UNIVERSITY OF JAFFNA, SRI LANKA

BACHELOR OF PHARMACY

SECOND YEAR SECOND SEMESTER EXAMINATION – JULY 2015

PHARMACEUTICAL CHEMISTRY III- PHACH 2201

Date: 06.07.2015 **Time: 3 Hours.**

ANSWER ALL THE SIX QUESTIONS

1 1.1 1.1.1 Define "Rate of Reaction". **(10Marks)**

1.1.2 The rate of formation of C in the following reaction is 1.0mol $dm^{-3}s^{-1}$. State the reaction rate and the rates of formation or consumption of A, B and D.

$2A+B \longrightarrow 2C+3D$ **(15 Marks)**

1.2 Consider the following reaction,

$A \longrightarrow$ Product

1.2.1 Derive the integrated rate equation for a first order reaction. **(20 Marks)**

1.2.2 Show how the half-life of a first order reaction of the above type of reaction is independent on the initial concentration of the reactant. **(15 Marks)**

1.2.3 The rate constant for the first order decomposition of a compound in the reaction $2A \longrightarrow P$ is $k=2.78\times10^{-7}\ s^{-1}$ at 25°C.

1.2.3.1 What is the half- life of A? **(25 Marks)**

1.2.3.2 If the initial pressure is 32.1kPa, what will be the pressure at 10 minutes after initiation of the reaction? **(15 Marks)**

2 2.1 2.1.1 Define 'pH'. **(10 Marks)**

2.1.2 Sketch the plots for pH *vs* volume of titrant and dpH/dv for NaOH and CH_3COOH titration. **(20 Marks)**

2.1.3 A solution was prepared by dissolving 0.02moles of acetic acid (pKa=4.8) in water to give 1L of solution. What is the pH of the dilute acetic acid? **(10 Marks)**

2.1.4 To thesolutionsaidinSection2.1.3, 0.008 moles of NaOH was added. Determine the pH of this solution. **(20 Marks)**

2.2 2.2.1 Explain'weak electrolytes'? **(10 Marks)**

2.2.2 The molar conductivity of 0.0250M Formic acid is 4.61 mSm^2mol^{-1}. Calculate the pKa value of formic acid? [I_{HCOO^-} = 5.46 mSm^2mol^{-1}, T^{H+}= 39.96 mSm^2mol^{-1}]

(30 Marks)

3 3.1 3.1.1 State the phase rule and define the number of degrees of freedom. **(10 Marks)**

3.1.2 Determine the number of phases, number of components and number of degrees of freedom in each of the following cases.

3.1.2.1 A saturated solution of NaCl with excess of solid of NaCl. **(10 Marks)**

3.1.2.2 Ammonium chloride undergoes thermal decomposition. **(10 Marks)**

3.1.2.3 Calcium carbonate in equilibrium with its composition of product.

(10 Marks)

3.1.2.4 A mixture of $CaCO_3(s)$, $CaO(s)$ and CO_2 (g) taken at random amounts.

(10 Marks)

3.2 3.2.1 Define'azeotrope'. **(10 Marks)**

3.2.2 Draw the temperature, composition diagram for ideal solution, high and low boiling azeotropes and give reasons for the differences in the diagrams.

(40 Marks)

4.1 4.1.1 Define electromotive force. **(10 Marks)**

4.1.2 Find the electromotive force for the following redox reactions.

$Zn_{(s)} \longrightarrow Zn^{2+}_{(aq)}$ E= - 0.763 V

$Cu^{2+}_{(aq)} \longrightarrow Cu_{(s)}$ E= + 0.340 V **(10 Marks)**

4.1.3 Calculate the cell potential for this reaction under the conditions and determine whether it will occur spontaneously. [Cu^{2+} = 1.0M, Zn^{2+} = $1.0x10^{-6}$ M]. **(20 Marks)**

4.2 4.2.1 The conductivity of 0.1MKCl solution at 298K is $0.0129Scm^{-1}$. The resistance of this solution in a conductivity cell is 580 ohms. 0.1M $AgNO_3$ solution at 298K in the same conductivity cell offered a resistance of 60.5ohms. Calculate the followings:

4.2.1.1 Cell constant. **(40 Marks)**

4.2.1.2 Conductivity of 0.1M $AgNO_3$ solution. **(20 Marks)**

5 5.1 5.1.1 Explain the followings:

5.1.1.1 Isothermal process **(05 Marks)**

5.1.1.2 Reversible process **(05 Marks)**

5.1.1.3 Irreversible process **(05 Marks)**

5.1.1.4 Adiabatic process **(05 Marks)**

5.2 5.2.1 Derive an expression for the maximum work obtainable when 'n' moles of an ideal gas expands isothermally and reversibly from an initial volume of V_1 to a final volume of V_2 at temperature T. **(20 Marks)**

5.2.2 A sample containing of 2.00 moles of He is expanded isothermally at 22°C from 22.8*L* to 31.7*L*. For the following process calculate Heat, Work, Enthalpy and Internal energy.

5.2.1.1 Reversibly. **(30 Marks)**

5.2.1.2 Against a constant external pressure equal to final pressure of the gas. **(20 Marks)**

5.2.1.3 Freely (against zero external pressure). **(10 Marks)**

6 6.1 6.1.1 Write down Arrhenius equation and identify its component. **(10 Marks)**

6.1.2 The rate of the second order decomposition of acetaldehyde was measured over the temperature range 700-1000K, and the rate constants are reported below. Find out the activation energy of the reaction. **(50 Marks)**

Temperature (T/K)	700	730	760	790	810	840	910	1000
Rate constant ($K, dm^3/mol$)	0.011	0.035	0.105	0.343	0.789	2.17	20.0	145

6.2 6.2.1 Define 'Electrode'. **(10 Marks)**

6.2.2 List the different type of electrodes with examples. **(10 Marks)**

6.2.3 Write short note on 'glass electrode' for pH measurement. **(20 Marks)**