KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

INSTITUTIONAL BASED PROGRAMME (DECEMBER SESSION)

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 300: COMPARATIVE STUDY OF S- AND P- BLOCK ELEMENTS

DATE: WEDNESDAY, 27TH APRIL 2011 **TIME: 4.30 P.M. - 6.30 P.M.**

INSTRUCTIONS: ANSWER ALL THE QUESTIONS.

1. Suggest reasons for the following observations.

   a) Group 1 elements have the lowest first ionization energy values in their periods. (2 marks)

   b) CO_2 is a gas whereas SiO_2 is a solid (4 marks)

   c) PF_5 is known but NF_5 is not. (2 marks)

   d) NF_3 has no donor properties, but PF_3 forms many complexes with metals. (2 marks)

   e) What is the structure of $BeCl_2$ in the gaseous and in the solid state? What is $BeCl_2$ acidic when dissolved in water? (6 marks)

   f) The bond length between sulphur and oxygen; Se and O are shorter than expected. (2 marks)

Total (18 marks)

2. a) Give reasons for trivalency and monvalency in group 13 elements and comment on the validity of divalent compounds such as $GaCl_2$. (4 marks)

   b) Give one method for the preparation of diborane, B_2H_6. Why is it called an electron - deficient compound? Draw the structure of diborane and give the bond lengths. What is unusual about the bonding in this compound? (6 marks)

c) The hardness of water may be "temporary" or "permanent". What cause each of these conditions, and how is each treated? (4 marks)

d) Describe how you would prepare a Grignard reagent from Mg, and list five different uses of the reagent in preparative reactions. (6 marks)

(Total 20 marks)

3. a) The first element in each of the main groups in the periodic table shows anomalous properties when compared with other members of the same group. Discuss this statement with particular reference to the elements Li, Be and B. (8 marks)

b) Write equation(s) to show the reaction that take place when magnesium burn in air. (4 marks)

c) How would you prepare LiH and $LiAlH_4$. What are they used for: (4 marks)

d) Explain the differences in bond angles and boiling points of H_2O and H_2S. (4 marks)

Total (20 marks)

4. a) Draw the structure of:

i) XeO_6^{4-} (2 marks)

ii) $B_3N_3H_6$ (2 marks)

b) Suggest reasons why the only binary compounds of the noble gases are fluorides and oxides of Kr, Xe and Rn. (3 marks)

c) i) What is the principal ore of aluminium?

ii) How is the metal extracted

iii) State three uses of aluminium

(6 marks)

Total (13 marks)

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