

P525/2
CHEMISTRY
Paper 2
Jul./Aug. 2023
2 ½ hours

ASSHU - KASESE JOINT EXAMINATIONS BOARD (AKJEB)

MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

CHEMISTRY

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Answer **five** questions including **three** questions from section **A** and any **two** from section **B**.

Write the answers in the answer booklets / sheets provided.

Begin each question on a fresh page.

Mathematical tables and graph papers are provided.

Non – programmable, silent scientific electronic calculators may be used.

Illustrate your answers with equations where applicable.

Where necessary use (C= 12, H = 1, O = 16, H =1, N= 14, 1F= 96500C)

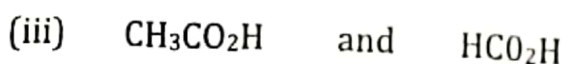
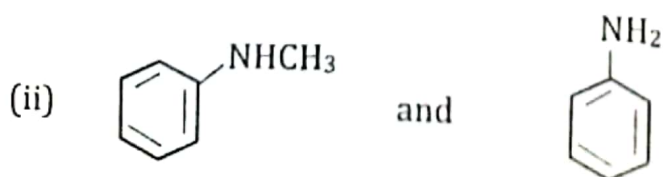
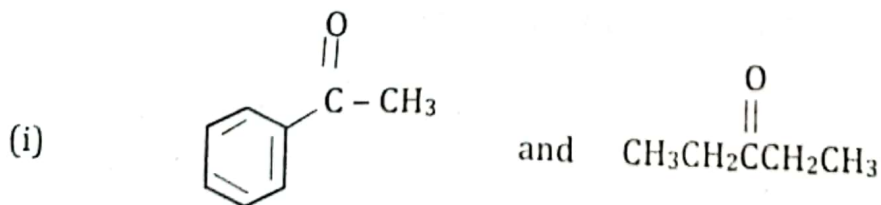
SECTION A

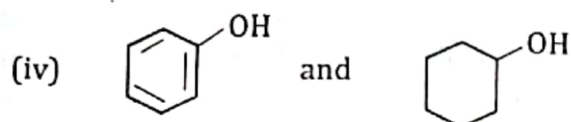
Answer three questions from this section.

1. (a)(i) State Kohlrausch's law of independent ion migration. (01 mark)
- (ii) 272g of anhydrous Zinc Chloride was dissolved in water and the solution made up to one litre. The electrolyte conductivity of the solution was found to be $5.176 \times 10^{-3} \text{ J L}^{-1}$ at 25°C . Determine the molar conductivity of chloride ions at this temperature. ($Z_n = 65$, $\text{Cl} = 35.5$, the molar conductivity of chloride at infinite dilution is $106 \Omega^{-1} \text{ mol}^{-1}$, molar conductivity of Zinc ions $52.8 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$). (04 marks)
- (b)(i) Draw sketch graphs to show how molar conductivity of the following compounds vary with concentration;
- Copper(II) Sulphate
 - Hydrofluoric acid.
- (ii) Explain the shape of the graphs you have sketched above in (b)(i). (02 marks)
- (c) The table below shows how the conductivity of Lithium chloride at 25°C varies with dilution $1/c$, where c is the concentration. (06 marks)

Dilution $\text{mol}^{-1} \text{ dm}^{-3}$	2000	1000	500	200	100	20
Molar conductivity, $\Lambda (\Omega^{-1} \text{ cm}^2 \text{ mol}^{-1})$	113.2	112.5	111.5	109.4	107.3	100.1

- (i) Plot a graph of molar conductivity of lithium chloride against dilution $\frac{1}{c}$ at 25°C . (04 marks)
- (ii) Explain the shape of your graph. (02 marks)
- (iii) Using the graph, estimate the molar conductivity of lithium chloride at infinite dilution. (01 mark)
2. For each of the following pairs of compounds;





Name **one** reagent which;

- (a) When reacted with each member will show similar observation. (04 marks)
 (b) Can be used to distinguish between each pair. (04 marks)
 (c) In each case, state what would be observed when each member of the pair is reacted with the reagent you have named. (12 marks)

3. Beryllium, Magnesium, Calcium, Strontium and barium are elements in group (II) of the periodic table.

(a) Describe the reaction of the elements with;

- (i) Air (03 marks)
 (ii) Water (03 marks)
 (iii) Dilute sulphuric acid. (03 marks)

(b) The atomic radii and melting points of group(II) elements in the periodic table are given in the table below;

Element	Atomic radius (Am)	Melting point (°C)
Beryllium	0.112	1283
Magnesium	0.160	650
Calcium	0.197	848
Strontium	0.215	770
Barium	0.222	710

Explain the trend in;

- (i) Atomic radius (03 marks)
 (ii) Melting points of group (II) elements. (03 marks)

(c) (i) State the reasons why Beryllium differs from the rest of group(II) elements.

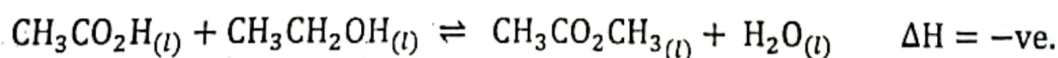
(02 ½ marks)

(d) (ii) Name a reagent that can be used to distinguish between calcium and beryllium ions.

State what would be observed and write equation(s) for reaction(s) that would take place if the reagent you have named in c(i) above was treated separately with calcium and barium ions.

(02 ½ marks)

4. (a) Ethanol reacts with ethanoic acid to form ethyl ethanoate according to the following equations:

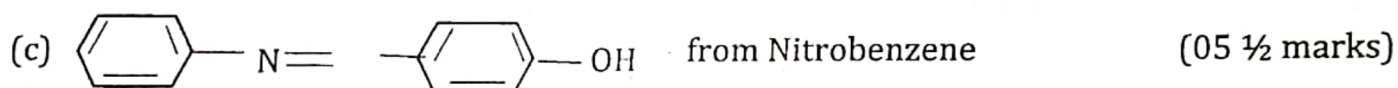
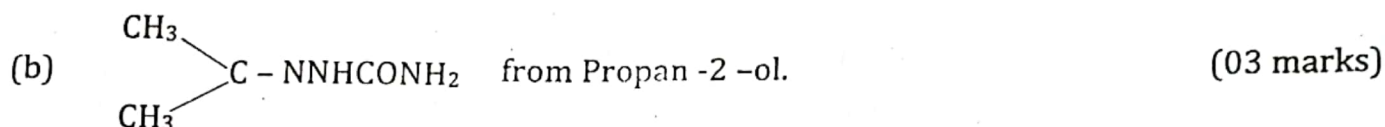
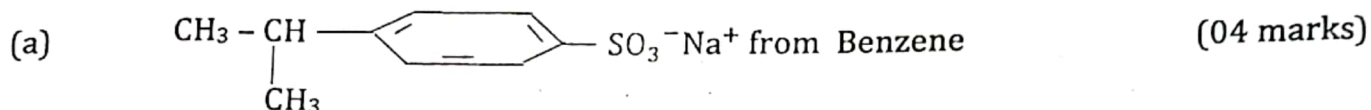


- (i) State the conditions for the reaction. (01 mark)
- (ii) Describe how the equilibrium constant K_c for the reaction can be determined by a titrimetric method. (08 marks)
- (b) Explain what would happen to the equilibrium constant if;
- (i) a catalyst was added. (03 marks)
- (ii) the temperature was increased. (03 marks)
- (c) A mixture of 0.69 g of ethanol and 0.9 g of ethanoic acid were allowed to react at 90 °C until equilibrium was reached. Calculate the mass of ethyl ethanoate formed at equilibrium. ($K_c = 3.6$) (05 marks)

SECTION B

(Attempt any two questions)

5. (a) State Raoult's law. (03 marks)
- (b) A mixture of ethanoic acid (b.p 118 °C) and pyridine (b.p 123 °C) shows negative deviation from Raoult's law.
- (i) Draw a vapour pressure/ composition curve for the mixture clearly well labelled. (04 marks)
- (ii) Explain the shape of the curve in relation to Raoult's law. (6 marks)
- (c) (i) Explain what is meant by steam distillation.
- (ii) When a compound Y was steam distilled at standard atmospheric pressure, the temperature of distillation was 96 °C. The vapour pressure of water at this temperature was 730 mmHg and the distillate contained 74 % water. Calculate the relative atomic mass of Y. (04 marks)
6. (a) Write the name and formula of one ore from which aluminium can be extracted and describe how aluminium is extracted from the ore. (08 marks)
- (b) Write equations and state conditions under which aluminum reacts with;
- (i) air. (02 marks)
- (ii) sodium hydroxide. (2 marks)
- (iii) Hydro chloric acid. (2 marks)
- (c) (i) State what is observed and write equation for reaction which takes place when aluminium ions react with aqueous sodium hydroxide. (02 ½ marks)
- (ii) State and explain what is observed when a solution of sodium carbonate is added to a solution of aluminium chloride. (03 ½ marks)
7. Write equations to show how the following conversions can be carried out. In each case, indicate the reagents and conditions for the reactions.



8. (a) Describe how nitric acid:

(i) is manufactured from ammonia

(ii) reacts with copper. (14 marks)

(b) State why nitric acid is not used to acidify potassium manganate (VII) in volumetric analysis. (02 marks)

(c) 1.07 g of nitrogen containing compound was boiled with excess sodium hydroxide solution to produce ammonia. The ammonia produced neutralized 200 cm³ of a 0.1 M monobasic acid. Calculate the percentage by mass of nitrogen in the compound. (03 marks)

(d) State two uses of Nitric acid. (01 mark)

END