

UNIVERSITY OF JAFFNA, SRI LANKA  
FACULTY OF ALLIED HEALTH SCIENCES  
SECOND YEAR SECOND SEMESTER EXAMINATION IN BPharmHons 2022  
PHACH 2224-PHARMACEUTICAL CHEMISTRY III

Allied Health Sciences

Date: 10 NOV 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 Define phase diagram. (10 Marks)
- 2.2 2.2.1 Draw the phase diagram for the water and carbon dioxide. (40 Marks)
- 2.2.2 Briefly explain the difference in between them. (20 Marks)
- 2.3 Briefly discuss the pharmaceutical applications of eutectic mixture. (30 Marks)
  
3. 3.1 3.1.1 Define "partition coefficient". (10 Marks)
- 3.1.2 When a solution of 1.00 g of X in 100 cm<sup>3</sup> of water was shaken with 10 cm<sup>3</sup> of ether, 0.80 g of X was transferred to the ether layer.
  - 3.1.2.1 Calculate the partition coefficient of X between ether and water. (30 Marks)
  - 3.1.2.2 How much X extracted into the ether layer if it shaken the original solution of 1.00 g of X in 100 cm<sup>3</sup> of water with just 5 cm<sup>3</sup> of ether. (30 Marks)
- 3.2 Briefly discuss the importance of crystallography technique in pharmaceutical industry. (30 Marks)

4. 4.1 Define “reversible” and “irreversible” processes. (20 Marks)
- 4.2 2 moles of an ideal gas at 300 K and 12 atm pressure underwent expansion isothermally to half the initial pressure. Calculate the work done by the gas on the surrounding ( $R=8.314 \text{ JK}^{-1}\text{mol}^{-1}$ ) for its expansion under the following conditions:
- 4.2.1 irreversibly against zero external pressure. (20 Marks)
- 4.2.2 irreversibly against the 6 atm external pressure. (30 Marks)
- 4.2.3 reversibly. (30 Marks)
5. 5.1 What is electrochemical cell. (10 Marks)
- 5.2 Given that the standard potentials of the  $\text{Cu} / \text{Cu}^{2+}$  and  $\text{Zn} / \text{Zn}^{2+}$  are respectively  $E^{\circ}\text{Cu}(\text{Red}) = +0.339 \text{ V}$ ;  $E^{\circ}\text{Zn}(\text{Red}) = -0.762 \text{ V}$ .
- 5.2.1 Write the half cell-reactions for each process. (20 Marks)
- 5.2.2 Identify the anode and the cathode. (10 Marks)
- 5.2.3 Write the balanced equation for the overall cell reaction that occurs. (10 Marks)
- 5.2.4 Write down the cell notation. (20 Marks)
- 5.2.5 Calculate the standard cell potential of a voltaic cell. (30 Marks)
6. 6.1 Write short note on followings:
- 6.1.1 Electrode (40 Marks)
- 6.1.2 Real time monitoring (30 Marks)
- 6.1.3 Liquid-liquid phase diagram (30 Marks)

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