



SOUTH EASTERN KENYA UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE (CHEMISTRY) AND

BACHELOR OF EDUCATION (SCIENCE)

SCH 201: CHEMISTRY OF THE MAIN BLOCK ELEMENTS

DATE: 21ST APRIL, 2017

TIME: 8.00-10.00 A.M

INSTRUCTIONS TO CANDIDATES

- (a) Answer question One and any other Two questions**
- (b) Question 1 carries 30 marks while the other questions carry 20 marks each**
- (c) Illustrate your answers with well labeled diagrams where appropriate**

QUESTION 1 (30 MARKS)

- (a) Explain the following, giving appropriate reasons;
 - (i) The oxidising character of elements increases and reducing character decreases as we move from left to right in a period (3 marks)
 - (ii) Metallic character of *p*-block elements decreases along a period but increases down a group. (3 marks)
- (b) Explain the reason for lithium having a greater tendency to form covalent compounds than the other elements in the group. (3 marks)
- (c) Explain why Group II elements are smaller than their Group I counterparts. (3 marks)
- (d) Describe the difference in structure between BeH_2 and CaH_2 . (4 marks)

- (e) 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 Be. (5 marks)
- (f) Give equations to show what reactions occur between CO and:
- (i) S (2 marks)
- (ii) Ni (2 marks)
- (g) Explain why nitrogen molecules have the formula N_2 , whilst phosphorus has the formula P_4 . (5 marks)

QUESTION 2 (20 MARKS)

- (a) Describe how you would make lithium hydride. (6 marks)
- (b) Explain four properties of alkali hydrides. (4 marks)
- (c) Explain why Group II elements are harder, and why they have high melting and boiling points than Group I elements. (4 marks)
- (d) Explain why compounds of Be are much more covalent than other Group II compounds. (4 marks)
- (e) Explain why the halides and hydrides of Be polymerize. (2 marks)

QUESTION 3 (20 MARKS)

- (a) List **four** uses of aluminium. (4 marks)
- (b) Explain the following:
- (i) BF_3 has no dipole moment, but PF_3 has a substantial dipole. (2 marks)
- (ii) BF_3 and BrF_3 molecules have different shapes. (2 marks)
- (c) Explain features which make borax a useful primary standard (2 marks)
- (d) Account for the reasons why CO_2 is a gas and SiO_2 is a solid. (4 marks)
- (e) Explain why CCl_4 is unaffected by water whilst $SiCl_4$ is rapidly hydrolysed. (4 marks)

- (f) Explain why SnI_4 is an orange coloured solid when CCl_4 and SiBr_4 are colourless liquids. (2 marks)

QUESTION 4 (20 MARKS)

- (a) Explain the properties to account for the abnormal behaviour of carbon (7 marks)
- (b) Explain why the dissociation energy of F_2 is less than that of Cl_2 (4 marks)
- (c) Give reasons to account for stability of clathrates (5 marks)
- (d) Explain why the vapour of all halogens is coloured (4 marks)

QUESTION 5 (20 MARKS)

- (a) List the main uses of fluorine. (4 marks)
- (b) Explain the bond angle in OF_2 and give a reason why it is different in Cl_2O . (4 marks)
- (c) State the main uses of Cl_2 . (3 marks)
- (d) Explain reasons why the only binary compounds of the noble gases are fluorides and oxides of Kr, Xe and Rn. (4 marks)
- (e) Give equations to show the reactions between sodium and:
- (i) H_2O (2 marks)
- (ii) Graphite (2 marks)

