THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A CONSTITUENT COLLEGE OF JKUAT)

(A Centre of Excellence)

Faculty of Applied and Health Sciences

DEPARTMENT OF **PURE AND APPLIED SCIENCES**

DIPLOMA IN SCIENCE LABORATORY TECHNOLOGY
(DSLT 12J)

ACH 2208: CHEMISTRY OF S & P BLOCK ELEMENTS

SPECIAL/SUPPLEMENTARY: EXAMINATIONS

SERIES: FEBRUARY 2013

TIME: 2 HOURS

INSTRUCTIONS:

You should have the following for this paper

- *Answer booklet*

This paper consists of ***FIVE*** questions.
Answer Question **ONE (compulsory)** and any other **TWO** questions
*This paper consists of **3 PRINTED** pages*

Question ONE

a) (I) Write down the electronic configuration of the following in Spd notation

(i) K(3) **(1mark)**

(ii) L (12) **(1mark)**

(iii) M(31) **(1mark)**

(iv) N(14) **(1mark)**

(v) O (15) **(1mark)**

(vi) P (8) **(1mark)**

(vii) Q(17) **(1mark)**

(II) Which of the elements in aI above

(i) Forms complexes of the nature $[MCl_4]^{2-}$ **(1mark)**

(ii) Has a high affinity for oxygen and thus forms complexes with it **(1mark)**

(iii) Its ion is highly hydrated and drags in aqueous solution resulting in low conductivity **(1mark)**

(iv) Is weakly metallic **(1mark)**

(v) Is a soft solid **(1mark)**

(vi) Oxidizes the rest of the elements except fluorine **(1mark)**

(vii) Is a diatomic gas **(1mark)**

b) Complete the following equations

(i) $H^- + H_2O \longrightarrow A + B$

(ii) $(C\equiv C)^{2-} + 2H_2O \longrightarrow C + HC\equiv C - H$

(iii) $N^{3-} + 3H_2O \longrightarrow NH_3 + D$ **(4marks)**

c) Explain the following of

(i) Beryllium forms more complexes than magnesium which also forms move complexes than calcium. Give two examples **(3marks)**

(ii) Boren does not form the B^{3+} cation while Aluminium does **(2marks)**

(iii) Hydrates aluminium compounds are acidic. Illustrate with the use of a balanced chemical equation. **(3marks)**

d) State the industrial application of the following

(i) NH_3

(ii) Al

(iii) $CaCO_3$

(iv) Magnesium **(4marks)**

Question TWO

a) (i) Give the name and chemical formula of the ore from which Aluminium is extracted **(2marks)**

(ii) State the solvent used in the extraction of aluminium arid write it formula. **(2marks)**

(iii) Give reason(s) why the graphite rods are to be replaced time after time in the extraction of aluminium .Write an equation for the reaction taking place. **(3marks)**

(v) State the two major impurities in the extraction n of Aluminion and explain how they are removed. **(3marks)**

b) (i) Explain FIVE properties of Aluminium **(5marks)**

(ii) Outline FIVE applications of Aluminium **(5marks)**

Question THREE

Graphite and diamond are allotropes of carbon and are different in many respects.

a) Explain the differences between graphite and Diamond in terms of
   (i) Bonding and structure **(6marks)**
   (ii) Conductivity **(2marks)**
   (iii) Density **(2marks)**
   (iv) Applications **(4marks)**

b) With reference to the electron pain repulsion theory predict the shapes of the following molecules and ions
   (i) NH_3 **(1 ½ mark)**
   (ii) NH_4 **(1 ½ mark)**
   (iii) CO_2 **(1 ½ mark)**
   (iv) H_2O **(1 ½ mark)**

Question FOUR

a) Explain any FIVE special features of nitrogen that makes it different from the rest of the elements in group VB **(10marks)**

b) Explain the following
   (i) Phosphine is less soluble than NH_3 **(2marks)**
   (ii) NH_3 has higher boiling point than pH_3 even though it is heavier. **(2marks)**
   (iii) pH_3 is more acidic than NH_3 **(1mark)**
   (iv) BiH_3 is a better reducing of agent a than the rest of group VB hydrides **(2marks)**

c) Outline any THREE applications of nitrogen **(3marks)**

Question FIVE

a) Give reasons for the following
   (i) Water boils at 100˚C while H_2S is a gas at room temperature. **(3marks)**
   (ii) SiO_2 is a high melting point solid white CO_2 is a gas at room temperature.

   (3marks)
   (iii) HF boils at higher temperature than HCl **(2marks)**

b) Phosphorus forms trivalent and pentavalent compounds. Explain with use of appropriate diagrams. **(6marks)**

c) (i) Draw the open structure of water **(2marks)**
   (ii) Give reasons why water is a universal solvent **(2marks)**
   (iii) State TWO applications of sulfurs **(2marks)**