KABARAK UNIVERSITY

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 BLOCKS ELEMENTS

STREAM: SESSION IX

DAY: WEDNESDAY

TIME: 2.00 – 4.00 P.M.

DATE: 12/08/2009

INSTRUCTIONS TO CANDIDATES:

- You are provided with a periodic table

PLEASE TURN OVER

QUESTION ONE – 17 ½ MARKS

(a) Define the following terms

(i) Shielding effect of electrons. [1mk]

(ii) Covalent radius [1mk]

(iii) Ionization energy [1mk]

(b) Briefly state the contributions of the following scientists in the development of the periodic table.

(i) Dobereiner [2mks]

(ii) Lotha Meyer. [2mks]

(c) The first ionization energy for phosphorous is higher than that of sulphur while that of magnesium is higher than that of aluminium. Briefly account for these observations. [4mks]

(d) What is electronegativity and how does it vary across period 2 and down group 2? [2½ mks]

(e) Lithium ion in solution should conduct electricity better than other ions of this group but this is not the case. Comment on this statement. [3mks]

(f) Explain the trend in ionic size in an iso-electronic series. [2mks]

QUESTION TWO - 17 ½ MARKS

(a) Comment on the following statements.

(i) Aqueous Na_2CO_3 is alkaline while NH_4Cl is acidic. [3mks]

(ii) NaH decomposes at 380^0C while LiH is stable up to approximately 900^0C. [2mks]

(b) (i) Suggest a reason why lithium chloride (LiCl) is soluble in an organic solvent while sodium chloride (NaCl) is not soluble. [2mks]

(ii) Justify the position of Hydrogen in the periodic table. [2mks]

(c) Briefly describe how magnesium metal can be obtained via electrolysis from magnesium chloride ($MgCl_2$) [3 mks]

(d) Explain the following observations:

i) The atomic radius of Al is 1.43nm while that of Ga is 1.41nm. [2mks]

ii) Aluminium bromide is a poor conductor of electricity even in fused state but is a good conductor in aqueous solution. [1½ mks]

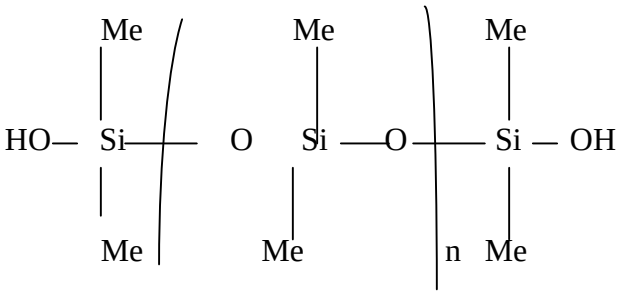
QUESTION THREE – 17 ½ MARKS

(a) (i) Define the term "Catenation". [1mk]

(ii) Carbon forms many compounds where as other group (IV) elements like silicon do not. Explain. [2mks]

(b) (i) Explain the observation that, tetra halides of group IV elements are such as $SiCl_4$ are easily hydrolysed but carbon halides such as CCl4 are not hydrolysed at all. [2mks]

(ii) Using equations show how the silicon polymer can be obtained



from tetrachlorosilane ($SiCl_4$). Show all the intermediates. [5mks]

(c) Show using equations how the diagonal relationship is observed in the oxides of Be and Al in the formation of their salts with acids and base. [4mks]

(d) Explain the variation in the basicity of the oxides of P, Sb and Bi [2mks]

(e) Nitrogen is able to form compounds that have no counterparts in the other elements of the group V for example NO_3, NO, NO_2 , etc. Briefly explain. [1½ mks]

QUESTION FOUR - 17 ½ MARKS

(a) How does the acid strength vary among the halogen acids down the group VII from HF, HCl, HBr to HI. [2mks]

(b) Explain the following observations:

(i) The boiling points of Cl_2 and HF are -35^0C and 19^0C, respectively. [2mks]

(ii) Interhalogen compounds of type A – X (heteronuclear) are more reactive than X-X (Homonuclear) halogen. [2mks]

(c) Write down the hydrolysis products of the following interhalogen compounds:- BrF_5, IF_7, ICl. Give a brief explanation. [4½ mks]

(d) Explain why the H-O-H bond angle in water is 105˚ while in H_2Te and H_2Se bond angles become close to 90˚. [3mks]

(e) Draw the structure of the following molecules:

(i) Pyrophosphorous acid [2mks]

(ii) Diborane. [2mks]