THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

AUGUST - DECEMBER 2016 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

REGULAR PROGRAMME

CHEM 104: CHEMICAL BONDING AND STRUCTURE

Date: DECEMBER 2016	Duration: 2 Hours
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Q1. a) Explain the dual nature of matter **(4 marks)**

b) Explain the assumption of Dalton Atomic theory **(6 marks)**

c) State the law of conservation of mass **(2 marks)**

d) Write and label the equation that relates to the speed, wavelength and frequency of electromagnetic radiation **(2 marks)**

e) Explain the importance of quantum number in relation to the property of atomic obitals and of their electrons **(6 marks)**

f) State and explain the three rules governing the electron configurations

(6 marks)

g) Write both the complete and shorthand electron configurations for iron (fe-atomic number 26) **(4 marks)**

Q2. a) Give five examples of electromagnetic radiation **(5 marks)**

b) Explain the Bohr model of hydrogen atom **(5 marks)**

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c)   Explain the change in atomic radius.

   i)   Along the period   **(2 marks)**

   ii)   Down the group in s-block elements   **(2 marks)**

d)   Alkali metals are good reducing agents. Explain   **(2 marks)**

e)   Radius of a cation is smaller than that of its parent atom. Explain

                                                            (3 marks)

Q3. a)   Explain why alkali metals used in photoelectric cells.   **(2 marks)**

b)   How does the electronegativity of m in m-OH classify it to be an acid or base?   **(6 marks)**

c)   Be $(OH)_2$ is insoluble in water but $Ba(OH)_2$ is soluble. Explain

                                                            (4 marks)

d)   Differentiate the following terminologies   **(6 marks)**

   i)   Van der walls radius

   ii)   Covalent radius.

   iii) Ionic radius

f)   Explain why second electron affinities are negative.   **(2 marks)**

Q4. a)   Differentiate diamagnetism from paramagnetism   **(4 marks)**

      (i)   Explain molecular orbital theory   **(6 marks)**

b)   What are the conditions to be meant before forming a bond. **(2 marks)**

c)   Define the following

   i)   Hydrogen bonding

   ii)   Hybrid orbitals

   iii) Metallic bond

   iv)   Polyatomic ion   **(8 marks)**

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Q5. a) i) Use the VSEPR theory to predict the molecular geometry of alumininum trichlonde ($AlCl_3$) **(4 marks)**

ii) Use the VSEPR theory to predict the shape of carbon dioxide (CO_2) and chloride ion (ClO_3^- **(6 marks)**

b) Define

i) Hybridization **(2 marks)**

ii) Intermolecular forces **(2 marks)**

c) Why do ionic compounds have generally higher melting points and boiling points and also do not vaporize readily at room temperature as many molecular compounds **(6 marks)**

END

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