

UNIVERSITY OF JAFFNA, SRI LANKA
FACULTY OF ALLIED HEALTH SCIENCES
SECOND YEAR SECOND SEMESTER EXAMINATION IN BPharmHons IN
PHARMACY- 2019
PHACH 2224-PHARMACEUTICAL CHEMISTRY III

Date:15.02.2022

Time: 3 Hours

ANSWER ALL THE SIX QUESTIONS

1. 1.1 Define "Half-life" of a reaction. (10 Marks)
- 1.2 Drive the integrated rate equation for a first order reaction, when a reactant 'A' is converted to a product 'P'. (40 Marks)
- 1.3 The rate constant for the first-order decomposition of a drug is $k = 2.78 \times 10^{-7} \text{ s}^{-1}$ at 25 °C.
 - 1.3.1 What is the half-life of this drug? (30 Marks)
 - 1.3.2 If initial pressure is 32.1 kPa, what will be the pressure after 10 s from initiation of the reaction? (20 Marks)

2. 2.1 2.1.1 Define the "component" of a system. (15 Marks)
- 2.1.2 Find out the number of phases and components in an aqueous solution of glucose? (20 Marks)

- 2.2 2.2.1 Draw the temperature-composition diagrams for partially miscible liquids. (45 Marks)
- 2.2.2 Explain the diagrams draw in 2.2.1 with suitable example. (20 Marks)

3. 3.1 3.1.1 Define "solubility product". (20 Marks)
- 3.1.2 An experiment is performed in which 100 mL of 0.300 M $\text{Ca}(\text{NO}_3)_2$ are mixed with 200 mL of 0.20 M NaF.
 - 3.1.2.1 Will precipitation occur? (25 Marks)
 - 3.1.2.2 What is the concentration of fluoride in the solution when the reaction is complete? (25 Marks)
- 3.2 Briefly discuss about the importance of crystallography technique in pharmaceutical industry. (30 Marks)

4. 4.1 4.1.1 Define "Calorimetry". (10 Marks)
- 4.1.2 A system has constant volume ($\Delta V=0$) and the heat around the system increases by 45 J. Determine the value of internal energy of the system in Joules? (20 Marks)
- 4.2 4.2.1 Define "Gibbs free energy". (20 Marks)
- 4.2.2 The reaction occurs at 68 °F, the change in heat (ΔH) = 19,070 cal, and the change in entropy (ΔS) = 90 cal/K.
- $$\text{ATP} \longrightarrow \text{ADP} + \text{Pi}$$
- 4.2.1.1 Calculate the Gibbs free energy change (ΔG) for the following chemical reaction. (30 Marks)
- 4.2.1.2 State whether reaction is spontaneous or not? (20 Marks)
5. 5.1 What is electrolyte. (10 Marks)
- 5.2 Briefly discuss about strong electrolyte and weak electrolyte. (40 Marks)
- 5.3 Derive Ostwald's dilution law for weak electrolyte. (30 Marks)
- 5.4 The molar conductivity of 0.0250 M HCOOH (aq) is 4.61 mSm² mol⁻¹. Determine the pKa of the acid. (20 Marks)
6. 6.1 Define "elementary reaction". (20 Marks)
- 6.2 Drive the rate law for the decomposition of N₂O₅,
 $2 \text{N}_2\text{O}_{5(\text{g})} \rightarrow 4 \text{NO}_{2(\text{g})} + \text{O}_{2(\text{g})}$
 on the basis of the following mechanism:
- $$\text{N}_2\text{O}_5 \rightarrow \text{NO}_2 + \text{NO}_3 \quad k_a$$
- $$\text{NO}_2 + \text{NO}_3 \rightarrow \text{N}_2\text{O}_5 \quad k_{a'}$$
- $$\text{NO}_2 + \text{NO}_3 \rightarrow \text{NO}_2 + \text{O}_2 + \text{NO} \quad k_b$$
- $$\text{NO} + \text{N}_2\text{O}_5 \rightarrow \text{NO}_2 + \text{NO}_2 + \text{NO}_2 \quad k_c$$
- (80 Marks)