

(iv) Rhombic sulfur in equilibrium with monoclinic sulfur

(v) A mixture of hydrogen gas, oxygen gas and water vapour (5,10)

6. (a) Explain the term photosensitization with at least three examples along with their mechanism.

(b) Calculate the absorbance of an opaque solution having 10 percent transmittance at 400 nm.

(c) Explain the phase diagram of the sulfur system with neat labeling. Discuss in detail the various phase equilibria involved and the significance of the triple point. (5,5,5)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 260

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Unique Paper Code : 2173010034

Name of the Paper : Phase Equilibria and Photochemistry

Name of the Course : **B.Sc. (Prog.) Physical Science**

Semester : IV

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions.
3. Use of Scientific calculator is permitted.

1. (a) State the phase rule. Explain the various terms involved. Discuss the deviation of phase rule.
(b) Distinguish between congruent and incongruent melting points.
(c) Explain the concept of Critical Solution Temperature (CST) with example.
2. (a) Draw the phase diagram of water and explain the significance of the triple point.
(b) Explain upper and lower critical solution temperatures with examples.
(c) State the Nernst Distribution Law and its applications.
3. Write short note on any **three** of the following.
 - (a) Azeotrope
 - (b) Lambert-Beer's law and its limitations
 - (c) Lever rule
 - (d) Quantum yield

4. (a) The specific volumes of ice and water at 0 °C are 1.0907 cm³ and 1.0001 cm³, respectively. What would be the change in melting point of ice per atm increase of pressure? Molar heat of fusion of ice is 6009.9 J mol⁻¹.
(b) Discuss the application of the Clausius-Clapeyron equation to liquid-vapour equilibrium. (5,5,5)
(c) Explain the principle of steam distillation. (5,5,5)
5. (a) What do you understand by the terms multiplicity, singlet states and triplet states? Explain the phenomenon of fluorescence and phosphorescence using Jablonski diagram.
(b) Calculate the degrees of freedom for following :
 - (i) A gas is in equilibrium with its solution in a liquid
 - (ii) Two partially miscible liquids in absence of vapour
 - (iii) A mixture of nitrogen and oxygen gases contained in a vessel