TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BTAC 15

ACH 4201 : S AND P BLOCK ELEMENTS

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 14 Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a) Explain briefly and concisely, the following observations or facts

(i) Li chemistry is almost similar to the chemistry of group II members. **[2mks]**

(ii) Glass made from boron or Al are more superior in quality than those made from Na_2O or K_2O [2**mks]**

(iii) Group III metals are much harder than group I **[1mk]**

(iv) Group I metals form mainly anhydrous salts **[2mks]**

(v) The covalent radius of Al is roughly 1.4Å, while that of Ga is 1.23Å yet Ga is below Al on the periodic table **[2mks]**

(vi) Explain why, caesium is stored under liquid hydrocarbons or in a sealed **[2mks]**

(vii) Down the group 3 members the formula of halides changes from $\mathbf{MX_3}$ to **MX** **[2mks]**

(viii) KO_2 exist, but $\mathbf{K_2O}$ does not exist **[2mks]**

(ix) The only binary compounds of noble gases are fluorides and oxides. **[1mk]**

(b) Using stoichiometric equations state three diagonal relationships between Li and Mg. [6**mks]**

(c) The table below represents some properties of the hydrides of group 6 elements. Use the information contained in the table and answer question that follow.

Hydride	ΔH of formation	Bond angle	Boiling point ◦C
H_2O	-242	H-O-H, 104°28’	100
H_2S	-20	H-S-H, 92°	- 60
H_2Se	+81	H-Se-H, 91°	- 42
H_2Te	+154	H-Te-H, 89°	- 2.3

Explain the trends in;

i. Stability of the hydrides. **[2mks]**

ii. Bond angle **[3mks]**

iii. Boiling point **[3mks]**

Question TWO

(a) Compare and contrast the formulas and stabilities of the oxidation states of the common nitrogen chlorides and phosphorous chlorides. **[6mks]**

(b) Explain why in; **$NH_3 \rightarrow BF_3$**, the **B—F** the distance is 1.38Å, and in **$Me_3N \rightarrow BF_3$** the distance **B—F** is 1.39Å, which are much longer than the 1.3Å in **BF_3** **[3mks]**

(c)

(i) State the three essential conditions necessary for Haber process **[4mks]**

(ii) State two sources for the raw material used in Haber process **[4mks]**

(d) State three economic importance of NH_3 **[3mks]**

Question THREE

(a) Suggest reasons for and against inclusion of H in the main group elements **[3mks]**

(b) What is meant by ‘hydrogen gap’? How does it a rise **[2mks]**

(c) Write down the general chemical equations for the reaction between hydrides of group I and group II with water **[2mks]**

(d)

(i) Give the other name for ‘inorganic benzene [1mk]

(ii) How is it different from benzene **[1mk]**

(e) State three differences between carbon and silicon which attributes to the differences between alkanes and silanes **[3mks]**

(f) Explain why trimethylamine is a Lewis base but trisiylamine is not . **[3mks]**

(g) Starting with $SiCl_4$, illustrate how silicone of benzene derivative can be prepared. **[5mks]**

Question FOUR

(a) Using examples explain how the chemistry of sodium is closely related to that of calcium metal **[4marks]**

(b) Explain how one can establish the presence of sodium metal from its ore. **[1mk]**

(c) State and write down the formula for the main ore of sodium metal **[2mk]**

(d) State the main raw materials required for extraction of Na **[1mk]**

(e) Using chemical equations explain the chemical process involved in recovering sodium metal from its ore **[7mks]**

(f) State two economic importance of sodium **[1mk]**

(g) Explain how tetraethyl lead [$Pb(C_2H_5)_4$], which is gasoline additive is prepared? State the challenges attached to its use **[2mks]**

Question FIVE

(a) State and write the formula of the chief constituent of Portland cement **[2mks]**

(b) Using explain the differences between permanent and temporary hardness of water **[4mks]**
(c) Explain how water hardness can be removed **[6mks]**
(d) State the raw materials required for large production of ammonia gas **[2mks]**
(e) State the condition required for Haber process **[3mks]**
(f) State why ammonium phosphate is more superior fertilizer than urea **[3mks]**

APPENDIX