UNIVERSITY OF JAFFNA, SRILANKA

BACHELOR OF PHARMACY

THIRD YEAR FIRST SEMESTER EXAMINATION (old syllabus)–July 2013

PHACH 3101 PHARMACEUTICAL CHEMISTRY III

Date:22.102013 **Time: 3 Hours**

Answer all the six questions.

Molar gas constant, R= 8.314Jmol^{-1}K^{-1}= 0.082atmdm^{3}mol^{-1}K^{-1},Avagadro constant, N_A = 6.022x10^{23}mol^{1},

latm =101325Nm-^{2} = 760mmHg, Relative atomic masses: H = 1, Ca = 40, Cl = 35.3, Na =23, O = 16, S =32

1.

1.1 Define the following

1.1.1 Degree of dissociation. (10 Marks)

1.1.2 Partition coefficient (10 Marks)

1.2 The dissociation constant of NH_40H is 1.8x 10-^{5}mol/dm and that of CH_3COOH is 1.8 x 10^{-5}mol/dm^3, and Ionic product of water is 1.0 x 10^{-14}mol^2/dm^{6}at 27°C.

1.2.1 Derive the relations between hydrolysis constant (K_h) of CH_3COONH_4, Kw of water, Ka of weak acid and Kof weak base (25 Marks)

1.2.2 Based on the above derived equation calculatethedegree of hydrolysis of ammonium acetate. (25 Marks)

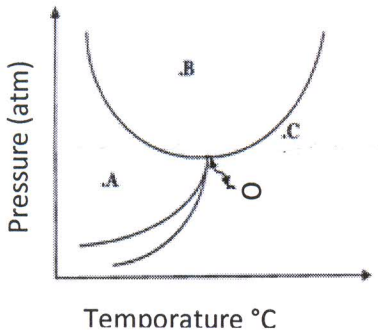
1.3 1.3.1 Define common ion effect (10 Marks)

1.3.2List the four applications of common ion effect with example (20 Marks)

2.

2.1 State the phase rule and define the terms said in the rule (25 Marks)

2.2 The Pressure *vs*Temperature diagram of a water system is given below.



Label the diagram and calculate the number of degrees of freedom corresponding to the points A,B,C & O. (40 Marks)

2.3 2.3.1 State the Raoult's law. (10 Marks)

2.3.2 Explain how non-ideal solutions deviate from Raoult's law. (25 Marks)

3.

3.1 Explain the following with one example.

3.1.1 Zero order reaction. (10 Marks)

3.1.2 Complex reaction. (10 Marks)

3.2 Substance A reacts based on first order kinetics where the rate constant is $K=5.0x10^{-5}sec^{-1}$. If the initial concentration of A is 1.0M, calculate the initial rate of the reaction (15 Marks)

3.3 3.3.1 Write the Arrhenius equation and explain all its components (15 Marks)

3.3.2 From the Arrhenius equation derive the expression for the activation energy Ea of a simple reaction (15 Marks)

3.3.3 The rate constant of a reaction was measured as a function of temperature and the results are given below. (35 Marks)

Temperature (K)	273.20	293.20	313.20	333.20
Rate constant(K) $x10^{-5}$ (min^{-1})	2.46	47.50	576.00	5480.00

Plot a curve and find out the activation energy

4. 4.1 Define the following terms

4.1.1 A closed system. (05 Marks)

4.1.2 An isolated system (05 Marks)

4.1.3 A open system. (05 Marks)

4.2 4.2.1 Derive the following equation using first law of thermodynamics.

$$Cp-Cv= (dH/dT)p - (dE/dT)v$$ (30 Marks)

4.2.2 From the above equation show that Cp-Cv= nR for an ideal gas. (10 Marks)

4.3 4.3.3 Derive the Clapeyron equation, using the equation dG= -SdT+ PdV (30 Marks)

4.3.2 α and β forms of a solid are at equilibrium at 247°C and 277°C. While the pressure are at 100 atm and 400 atm respectively. ΔH and ΔV for this process can be taken to be independent of temperature in this temperature range, if ΔV = 1.2 dm^3mol^{-1}, calculate the enthalpy of transformation of this process. (15 Marks)

5.

5.1 5.1.1 Write the Debye-Huckel equation and all its components (10 Marks)

5.1.2 A solution that contains 0.01 mol KCl, 0.005 mol MgCl, 0.002 mol MgS04 and 100g H_20 (density of water is 191ml). Calculate the

5.1.2.1. ionic Strength (20 Marks)

5.1.2.2. mean ionic activity coefficient of KCI and $MgCl_2$. (10 Marks)

5.2

The resistance of conductivity cell filled with 0.01moldm-^{3}KCI(aq) was 35.20 Ω at 25^{0}C.When cell was filled with 0.1 moldm^{-3} aqueous solution of a weak acid HA at the same temperature, the resistance was 18.36 Ω. The conductivity of 0.01moldm^{-3}KCI solution is 2.399xl0^{-1}Sm^{-1}at 25°C. Neglecting the conductivity of water. Calculate the following

5.2.1 Cell constant. (15 Marks)

5.2.2 Conductivity. (10 Marks)

5.2.3 Molar conductivity. (15 Marks)

5.3 Devise the electrochemical cells in which the following reaction take place.

5.3.1 $CrO_4^{2-}(aq) + 2\ Ag\ (s) + 2Fe^{3+}(aq) \longrightarrow Ag_2Cr0_4(s) + 2Fe^{2+}(aq)$ (10 Marks)

5.3.2 $3Fe^{2}+ \longrightarrow 2Fe^{3}+ (aq) + Fe(s)$ (10 Marks)

6.

6.1 Briefly explain the following terms used in photochemistry with the help of Jablonski diagram

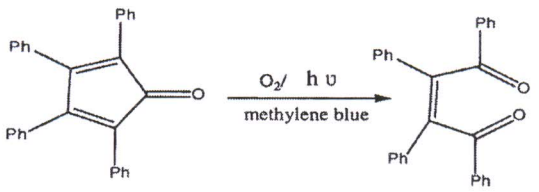
6.1.1 Internal conversion (05 Marks)

6.1.2 Intersystem crossing (05 Marks)

6.1.3 Fluorescence (05 Marks)

6.1.4 Phosphorescence (05 Marks)

6.2 6.2.1 Suggest plausible explanations for the following observation



(15 Marks)

6.2.2 Give the 1st and 2nd laws of photochemistry (10 Marks)

6.3 6.3.1 Classify and explain the different type of crystals.

(40 Marks)

6.3.2 Write the Bragg's equation and explain all its components (10 Marks)

6.3.3 Give two methods to measure the diffraction angle. (05 Marks)