



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

**UNIVERSITY EXAMINATION FOR:**

DIPLOMA IN ANALYTICAL CHEMISTRY

DAC 15S

ACH 2205: CHEMISTRY OF S AND P BLOCK ELEMENTS

END OF SEMESTER EXAMINATION

**SERIES:DECEMBER2016**

**TIME:2HOURS**

**DATE:**Pick DateSelect MonthPick Year

## Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

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

**Do not write on the question paper.**

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## Question ONE

- Define the following terms
  - Catenation (2marks)
  - Covalent radius (2marks)
  - Ionization energy (2marks)
- Outline **FOUR** factors which influence ionization energy (4 marks)
- Explain how diagonal relationships arise in the periodic table (2 marks)
- The ionization value IE<sub>1</sub> of magnesium is 737 kJmol<sup>-1</sup> higher than that of its counterpart Sodium (Na) 496 kJ mol<sup>-1</sup>.How can you explain the lowering of IE<sub>2</sub> value of the alkaline Earth metal over the Alkali metal?. [(Mg = 1450 kJ mol<sup>-1</sup>, Na=4562 kJ mol<sup>-1</sup>)]? (4marks)
- Discuss the diagonal relationship of lithium and magnesium (6marks)
- Lithium ion in aqueous solution should conduct electricity better than other ions of this group but this is not the case. Comment on this statement (4marks)
- Explain why lithium chloride (LiCl) is soluble in an organic solvent while sodium chloride (NaCl) is not soluble. (4 marks)

## Question TWO

- a) Describe using equations how the diagonal relationship is observed in the oxides of Be and Al in the formation of their salts with acid and water. (4marks)
- b) Explain briefly the following observations:
- i) Most Beryllium and Lithium salts are soluble in organic solvents (3 marks)
  - ii) The usual co-ordination number of  $\text{Be}^{2+}$  is four whereas  $\text{Mg}^{2+}$  is six (2 marks)
  - iii)  $\text{NaH}$  decomposes at  $380^{\circ}\text{C}$  while  $\text{LiH}$  is stable upto  $900^{\circ}\text{C}$  (3 marks)
- c) Comment on the solubility of fluorides and carbonates down the group compared to solubility of other S- block salts. (3 marks)

## Question THREE

- a) Aluminium reacts vigorously when heated with sulphur to give aluminium sulphide, explain why Aluminium sulphide can't be obtained by mixing solution containing aluminium ions and sulphide ion? how would you expect aluminium sulphide to react with water (6marks)
- b) Discuss the diagonal relationship of Beryllium and aluminium (6marks)
- c) Relate Fajan's Rule and Covalency to diagonal relationship (3 marks)

## Question FOUR

Carbon is the first element in group IV of the periodic table with two allotropes graphite and diamond

- a) Draw the structure of diamond and graphite (5 marks)
- b) using the structure drawn in 4b above explain why
- (i) Diamond is very hard while graphite is soft (3 marks)
  - (ii) Diamond is a poor electrical conductor while graphite is a good conductor of electricity (3marks)
- c) State two uses of diamond and graphite (4marks)

## Question FIVE

- a) Explain the following statements:
- (i) Aluminium Chloride is essentially covalent while Aluminium Fluoride is ionic (3 marks)
  - (ii) Aluminium oxide is amphoteric while Boric oxide is acidic (4 marks)
- b) Draw a flow diagram to illustrate the extraction of Aluminium (8 marks)