KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY CHEMISTRY

COURSE CODE: **PCHEM 011**

COURSE TITLE: **BASIC PHYSICAL AND INORGANIC CHEMISTY**

STREAM: **SEMESTER ONE**

DAY: **THURSDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **18/03/2010**

INSTRUCTIONS:

Attempt All Questions

PLEASE TURN OVER

QUESTION 1

a) Explain the following
   i) Chemical property
   ii) Homogeneous mixture
   iii) Relative atomic mass
   iv) Isotopes **(4mks)**

b) i) Differentiate between empirical formula and molecular formula **(2mks)**
   ii) Combustion of 0.2 g sample of vitamin C yields 0.2998 g of CO_2 and 0.0819 g of H_2O.
      I) Given that vitamin C is a C – H – O compound, determine its empirical formula. [C = 12.01, H = 1.008, O = 15.999] **(8mks)**
      II) If molar mass of vitamin C is 264 g, determine its molecular formula **(3mks)**

c) A 15 ml sample of 0.45M sodium chloride is diluted to 100 ml. Calculate the concentration of the new solution. **(3mks)**

QUESTION 2

a) Define chemical equation? **(0.5mks)**

b) Briefly outline five types of molecular equations and give an example in each case. **(7.5mks)**

c) i) Balance the following redox equation in acidic medium;

$$Fe^{2+}(aq) + Cr_2O_7^{2-}(aq) \longrightarrow Fe^{3+}(aq) + Cr^{3+}(aq)$$ **(5mks)**

   ii) Identify oxidizing agent in the reaction **(1mk)**

d) Calculate the oxidation state of Cr in CrO_2^- **(3mks)**

QUESTION 3

a) What does 'group' and 'period' represent in a periodic table? **(2mks)**

b) i) Give the electronic configuration of two elements A and B having atomic number of 8 and 15 respectively. **(2mks)**
   ii) Identify the group and period in which the two elements are found in the periodic table. **(2mks)**

c) i) Explain why the atomic radii of elements decrease from left to right within a a period in the periodic table. **(2mks)**
   ii) Arrange the following atoms of elements in order of increasing atomic radii; Al, Si, N and Mg.

d) Briefly explain the following types of bonds giving examples in each case.
   i) covalent bond
   ii) ionic bond
   iii) hydrogen bond **(6mks)**

QUESTION 4

a) State the following laws
   i) Boyle's law
   ii) Hess's law
   iii) Le – chetalier principle **(6mks)**

b) Outline three factors that affect rates of reaction **(6mks)**

c) At elevated temperatures, BrF_5 establishes the following equilibrium;

$$2BrF_5(g) \rightleftharpoons Br_2(g) + 5F_2(g)$$

the equilibrium concentration of the gases at 1500º K are 0.0064 mol/L for BrF_5, 0.0018 mol/L for Br_2 and 0.009 mol/L for F_2.

i) Write equilibrium expression for the reaction **(2mks)**

ii) Calculate equilibrium constant for the reaction **(3mks)**