol^{-1}
- (i) Determine the enthalpy of solution of potassium iodide (2 marks)
- (ii) Explain why potassium iodide is soluble in water (2 marks)
- (iii) Sketch a potential energy diagram for the dissolution of potassium iodide in water (3 marks)
- b (ii) above

END