



UNNASE MOCK EXAMINATIONS

Uganda Advanced Certificate Of Education

MOCK EXAMINATIONS

CHEMISTRY

Paper 2

2hours 30minutes

INSTRUCTIONS TO CANDIDATES

- Attempt **five** questions including **three** from section **A** and any **two** questions from section **B**.
- Answers to the question must on the answer sheets provided
- **Begin each question on a fresh page.**
- **Extra questions attempt will not be marked.**
- Mathematical tables and graph papers are provided.
- Non- programmable scientific electronic calculators may be used.
- Use equations where necessary to illustrate your answers.

[H= 1 , C= 12 , O = 16 , F= 19.0]

SECTION A

Answer **three** questions from this section

1. a) (i) Distinguish between d- block element and transition element. (02marks)
- (ii) Explain why zinc is **not** considered as a typical transition element. (02marks)
- b) One of the characteristics of transition elements is complex ion formation
- (i) What is meant by the term complex ion. (01mark)
- (ii) State **three** factors that favour formation of complexes. (1½marks)
- c) Chromium(III) chloride hexahydrate, $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ exists in isomeric forms. Write the possible isomers of the compound. (02marks)
- d) A mixture of manganese(IV) oxide and potassium hydroxide was fused in the presence of excess air.
- (i) State what was observed (01mark)
- (ii) Write equation for the reaction that took place. (1½marks)
- e) The product in (d) was dissolved in water and the resultant solution acidified with dilute sulphuric acid.
- (i) State what was observed. (1½marks)
- (ii) Explain your observation (2½marks)
- f) Name the reagent that can be used to distinguish between the following pairs of ions. State what would be observed when each ion of the pair is treated with the reagent.
- (i) Fe^{2+} and Sn^{2+} (2½marks)
- (ii) Co^{2+} and Cu^{2+} (2½marks)
2. a) 1 mole of an organic compound **Q**, $\text{C}_x\text{H}_y\text{O}_z$ reacts completely with 7 moles of oxygen to form 6 moles of carbon dioxide and 3 moles of water. Determine the molecular formula of **Q**. (3½marks)
- b) **Q** burns with a sooty flame. Identify **Q**. (0½mark)
- c) Write equation and suggest a mechanism for the reaction between an alkaline solution of **Q** and
- (i) bromoethane (03marks)
- (ii) propanoyl chloride ($\text{CH}_3\text{CH}_2\text{COCl}$) (04marks)

- d) State what would be observed, write equation for the reaction and name the main organic product when bromine water was added to **Q**.
(02marks)
- e) Using equations only show how **Q** can be
(i) converted to phenylmethanol (3½marks)
(ii) synthesized from nitrobenzene (3½marks)

3. a) What is meant by the following terms?
(i) base ionisation constant (01mark)
(ii) solubility product constant (01mark)
(iii) common ion effect (01mark)

- b) When 0.68g of ammonia (NH_3) and 0.68g of silver chromate (Ag_2CrO_4) were separately shaken with 1 dm³ of distilled water until equilibrium is attained at 25°C, 2.087% of the ammonia had ionized and 3.36% of silver chromate had dissociated into its ions.

Calculate

- (i) the base ionisation constant, K_b for ammonia at 25°C. (2½marks)
(ii) the solubility product for silver chromate at 25°C. (3½marks)
($H = 1$, $N = 14$, $O = 16$, $Cr = 52$, $Ag = 108$)
- c) Describe an experiment that can be used to determine the solubility product of silver chromate in the laboratory. (06marks)
- d) State and explain how the solubility of silver chromate would be affected when the following were added to its saturated solution.
(i) silver nitrate. (02marks)
(ii) ammonia solution (02marks)
- e) Explain briefly how solubility product is applied in purification of common salt. (02marks)

4. a) What is meant by the term ideal solution? (03marks)

b) Ethanol and butanol are liquids that form an ideal solution. The data below shows the mole fraction butanol in the liquid and vapour phases varying with temperature for ethanol – butanol system

| Boiling point (°C) | | 117 | 110 | 100 | 90 | 85 | 78.5 |
|------------------------------|--------|-----|-----|-----|----|----|------|
| Mole fraction of butanol (%) | liquid | 100 | 90 | 66 | 40 | 22 | 0 |
| | vapour | 100 | 70 | 40 | 18 | 10 | 0 |

(i) On the same axes plot a graph of boiling point against percentage of butanol in both liquid and vapour phases and label your graph completely. (05marks)

(ii) Explain the shape of the graph. (04marks)

(iii) Describe how a liquid mixture containing 45% ethanol is fractionally distilled. (04marks)

c) (i) State Raoult's Law as applied to miscible. (01mark)

(ii) Explain why some liquid mixtures don not obey Raoult's law. (03marks)

SECTION B

Answer any **two** questions from this Section.

5. Using equations only show how the following organic compounds can be synthesized.

a) Propanone from propanoic acid (4½marks)

b) methylbenzoate from benzene (04marks)

c) 2-hydroxypropanoic acid from but-2-ene (4½marks)

d) 2,2-dichloro propane from propene (04marks)

e) chlorobenzene from aminobenzene (03marks)

6. a) What is meant by the terms

(i) electrolytic conductivity (01mark)

(ii) molar conductivity. (01mark)

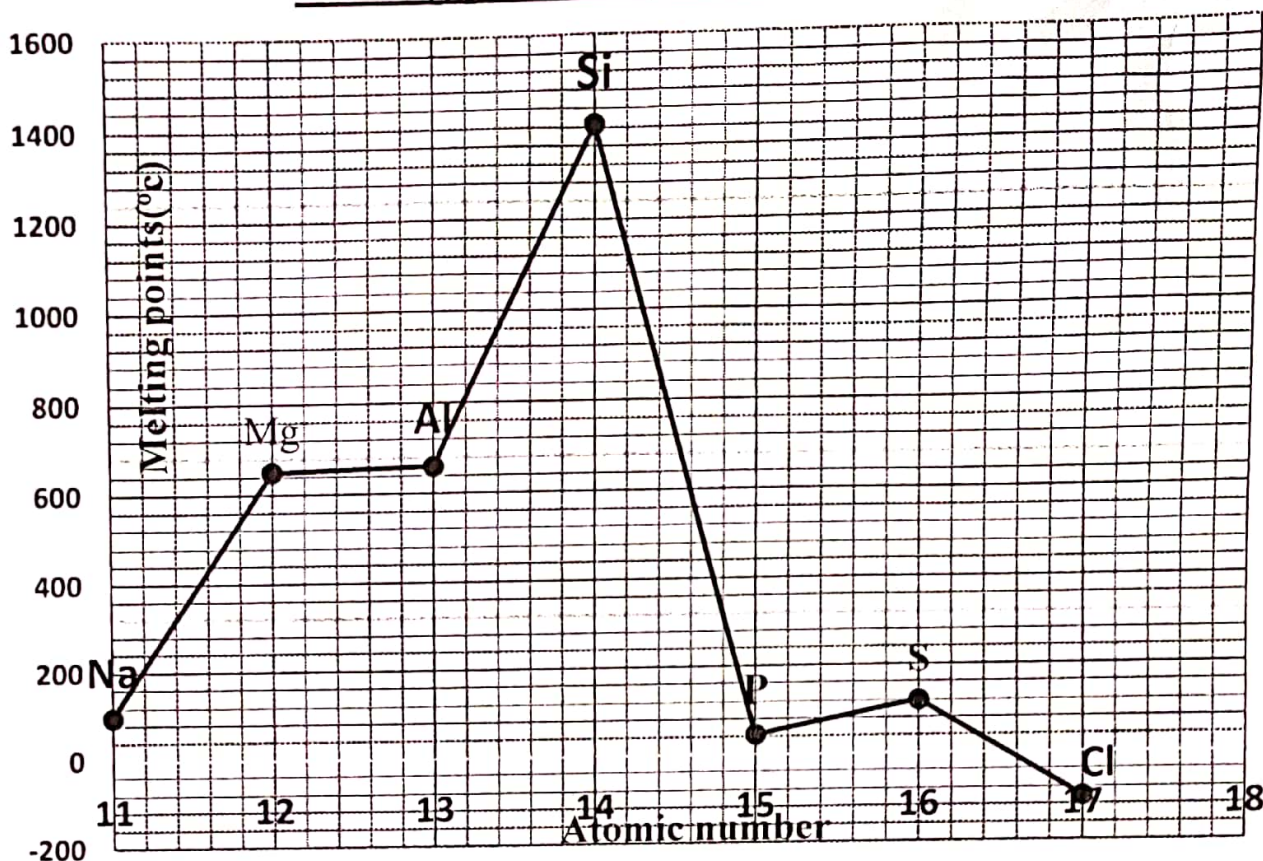
- b) Sketch graphs for
- molar conductivity potassium chloride with dilution. (02marks)
 - conductimetric titration of ethanoic acid with ammonia (02marks)
- c) Explain the shapes of the graphs in (b). (08marks)
- d) The molar ionic conductivities at infinite dilution of some ionic species are shown in the table below.

| ion | $\lambda_0 (\Omega^{-1} \text{cm}^2 \text{mol}^{-1})$ |
|---------------|---|
| Na^+ | 50.1 |
| OH^- | 198.6 |
| H^+ | 349.8 |
| Cl^- | 76.4 |

- Calculate the electrolytic conductivity of a solution made by mixing 35cm^3 of 0.01M sodium hydroxide and 45cm^3 of 0.02M hydrochloric acid. (04marks)
 - Would you expect the molar conductivity of lithium ion (Li^+) to be less or greater than that of sodium ion (Na^+). Explain your answer. (02marks)
7. Explain the following observations.
- When iron filings were added to copper(II) sulphate solution, the pale blue solution turns to pale green and brown solid formed. (03marks)
 - When sodium hydroxide solution was added to chromium(III) sulphate solution drop-wise until in excess, green precipitate dissolved in excess alkali to form a green solution which turned yellow on warming with hydrogen peroxide solution. (05marks)
 - When concentrated hydrochloric acid was added to an aqueous solution cobalt(II) sulphate, a pink solution turned to blue which on dilution with water the blue solution turned to pink again. (04marks)
 - When hydrogen sulphide gas was bubbled through acidified potassium dichromate solution, orange solution turned green and yellow precipitate formed. (03marks)
 - When warm dilute nitric acid was added to trileadtetraoxide, a red powder turned to dark brown solid which dissolved to form a bright yellow liquid when treated with excess cold concentrated hydrochloric acid. (05marks)

8. a) The graph below shows the melting points of period 3 elements

Melting points of Period 3 elements



Explain why;

- there is a drastic increase in melting point from sodium to magnesium however there is slight increase in melting point from magnesium to aluminium. (03marks)
- silicon has the highest melting point while chlorine has the lowest melting point. (03marks)
- there was a general decrease in melting point from silicon to chlorine. (03marks)

b) Describe the reaction of

- aluminium, silicon, phosphorus and chlorine with sodium hydroxide. (08marks)
- sodium chloride and sodium bromide with concentrated sulphuric acid. (03marks)

END