

Bachelor of Pharmacy Second Year First Semester Examination, 2023

Physical Pharmaceutics I

Time: Three hours

Full Marks: 75

Answer any five questions taking at least one from each group.

Group A

1. a) Define surface tension. Write the unit of surface tension in CGS and MKS system.
- b) When a drop of liquid is suspended in air, it assumes a spherical shape. Why?
- c) Derive an equation for the determination of surface tension of a liquid by the capillary rise method.
- d) A 2% w/v solution of wetting agent has a density of 1.008 g/cm<sup>3</sup>. The solution rises 3.3 cm in a capillary tube having an inside diameter of 0.04 cm. Calculate the surface tension of the solution. 2+3+6+4=15
2. a) What is surface free energy. Derive the equation  $\Delta G = \gamma \times \Delta A$ , where  $\Delta G$  = increase in surface free energy,  $\gamma$  = surface tension,  $\Delta A$  = increase in surface area.
- b) Calculate the HLB of a mixture of 40% of Span 60 and 60% of Tween 60. HLB of Span 60 = 4.7 and HLB of Tween 60 = 14.9
- c) Explain Langmuir adsorption isotherm. Derive the equation of Langmuir adsorption isotherm. 6+4+5=15

Group B

3. i) Write the types of solvents with example OR What is solvation / dissolution and association.
- ii) Write the factors influencing the solubility.
- iii) Explain Raoult's law and ideal solution with a diagram. 5+5+5=15
4. i) Explain the working principle of Abbe's Refractometer with a diagram and write its application.
- ii) Write Distribution law, its limitations and application. (5+3) + (1+3+3) = 15

Group C

- 5.a) How to make 30ml of a 1% solution of procaine hydrochloride isotonic with body fluid? [NaCl equivalent= 0.21]
- b) Discuss about the various methods of adjusting tonicity.
- c) Define buffers. Elaborate the importance of pH maintenance in various pharmaceutical dosage forms. 5+5+(1+4)=15
6. Write short notes on any 3 of the following:
  - a) Gelsication.
  - b) "Gases can be liquefied under high pressure in a closed chamber. When the pressure is reduced, the liquid reverts to gaseous state". Discuss how this property can be used in development of pharmaceutical formulations.
  - c) Importance of polymorphism in pharmaceutical formulation development.
  - d) Hydrates and solvates. 5x3=15

[ Turn over

**Group D**

7. Define complexation. Give the electron configuration, hybridization type, and type of complex of the following metal ion complexes:

$[\text{Cu}(\text{NH}_3)_4]^{2+}$  and  $[\text{Fe}(\text{CN})_6]^{3-}$

What is a chelate? Give the examples of organomolecular complex formed by (i) donor-acceptor mechanism and (ii) charge transfer mechanism. What is a molecular sieve? Explain with an example. Give the structure of Butesin-picric acid complex and its use.

$$2+4+1+4+2+2 = 15$$

8. Give the importance of drug-protein complexes. Deduce the equation for Klotz reciprocal plot and Scatchard plot. Write the importance of Scatchard plot. What is Sandberg equation? Write its importance. Describe equilibrium dialysis method for the estimation of drug-protein complexes.

$$3+(4+2) +1+1+1+3 = 15$$