

**P525/2**

**CHEMISTRY**

**Paper 2**

**August 2024**

**2½ hours.**



**JINJA JOINT EXAMINATIONS BOARD**

*Uganda Advanced Certificate of Education*

**MOCK EXAMINATIONS AUGUST, 2024**

**CHEMISTRY**  
**(Principal Subject)**

**Paper 2**

**2 hours 30 minutes.**

**INSTRUCTION TO CANDIDATES:**

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

Write answers in the answer booklet provided

Begin each question on a fresh page.

Mathematical tables and graph papers are provided.

Non-programmable scientific electronic calculators may be used.

Use equations where necessary to illustrate your answers

Where necessary use ( $\text{Cu} = 64$ ,  $\text{S} = 32$ ,  $\text{O} = 16$ ,  $\text{Br} = 79.9$ ,  $\text{H} = 1$ )

Faraday's constant is  $96500\text{c}$

**SECTION A****(Answer three questions from this section)**

1. The atomic numbers and the melting points of the chlorides of elements of period 3 of the periodic table are shown in the table below.

Element	Na	Mg	Al	Si	P	S
Atomic number	11	12	13	14	15	16
chloride and melting	$NaCl$	$MgCl_2$	$Al_2Cl_6$	$SiCl_4$	$PCl_3$	$S_2Cl_2$
Point ( $^{\circ}C$ )	808	714	192	-68	-94	-80

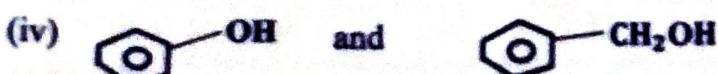
- a) (i) Plot a graph of melting points of the chlorides against the atomic numbers of the elements. (04 marks)
- (ii) Explain the shape of the graph you have drawn in (a) (i) above (05 marks)
- b) (i) Briefly describe how hydrated aluminum chloride ( $AlCl_3 \cdot 6H_2O$ ) can be prepared from aluminum oxide. (03 marks)
- (ii) State what would be observed when hydrated aluminum chloride is strongly heated and write equation for the reaction that takes place? (2½ marks)
- (iii) Explain what would be observed when aluminum chloride is exposed to moist air. (03 marks)
- c) Explain why it is not advisable to wash aluminum utensils using soap. (2½ marks)
2. (a) Describe how zinc is extracted from zinc blende. (07½ marks)
- (b) Explain the following observations:
- (i) Zinc belongs to the d-block in the periodic table and yet it is not a transition element. (02 marks)
- (ii) Zinc chloride dissolves in water to give a solution whose pH is less than seven (03 marks)
- (c) Potassium hydroxide was fused with manganese (IV) oxide in the presence of oxygen to form a green solid X. Solid X dissolved in water to form a green solution. On bubbling carbon dioxide gas through the green solution, a purple solution Y and a black solid were formed.
- (i) Name solid X and write equation for the reaction leading to the formation of X. (2½ marks)
- (ii) Write equation leading to the formation of solution Y. (1½ marks)

(iii) When sulphur dioxide was bubbled through acidified solution Y, the colour of the solution turned from purple to colourless. Explain. (3½ marks)

3. (a)(i) Define the term electrophilic substitution reaction. (01 mark)
- (ii) Explain why benzene undergoes electrophilic substitution reaction. (02 marks)
- (b) Write equation
- (i) To show how methylbenzene can be converted to benzene. (02 marks)
- (ii) For the reaction between methylbenzene and chlorine in the presence of aluminum bromide and outline a mechanism for the reaction. (04 marks)
- (c) Write the mechanism for the reaction between phenol and
- (i) chloroethane in alkaline medium. (04 marks)
- (ii) ethanoyl bromide in alkaline medium (04 marks)
- (d) Explain why a solution of phenol turns blue litmus paper red. (03 marks)
4. (a) Explain what is meant by the term ideal solution (03 marks)
- (b) At standard atmospheric pressure, hydrochloric acid and water form a constant boiling point mixture of boiling point  $110^{\circ}\text{C}$  and composition 20.5% by mass of hydrochloric acid.
- (i) Define the term constant boiling point mixture. (02 marks)
- (ii) Sketch a labelled diagram of the boiling point - composition for the system (boiling point of hydrochloric acid is  $85^{\circ}\text{C}$ ). (04 marks)
- (iii) Describe what would happen if a mixture of 10% hydrochloric acid is fractionally distilled. (03 marks)
- (c) A constant boiling point mixture of hydrochloric acid and water has a density of  $1.18\text{gcm}^{-3}$ . Calculate the stock molarity of hydrochloric acid. (02 marks)
- (d) The vapour pressure of a solution containing 1 mole of liquid X and 4 moles of liquid Z at  $20^{\circ}\text{C}$  is 0.750 atm.
- (i) Calculate the vapour pressure of the solution assuming that it is ideal. (vapour pressure of pure X and pure Z at  $20^{\circ}\text{C}$  are 0.674 and 0.453 atm respectively) (04 marks)
- (ii) State how the solution deviated from Raoult's law. Explain your answer. (02 marks)

**SECTION B**

5. For each of the following pairs of compounds.



name one reagent which;

(a) When reacted with each member of the pair will show similar observations. (08 marks)

(b) can be used to distinguish between the members of each pair. (12 marks)

In each case state what would be observed when each member of the pair is reacted with the reagent you have named).

6. (a) (i) Describe an experiment which can be carried out to determine the solubility product of silver oxalate. (6½ marks)

(ii) A saturated solution of silver oxalate contains  $1.1 \times 10^{-4}$  moles of the salt at  $25^\circ\text{C}$ . Determine the solubility of silver oxalate in a  $0.01M$  silver nitrate solution. (07½ marks)

(b) Explain the following observations.

(i) Silver chloride readily dissolved in aqueous ammonia. (03 marks)

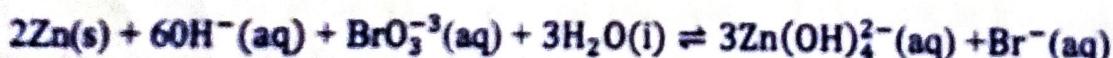
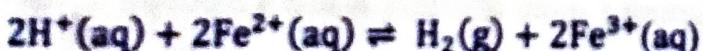
(ii) Barium sulphate is more soluble in lead (II) nitrate solution than in water. (03 marks)

7. (a) (i) Explain what is meant by the term standard electrode potential. (2 marks)

(ii) Explain any two factors that affect standard electrode potential. (04 marks)

(b) Describe with the aid of a labeled diagram how the standard electrode potential of a zinc electrode can be determined. (08 marks)

(c) The equations for some redox reactions are shown below.



(i) For each reaction, write the half cell reactions taking place at both the anode and the cathode. (2 marks)

(ii) For each reaction, write the cell made by combining the electrodes of each half cell. (02 marks)

- (iii) State what each symbol used in (c) (ii) stands for. (2 marks)
8. Explain the following observations.
- (a) The polarizing power of cations of group II elements are much higher than those of the cations of group I elements. (04 marks)
  - (b) Zinc chloride dissolves in water to give a solution whose PH is less than seven. (03 marks)
  - (c) Alkenes undergo electrophilic addition reactions whereas carbonyl compounds undergo nucleophilic addition reactions. (06 marks)
  - (d) methanoic acid is a stronger acid than ethanoic acid. (04 marks)
  - (e) lead (IV) chloride exists but lead (iv) bromide does not. (3 marks)