

KABARAK



UNIVERSITY

EXAMINATIONS

2008/2009 ACADEMIC YEAR

**FOR THE DEGREE OF BACHELOR OF EDUCATION
SCIENCE**

COURSE CODE: CHEM 221

**COURSE TITLE: COMPARATIVE STUDY OF S AND P
BLOCK ELEMENTS**

STREAM: SESSION IV & V

DAY: THURSDAY

TIME: 2.00 – 4.00 P.M.

DATE: 27/11/2008

INSTRUCTIONS:

Answer all the questions

PLEASE TURN OVER

Q1. a) (i). Give the general trend with explanation of the first ionization energies of the elements: H, Li and Na {2mks}

ii) What is electronegativity and how does it vary across period 2? {2mks}

iii) Lithium ion in solution should conduct electricity better than other ions of group one, but this is not the case. Comment on this statement. {1mk}

iv) State four factors that influence the ionization energy values of elements. {4mks}

b) (i) Comment on the solubility of fluorides and carbonates down the group compared to solubility of other S- block salts. {1mk}

ii) Describe using equations how the diagonal relationship is observed in the oxides of Be and Al in the formation of their salts with acid and water. {4mks}

iii) Explain the meaning of the term "Ionization potential (energy)". {1mk}

iv) Define electropositivity and state how it varies across the periodic table and down the group. {2mks}

Q2 (a). Comment on the following statements:

i) Aqueous Na_2CO_3 is alkaline while aqueous NH_4Cl is acidic {3mks}

ii) Generally across the period ionization energies increase, but the 1st ionization energy of Nitrogen is higher than that of oxygen. {3mks}

iii) The first ionization energy of Lithium is lower than that of Boron but higher than that of Sodium. {3mks}

iv) NaH decomposes at 380°C while LiH is stable upto 900°C {2mks}

b). i) Define an organometallic compound and show whether sodium acetate is an organo-metallic compound or not. {2mks}

ii) Give equations for the preparation of the following compounds:-

$\text{CH}_3 - \text{Mg} - \text{Br}$ and $\text{Al}(\text{CH}_3)_3$ {4mks}

iii) Account for the large decrease in electron affinity between Li and Be despite increase in nuclear charge {3mks}

- c) i) Boron halides are trivalent compounds and they act as Lewis acids. Explain
 { 3 mks }
- ii) Boron hydride fuels must be kept free from water. Explain this phenomenon using an equation
 { 1 mk }
- Q3. a) Explain how Aluminium (Al) can be obtained from Al_2O_3 Ore (Bauxite). Illustrate your answer with suitable chemical equations including the reactions at electrodes.
 { 6mks }
- b) Explain briefly the following observations:
- i) The atomic radius of Aluminium is 1.43 while that of Gallium is 1.41
 { 3mks }
- ii) Most Beryllium and Lithium salts are soluble in organic solvents.
 { 3mks }
- iii) The usual co-ordination number of Be^{2+} is four whereas Mg^{2+} is six
 { 2mks }
- c) Group IV elements form hydrides, which vary in size and ease of formation. Compare the hydrides of Carbon and silicon and explain the term catenation
 { 4mks }
- d) Write down the balanced equation for the reaction involving the preparation of orthophosphoric acid H_3PO_4 from calcium phosphate.
 { 1mk }
- 4 a) (i) Explain why the H- O - H bond angle in water is 105° while in H_2Se and H_2Te the bond angle becomes close to 90°
 { 2mks }
- ii) How does the acid strength vary among the halogen acids of the form HX down the group?
 { 2mks }
- iii) Write down the hydrolysis products of the following inter-halogen compounds. BrF_5 , IF_7 , ICl
 { 3mks }

b) Briefly explain the following observations

i.) Nitrogen is able to form compounds that have no counterparts in the other elements of group V for example NO_3^- , NO_2 , N_2O , NO etc. {2mks}

ii) The boiling point of Cl_2 and HF are -35°C and 19°C respectively. {2mks}