

P525/2
CHEMISTRY
(Theory)
Paper 2
April/May, 2024
2½ hours.

Uganda Advanced Certificate of Education

S.5 CHEMISTRY

THEORY

Paper 2

2 hours 30 minutes.

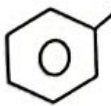
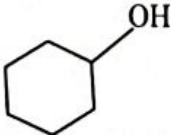
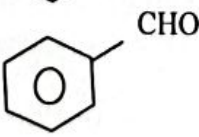
INSTRUCTIONS TO CANDIDATES:

- Answer five (5) questions including three questions from section A and any two from section B.
- Write your answers in the answer booklet (s) provided
- Begin each question on a fresh page.
- Mathematical tables and squared paper are provided.
- Silent non-programmable scientific electronic calculators may be used.
- Illustrate with equations where necessary.

SECTION A: (60MKS)

(Attempt three questions from this section).

1. Explain the following observations.
 - (a) When dilute hydrochloric acid is added to an aqueous solution of sodium thio sulphate, a yellow residue and a colourless gas are formed. (3mks)
 - (b) Solid lead (II) bromide does not conduct electricity while molten lead (II) bromide conducts electricity. (3mks)

- (c) When acidified potassium manganate (VII) solution is added to an aqueous solution of sodium nitrite, the purple colour turns colourless. (4mks)
- (d) The first ionization energy of aluminium is less than that of magnesium. (5mks)
- (e) When acidified sodium chlorate (I) is added to a solution of iron (II) ions, the green solution turns yellow which on addition of zinc dust and left to stand turns green. (5mks)
- 2(a) Describe how iron can be extracted from iron pyrite. (9mks)
- (b) Describe how 98% concentrated sulphuric acid can be prepared from iron pyrite. (7mks)
- (c) Explain the following;
- (i) Sulphur dioxide is not directly dissolved in water during the contact process. (2mks)
- (ii) Soils in which ammonium sulphate fertilizer is used are acidic. (2mks)
- 3(a) (i) What is meant by a colligative property? (1mk)
- (ii) State four examples of a colligative property. (2mks)
- (b) Describe an experiment with a labeled diagram showing how the molecular mass of a substance can be determined using the elevation in boiling point method. Show clearly how results can be treated. (11mks)
- (c) State any three limitations when using the above method. (3mks)
- (d) A solution was prepared by dissolving 7.5g of propan-1, 2, 3-triol. ($C_3H_8O_3$) in 200g of water at $25^\circ C$. Calculate the boiling point of the solution assume that the boiling point constant for water $K_b = 0.52^\circ C \text{ mol}^{-1} \text{ kg}^{-1}$. (3mks)
4. For each of the following pairs of compounds:
- (i) CH_3COCH_3 and $CH_3CH_2COCH_2CH_3$
- (ii) CH_3COOH and $HCOOH$
- (iii)  and 
- (iv) CH_3CHO and 
- Name one reagent which.
- (a) When reacted with each member of the pair will show similar observations. (8mks)

Can be used to distinguish between each pair. In each case state what is observed when a member is treated with the reagent. (12mks)

SECTION B: (40MKS). *(Attempt two questions from this section).*

- 5(a) (i) Describe the structure of a standard hydrogen electrode. (Diagram is required). (5mks)
- (ii) What is meant by a standard electrode potential? (1mk)
- (iii) State two reasons why it is hard to measure the electrode potential of an element absolutely? (2mks)
- (b) With a labeled, describe how the standard electrode potential of copper can be measured. (10mks)
- (c) State any two factors that affect the magnitude of standard electrode potential. (2mks)
- 6(a) Explain what is meant by isomerism? (2mks)
- (b) For each of the following, explain the isomerism with relevant examples in each case.
- (i) Structural isomerism. (13mks)
- (ii) Stereo isomerism. (5mks)
- 7(a) State what is meant by the term an ideal gas. (1mk)
- (b) Explain how liquefaction of a gas can be affected by;
- (i) Pressure. (2½mks)
- (ii) Temperature (2½mks)
- (c) The curves below show deviations of some gases from ideal behavior.

- (i) State why hydrogen shows a small deviation from ideal behavior compared to the other gases. (1½mks)
- (ii) Compare the deviations of oxygen and carbondioxide from ideal behavior. (2½mks)
- (d) A gas Q contains 30.43% nitrogen and the rest being oxygen. 0.23g of Q occupied 154.11 cm³ at 150°C and 840 mmHg. Determine the;
- (i) empirical formula of Q. (2mks)
- (ii) molecular formula of Q. (3½mks)
- [1 mole of a gas occupies 24dm³ at a temperature of 25°C and pressure of 760 mmHg].
- (c) When a mixture of Q and oxygen was bubbled through water, compound Y was formed.
- (e) (i) Identify Y. (½mk)
- (ii) Write equation for the reaction leading to the formation of Y. (1½mks)
- (iii) Briefly describe a test (s) that can be carried out to identify Y. (2½mks)
- 8(a) Explain what is meant by first ionisation energy? (2mks)
- (b) Explain how the following affect first ionization energy.
- (i) Nuclear charge. (4mks)
- (ii) Screening effect. (4mks)
- (iii) Atomic radius. (4mks)
- (iv) Electronic configuration (3mks)
- (v) Penetrating power of valence electrons. (3mks)

END