KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE- UNIVERSITY CHEMISTRY

COURSE CODE: PCHEM 011

COURSE TITLE: BASIC PHYSICAL AND INORGANIC
                                    CHEMISTRY

STREAM: SEMESTER ONE

DAY: TUESDAY

TIME: 9.00 – 11.00 A.M.

DATE: 11/08/2009

INSTRUCTIONS:

Attempt all questions

PLEASE TURN OVER

QUESTION ONE (20 MARKS)

a) Define the following terms.

    i.   Element

    ii.   Matter

    iii.   Atom   (6marks)

b) Differentiate between the following.

    i.   Homogeneous mixtures and heterogeneous mixtures

    ii.   Physical and chemical properties of substances.   (4marks)

c) According to Dalton's atomic theory, state and explain the three laws of chemical reactions.

    (6marks)

d) Illustrate the discovery of protons as explained by Rutherford.   (4marks)

QUESTION TWO (20 MARKS)

a) Balance the following equations

    i. $NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

    ii. $Ca_{(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(aq)} + H_{2(g)}$

    iii. $Ca(OH)_{2(aq)} + Na_2CO_{3(aq)} \longrightarrow CaCO_{3(s)} + NaOH_{(aq)}$

    iv. $Na_{(s)} + Cl_{2(g)} \longrightarrow NaCl_{(s)}$

    v. $Zn_{(s)} + HCl_{(aq)} \longrightarrow ZnCl_{2(s)} + H_{2(g)}$ (5marks)

b) Define the terms

    i.   Mole

    ii.   Molar mass   (2marks)

c) On analysis of an unknown ionic compound, the following were obtained; 2.82g of Na, 4.33 g of Cl and 7.83 g of Oxygen. Calculate the empirical formula of this compound.   (3marks)

d) A flask contains a solution with unknown amount of HCl. This solution is titrated with 0.101M NaOH. It takes 3.35ml of NaOH to complete the reaction with HCl. What is the mass of the HCl acid?   (5marks)

e) A chemist wants to prepare 0.25M HCl from a commercial HCl which is 12.4M. How many millilitres of the commercial acid does the chemist require to make up 1.0L of the dilute acid?

(5marks)

QUESTION THREE (15MARKS)

a) Using the orbital notation, give the electronic configurations of the following elements: Na (11), Ne(10), S(16)and Ca(20). (4marks)

b) The specific properties of an atomic orbital can be represented by four quantum numbers. Enumerate these quantum numbers and state the specific properties represented by each quantum number. (8marks)

c) Explain the variation in atomic radii within a period of a periodic table. (3marks)

QUESTION FOUR (15MARKS)

a) Define the terms;
   i. Electronegativity
   ii. Electron affinity (4marks)

b) The second ionization energies of elements are higher than the first ionization energies. Explain this observation. (3marks)

c) Ethanol is highly soluble in water unlike the corresponding alkane ethane. Explain this observation. (2marks)

d) Explain the nature of the following chemical bonds.
   i. Metallic bond
   ii. Covalent bond
   iii. Ionic bond (6marks)