CHUKA UNIVERSITY

COLLEGE

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DIPLOMA IN ANIMAL HEALTH

CHEM 0111: BASIC INORGANIC AND PHYSICAL CHEMISTRY

STREAM: DIP. (ANHE) Y2S1 **TIME: 2 HOURS**

DAY/DATE: TUESDAY 27/7/2010 **2.30 P.M. - 4.30 P.M.**

INSTRUCTIONS:

Answer all the questions.

1. (a) (i) What are isotopes? [1 mark]

(ii) Write the electronic configuration of element $^{40}_{20}X$. [1 mark]

(b) Explain

(i) The size of atomic and ionic radius of group 1A elements. [2 marks]

(ii) Melting point of silicon compared to other elements in period three. [2 marks]

(c) Give two properties of

(i) ionic compounds [2 marks]

(ii) Covalent compounds [2 marks]

2. (a) How many moles and atoms of carbon are present in three moles of aspirin ($C_9H_8O_4$) (N_A=6.22 x 10^{23})? [3 marks]

(b) A student was required to use 0.25 moles of calcium phosphate [$Ca_3(PO_4)_2$] in an experiment. How many grams did he weigh? (Ca=40, P=31, O = 16)? [3 marks]

(c) Melamine contains 28.57% carbon, 4.8% hydrogen and the rest is nitrogen. If its molar mass is 126.13, what is its molecular formula (C=12.01, H=1.008, N=14.01)? [4 marks]

3. (a) Explain how concentration changes affect equilibrium. [4 marks]

(b) At 10°C, a litre of a mixture of NO_2 and N_2O_4 contains 0.0045 moles of N_2O_4 and 0.030 moles of NO_2.

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

Write the expression of equilibrium constant and calculate it. [3 marks]

4. (a) Define an acid and a base. [2 marks]

(b) Give two examples of

(i) acids with small acid dissociation constant (Ka) [2 marks]

(ii) bases with a large base dissociation constant (Kb) [2 marks]

(c) (i) How much 4M solution need to be diluted to form 100ml of 0.5M solution. [3 marks]

(ii) What is the molarity of a solution continuing 11.69 of sodium chloride in 2.5 litres of solution (Na = 23, Cl = 35.45)? [4 marks]

5. (a) What should be considered when selecting a salt to use in salt bridge? [2 marks]

(b) A galvanic cell consist of magnesium electrode in 1M magnesium nitrate solution and silver in 1M silver nitrate solution. [3 marks]

(i) Write the cell diagram of this cell. [1 mark]

(ii) Write the oxidation and reduction half equations and the overall reaction. [3 marks]

(iii) Given that

$Mg^{2+}(1M) + 2e^- \rightarrow Mg(S) \quad \in° = -2.37V$

$Ag^+(1M) + e^- \rightarrow Ag(s) \quad \in° = 0.80V$

Calculate the e.m.f. of this cell. [2 marks]

(iv) Calculate the mass of copper deposited on cathode when 2.0 A current flows through a solution of copper ions for one hour (Cu = 63.5, IF = 96500C) [4 marks]

(c) Give three methods to prevent corrosion. [3 marks]

6. (a) Compare solid and gaseous states of matter in terms of shape, volume, arrangement of particles, interaction between particles and movement. [5 marks]

(b) Make a sketch of phase diagram of water (pressure against temperature) Given that triple point is at 0.01°C and 4.58 mmHg. [3 marks]

(c) (i) Define a closed system, exothermic process and enthalpy. [3 marks]

(ii) What are the standard conditions for enthalpy changes? [2 marks]

(iii) What is enthalpy of formation? [2 marks]
