

P525/ 2
CHEMISTRY
Paper 2
July 2025
2 ½ hours



ACEITEKA JOINT MOCK EXAMINATIONS 2025

Uganda Advanced Certificate of Education

CHEMISTRY

Paper two

2hours 30minutes

INSTRUCTIONS TO THE CANDIDATES

- ✓ Answer *five* questions including *three* questions in section A and any *two* questions in section B.
- ✓ Write the answers in the answer booklet provided.
- ✓ Mathematical tables and graph papers are provided.
- ✓ Begin each question on a fresh page.
- ✓ Non-programmable scientific electronic calculators may be used.
- ✓ Illustrate your answers with equations where applicable.
- ✓ Indicate the questions in the grid below.

Where necessary use Na = 23 , C = 12 , O = 16 , H =1 , K = 39

Question						Total
Marks						

SECTION A (60marks)

Attempt any three questions from this section

1. 9.25g of an organic compound **Q** on complete combustion yielded 8.4dm^3 of carbon dioxide and 6.75g of water at s.t.p. The vapour density of **Q** is 37.
- (a) (i) Calculate the empirical formula of **Q**. (3½marks)
- (ii) Determine the molecular formula of **Q**. (03marks)
- (b) **Q** burns with a non- sooty flame. Write the structural formulae and IUPAC names of the possible isomers of **Q**. (03marks)
- (c) **Q** reacts with metallic sodium with effervescence of a colourless gas and an aqueous solution of **Q** had a pH of 2.95. Identify **Q**. (0½mark)
- (d) When **Q** was treated with lithium aluminium tetrahydride in presence of dry ether, compound **R** was formed. When **R** was warmed with acidified chromium trioxide, compound **S** was formed. **S** formed yellow precipitate with Brady's reagent. Identify **R** and **S**. (01mark)
- (e) Write equation and suggest a mechanism for the reaction between
- (i) **Q** and methanol in the presence of few drops of concentrated sulphuric acid and the mixture heated. (4½marks)
- (ii) **S** and Brady's reagent. (4½marks)
2. (a) State Raoult's law. (01mark)
- (b) The saturated vapour pressures of pure water and pure hydrofluoric acid at 20°C are 2.3 and 10.9kNm^{-2} respectively. A solution was made by mixing 45g of water and 110g of hydrofluoric acid at 20°C .
- (i) Calculate the vapour pressure of the solution. [Assume the solution obeys Raoult's law].
- (ii) If the actual vapour pressure of solution was 7.5kNm^{-2}

State how the solution deviates from Raoult's law. Give a reason for your answer. (02 marks)

(c) (i) Sketch a well labelled boiling point composition diagram for the mixture in (b) above. (02 marks)

(ii) Explain the shape of the graph (05 marks)

(d) Explain the following observations

(i) When a small amount of ethanol is added to water, the mixture boils at 98°C whereas when small amount of glucose is added to water, the mixture boils at 101°C . (Boiling point of pure water is 100°C) (03marks)

(ii) An azeotropic mixture cannot be separated by fractional distillation (02marks)

3. (a) Distinguish between covalent bonding and electrovalent bonding. (02marks)

(b) State **two** factors that determine the strength of

(i) Covalent bond (02marks)

(ii) Ionic bond (02marks)

(c) Explain your answer in ((ii) above. (03marks)

(d) Explain the following observations

(i) The melting point of sodium oxide is higher than that of sodium fluoride. (04marks).

(ii) The acidic strength of the hydrides of group (VII) are in the order $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$. (04marks)

(iii) Freshly prepared potassium iodide solution is colourless. However, turns pale yellow on standing. (03marks)

4. Beryllium, magnesium, calcium, strontium and barium are the elements of group(II) of the periodic Table.

(a) Write the outer most electronic configuration of;

(i) strontium

(ii) barium

(01 mark)

(b) Describe how the following vary down the group

(i) Electronegativity

(03marks)

(ii) Electrode potential

(03marks)

(c) Discuss the reactivity of the elements with;

(i) Cold water

(04 marks)

(ii) Concentrated hydrochloric acid

(03 marks)

(iii) Iodine

(03 marks)

(d) Beryllium was added to hot concentrated potassium hydroxide solution

(i) State what would be observed

(1 $\frac{1}{2}$ marks)

(ii) Write ionic equation for the reaction

(1 $\frac{1}{2}$ marks)

SECTION B (40 marks)

Answer any two questions from this section

5. Using equations show how the following conversions can be effected.
- (a) (4- hydroxyphenyl) azo benzene from nitrobenzene. (04marks)
 - (b) 1-methylcyclohexan- 1- ol from cyclohexene. (04marks)
 - (c) 2-bromopropan-1- ol from ethanol. (04marks)
 - (d) polystyrene from benzene. (04marks)
 - (e) iodobenzene from benzene carboxamide($C_6H_5CONH_2$) (04marks)
6. (a) what is meant by the term buffer solution? (01mark)
- (b) Describe the action of a basic buffer. (05marks)
- (c) 75 cm³ of 0.24M Ammonia solution were mixed with 45cm³ of 0.12M ammonium chloride solution
- (i) Calculate the pH of the resultant solution
(K_b for ammonia = 1.75×10^{-5} moldm⁻³ and $K_w = 1.0 \times 10^{-14}$ mol²dm⁻⁶). (04 marks)
 - (ii) State and explain how the pH in (i) will vary when few drops of sodium hydroxide were added to the resultant solution. (03marks)
- (e) Explain the following observation
- (i) When magnesium ribbon was added to an aqueous solution of ammonium chloride, there was effervescence of a colourless gas. (03¹/₂ marks)
 - (ii) Phenolphthalein indicator is suitable for titration of ethanoic acid with sodium hydroxide. (03¹/₂ marks)

7. Explain the following observations

- (a) When moderately concentrated nitric acid was added to copper turnings there was effervescence of a colourless gas which on exposure to air turned brown fumes and blue solution was formed. (05marks)
- (b) When dilute sulphuric acid was added to a solution of potassium manganate (VI), the green solution turned purple and black precipitate formed. (04marks)
- (c) When excess hot concentrated hydrochloric acid was added to lead (IV) oxide, dark brown solid dissolved with effervescence of a greenish yellow gas and a colourless solution was formed (05marks)
- (d) When Fehling's solution was added to methanoic acid and the mixture warmed, a reddish brown precipitate was formed. (03marks)
- (e) When an aqueous solution of sodium sulphite was added to iodine solution, brown solution turned colourless. (03marks)

8. (a) What is meant by the term ore? (01mark)

(b) Zinc blende is one of the ores from which zinc is extracted

(i) Write the formula and name of another ore of zinc. (01mark)

(ii) Describe briefly how pure zinc can be extracted from zinc blende. (05marks)

(c) Describe how pure zinc reacts with

(i) Sulphuric acid (03marks)

(ii) Cold dilute nitric acid. (03marks)

(iii) Sodium hydroxide. (03marks)

(d) Ammonia solution was added to zinc sulphate solution drop wise until in excess.

(i) State what was observed. (1½marks)

(ii) Write equations for the reactions that took place. (1½marks)

(e) State the role of zinc dust in the hydrolysis of alkene ozonides. (01mark)

END