KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: CHEM 111

COURSE TITLE: INORGANIC CHEMISTRY

STREAM: Y1 S1

DAY: TUESDAY

TIME: 2.00 – 4.00 P.M

DATE: 30/11/2010

INSTRUCTIONS:
Attempt all questions
Constants
h=6.626x10^{-34}Js, C=2.999x10^{8}m/s, R=1.09776x10^{7}m^{-1}

PLEASE TURNOVER

QUESTION ONE (20MARKS)

a) Define the following terms
   i. Electro negativity
   ii. Electron affinity **(4marks)**

b) Differentiate between nuclear charge and effective nuclear charge. **(2marks)**

c) Outline the factors that affect the magnitude of effective nuclear charge? Explain each of the factors. **(4marks)**

d) Which sets of quantum numbers describe the most easily removed electron in an aluminum atom in its ground state? **(4marks)**

e) Discuss the foundations of Dalton's atomic theory on chemical reactions. **(6marks)**

QUESTION TWO (20MARKS)

a) Define the terms
   (i) Bond length **(2marks)**
   (ii) Bond angle **(2marks)**

b) Differentiate between non-polar and polar covalent bonds. Give examples.
   (i) Non-polar covalent bond **(3marks)**
   (ii) Polar covalent bond **(3marks)**

c) Explain why water has stronger hydrogen bonding than hydrogen fluoride and ammonia? **(3marks)**

d) Outline the relationship between electronegativity and the ionic character of a chemical bond? **(2marks)**

QUESTION THREE (15MARKS)

a) Explain why the Bohr model of the atom is superior to the Rutherford's model. **(4marks)**

b) The wavelength of the radio waves of an FM station is 3.10 meters. Calculate the frequency(s^{-1}) used by the FM station? **(4marks)**

c) An electromagnetic radiation of λ=242nm is just sufficient to ionize Na atom. Calculate the ionization energy of Na atom. **(3marks)**

d) Calculate the energy emitted by a hydrogen when it moves from n=2 to n=1. **(4marks)**

QUESTION FOUR (15MARKS)

a) Outline the change that will occur for the following reaction if a few drops of HCl are added? Give an explanation for your answer.

$$CH_3CO_2H + H_2O \rightleftharpoons CH_3CO_2^- + H_3O^+$$ **(4marks)**

b) A sample of orange juice has a hydrogen ion concentration of 2.9×10^{-4} M. calculate the pH of the orange juice? **(3marks)**

c) Gallium (Atomic weight 69.72) has two naturally-occurring isotopes, the predominant one being ^{69}Ga with isotopic weight 68.9257 and an abundance of 60.47%. Calculate the weight of the other isotope? **(4marks)**

d) When 0.880 g of an organic compound containing carbon, hydrogen and oxygen is burned completely in oxygen, 1.760 g of CO_2 and 0.720 g H_2O are produced. Calculate the empirical formula of the compound? (Atomic weights: carbon = 12.01, H = 1.008, O = 16.00). **(6marks)**

e) Potassium per chlorate, $KClO_4$, may be prepared from KOH and Cl_2 by the following series of reactions. Calculate the moles of $KClO_4$ that can be prepared from 8 mole of KOH? (Atomic weights: K = 39.10; Cl = 35.45; O = 16.00; H = 1.008).

$$2\ KOH + Cl_2 ==========> KCl + KClO + H_2O$$
$$3\ KClO =========> 2\ KCl + KClO_3$$
$$4\ KClO_3 =========> 3\ KClO_4 + KCl$$ **(3marks)**