



EMBU UNIVERSITY COLLEGE
(A CONSTITUENT COLLEGE OF THE UNIVERSITY OF NAIROBI)

FIRST SEMESTER EXAMINATIONS 2014/2015

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 201: CHEMISTRY OF THE MAIN BLOCK ELEMENTS

DATE: DECEMBER 15, 2014

TIME: 08:00 – 10:00AM

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions.

QUESTION ONE

- a) Inert gases are mono atomic in nature. Explain (3 marks)
- i) Mention the source or sources and method of production of noble gases. (3 marks)
 - ii) The elements oxygen and sulphur belong to group 16 in the periodic table. They have shown a wide range of reactions between themselves and other elements especially hydrogen.
- b) Present the chemical formulae of the hydrides formed between
- i) Sulphur and Hydrogen (2 marks)
 - ii) Oxygen and hydrogen (2 marks)
- c) Using stoichiometric equations present formation of oxides of sulphur (2 marks)
- d) Name the common allotropic forms of the element sulphur (2 marks)

QUESTION TWO

- a) Impurities of bauxite are gotten rid off during production of Al from impure aluminium oxide. Briefly with the aid of chemical equations show the behavior of Al_2O_3 and the impurities $\text{Fe}_2\text{O}_3(\text{s})$ and $\text{SiO}_2(\text{s})$ in the presence of concentrated $\text{NaOH}(\text{aq})$.
(3 marks)
- b) Carbon exhibits allotropy in its existence.
- What is meant by the term allotropy as applied to an element? (1 mark)
 - Give the sketches of the structures of the common allotropes of carbon.
(2 marks)
- c) Explain the differences in the following properties between the common allotropes of carbon.
- Electrical conductivity
 - Relative chemical reactivity (4 marks)
- d) Inert pair effect is first experienced in Group 13 of the p block elements. The effect is more pronounced in Groups 14 and 15.
- Explain the meaning of inert pair effect (2 marks)
 - Explain the cause of the inert pair effect (2 marks)

QUESTION THREE

- a) Define the terminologies:
- Electron affinity (2 marks)
 - Electronegativity (2 marks)

b) State and explain:

- i) Variation of electron affinity down a group (3 marks)
 - ii) Variation in electronegativity across a period (3 marks)
- c) i) Why does thiosulphuric acid readily undergo disproportionation? (2 marks)
- ii) Write an equation for disproportionation of thiosulphuric acid? (2 marks)

QUESTION FOUR

- a) Borax is a white crystalline solid, the most important compound of Boron.
- i) Give the chemical formula of borax (2 marks)
 - ii) Write the chemical reaction between borax and H_2O . (2 marks)
 - iii) How does H_3BO_3 ionize in water at low amounts? Explain how addition of glycerol affects this ionization. (4 marks)
- b) State one major source of the elements nitrogen and phosphorus respectively. Hence briefly describe how these two elements can be extracted from their sources? (4 marks)
- c) Explain why $SnCl_4$ is more covalent than $SnCl_2$ (2 marks)

QUESTION FIVE

- a) Lithium resembles magnesium in some of its properties.
- i) Name TWO such properties. (2 marks)
 - ii) What name is given to the resemblance in c (i) above? (1 mark)
 - iii) Give the reason for the resemblance above? (2 marks)
- b) Draw the structure of BrF_5 hence write its geometry. (3 marks)
- c) Hypophosphorus acid is a better reducing agent than phosphorus acid. Explain. (2 marks)

- d) Nitrogen can form a number of oxides with oxygen. Give the chemical formulae four of these oxides and for each case state the oxidation state of nitrogen in the molecule.

(4 marks)

QUESTION SIX

- a) Name the three series of oxo anions arising from sulphurous acid (3 marks)
- b) Discuss the variation in ionization energy for the elements of the period 3 of the Periodic Table (6 marks)
- c) Which of the two compounds PbCl_4 and PbCl_2 is more covalent? Explain your answer. (2 marks)
- d) Why does the acidity of HF increase with increase in concentration? (3 marks)

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