

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: B.PHARM
BRANCH: PHARMACY

SEMESTER: III
SESSION: MO 2025

SUBJECT: BP302T PHYSICAL PHARMACEUTICS I

TIME: 3.00 Hours

FULL MARK: 75

INSTRUCTIONS:

1. The missing data, if any, may be assumed suitably.
2. Before attempting the question paper, be sure that you have got the correct question paper.
3. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
4. This question paper consists of (03) three parts. Read the part wise instructions before attempting the questions.

PART-I

Objective types questions (Instruction: Answer all questions)

Q1. (10 x 2 = 20 Marks)

- A. What are organic molecular complexes? Explain with suitable examples.
- B. Define partial miscibility and discuss how the presence of foreign substances influences the solubility of partially miscible liquid pairs.
- C. How does ionization affect drug distribution between two immiscible solvents?
- D. Differentiate between physical adsorption and chemical adsorption.
- E. What do you mean by wetting agents? What is the principle of their action?
- F. What are eutectic mixtures?
- G. Define polymorphism and explain its pharmaceutical significance.
- H. The three isomeric forms of dichlorodiphenyltrichloroethane (DDT), which are para, meta, and ortho, possess dipole moments of 1.10 D, 1.55 D, and 1.90 D, respectively. How does the magnitude of the dipole moment correlate with the toxicity of these isomers?
- I. Define Buffer capacity.
- J. What are chelates? Give an example of a hexadentate ligand.

PART-II

Short Answers

(Instruction: Answer seven out of nine questions)

(7 x 5 = 35 Marks)

- Q2. What are inclusion complexes? Describe the mechanism involved in their formation.
- Q3. What are buffers? Explain the *Henderson-Hasselbalch* equation for a weak acid and its salt?
- Q4. Write short notes on solubilization and detergency.
- Q5. Enlist the various methods used for the determination of surface tension. Explain in detail the capillary rise method and the Du Noüy ring method with their principles and working.
- Q6. Explain the colorimetric method for pH determination.
- Q7. (a) State the limitations of distribution law (2 marks) (b) Calculate the distribution coefficient ($K_{w/o}$) of boric acid between amyl alcohol at 25°C. The concentration of boric acid in water is 0.0510 mole/liter and in amyl alcohol is found to be 0.0155 mole/liter. (3 marks)
- Q8. What is the effect of an increase in pressure by 1 atm on the freezing point of water? The molar volume of ice is 19.651 cm³/mole, the molar volume of water is 18.018 cm³/mole, and the molar heat of fusion is 1440 cal/mole. [1 atm = 1.013 × 10⁵ Pa, 1 cal = 4.184 J]
- Q9. What are buffers? Explain the *Henderson-Hasselbalch* equation for a weak acid and its salt?
- Q10. Explain any two methods of analysis for determining the stability constant and stoichiometry of a complex.

PART-III

Long Answers

(Instruction: Answer two out of three questions)

(2 x 10 = 20 marks)

- Q11. Define protein binding and describe its importance with suitable examples. Derive the Scatchard plot equation and explain how it is used to determine the association constant of the drug-protein complex.
- Q12. (a) Explain the solubility behaviour of phenol in water with reference to partial miscibility. Discuss the effect of temperature and the concept of critical solution temperature. (5 marks) (b) Explain the phase diagram of water and discuss the process of lyophilization. (5 marks)
- Q13. (a) Define solubility and explain the mechanism of solute-solvent interaction (5 marks) (b) Discuss the various factors affecting the solubility of drugs with suitable examples. (5 marks)