



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

AUGUST - DECEMBER 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

REGULAR PROGRAMME

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CHEM 200: DESCRIPTIVE INORGANIC CHEMISTRY OF S AND P BLOCK

Date: DECEMBER 2015

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

- Q1. The elements of atomic numbers 9, 19, 44 are either s- block or p-block or d-block.
- a) i What do you understand by the terms s-block, p-block or d-block? **(2 marks)**
- ii In which groups and blocks of the periodic table do these elements belong? Explain your reasoning. **(2 marks)**
- iii Give the electronic configurations of the elements. **(3 marks)**
- b) Describe the trend of properties for
- i Group 1 elements down the group
- a) First ionization energy. **(2 marks)**
- b) Atomic radius. **(2 marks)**
- ii Explain way an aqueous solution of sodium chloride is neutral whereas an aqueous solution of sodium hydrogen carbonate is alkaline. **(4 marks)**

- c) i How do you account for the fact that the melting points of group 2 metals is higher than that of group 1 metals. **(2 marks)**
- ii Beryllium chloride is substantially covalent but the chlorides of group 2 become more ionic on going down the group. How do you account for this? **(3 marks)**
- d) i Describe briefly how you would obtain a pure sample of aluminum chloride from aluminum. **(3 marks)**
- ii Give and explain the reaction of aluminum chloride with water and write an equation. **(4 marks)**
- e) Give the names of the following ions and in each case state the oxidation state of the halogen
- a) BrO^-
- b) ClO_2^-
- c) IO_3^- **(3 marks)**
- Q2. a) Outline giving equations where possible the extraction of aluminum starting with Bauxite ($\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$) **(14 marks)**
- b) Explain why aluminum cables are preferred to the better conducting copper cables for the overhead high tension transmission of electricity. **(1 mark)**
- c) Give the expected formula of aluminum chloride in solid and in gaseous state. Describe the bonding in these two molecules. (Al = 27.0; Cl = 35.5) **(5 marks)**
- Q3. a) Hydrogen chloride may be prepared by warming sodium chloride with concentrated sulphuric acid.
- i Write an equation for this reaction. **(2 marks)**
- ii Explain why similar reactions cannot be used to prepare hydrogen bromide and hydrogen iodide. **(2 marks)**
- iii Using equations, explain how hydrogen bromide and hydrogen iodide are prepared. **(4 marks)**

- b) Disproportionation occurs when chlorine reacts with hot aqueous sodium hydroxide solution.
- i What is meant by disproportionation? **(2 marks)**
 - ii Write the equation for the reaction. **(2 marks)**
- c) Describe the extraction of sulphur by Frasch process. **(8 marks)**
- Q4. Compare and contrast the following.
- a) MO_2 Oxides of potassium, carbon and nitrogen. **(10 marks)**
 - b) The properties of the hydrides of sulphur and oxygen. **(10 marks)**
- Q5. a) Discuss the general characteristics of oxides, hydrides and halides of group 4 elements. **(10 marks)**
- c) Describe the anomalous behaviour of Beryllium. **(10 marks)**

END