CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Chem-DSE 12: Phase Equilibria and Photochemistry	04	02	-	02	Class XII with Science	

Learning Objectives

The Learning Objectives of this course are as follows:

- To develop basic understanding of Phase, Component, Degree of freedom, basic principles of phase equilibria,
- To understand phase diagram of one and two component systems.
- The students will also gain an understanding of Binary solution, distillation of binary solution, CST and distribution law & its applications.

Learning outcomes

By studying this course, students will be able to:

- Understand phase equilibrium, criteria, CST, Gibbs-Duhem-Margules equation.
- Apply the concepts of phase, conductance and distribution law while studying otherchemistry courses and every-day life.
- Explain low and high quantum yield, photosensitized reactions

Syllabus

Unit 1: Phase Equilibria (Hours: 22)

Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems; Clausius-Clapeyron equation and its applications to solid-liquid, liquid-vapour and solid-vapour equilibria, Phase diagram for one component systems (H_2O and S). Phase diagrams for systems of solid-liquid equilibria involving eutectic, congruent and incongruent melting points.

Binary solutions: Gibbs-Duhem-Margules equation, its derivation and applications to fractional distillation of binary miscible liquids (ideal and non-ideal), azeotropes, lever rule, partial miscibility of liquids, CST, miscible pairs, steam distillation. Nernstdistribution law: its derivation and applications.

Unit 2: Photochemistry (Hours: 8)

Characteristics of electromagnetic radiation. Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws of photochemistry, quantum yield, examples of low and high quantum yields

Photosensitized reactions, Jablonski's diagram. Role of photochemical reactions in biochemical processes, chemiluminescence.

Practical component Credits: 02

(Laboratory periods: 60)

Phase Equilibrium
1. Determination of critical solution temperature and composition at CST of the phenol water system.
2. Effect of impurity on CST of phenol-water system (NaCl and succinic acid).
3. Construction of the phase diagram using cooling curves :
   a. Simple eutectic.
   b. Congruent melting system(s).
4. Distribution of acetic/ benzoic acid between water and chloroform or cyclohexane.
5. Study of equilibrium of any one of the following reactions by distribution method:

   (i) I_2 (aq) + I^- (aq) $\rightleftharpoons$ I_3^-(aq)
   (ii) Cu^{2+} (aq) + $nNH_3 \rightleftharpoons$ $[Cu(NH_3)n]^{2+}$

References:

Theory:

1. Atkins, P.W.; Paula, J.de. (2014), **Atkin's Physical Chemistry Ed**., 10th Edition, OxfordUniversity Press.

2. Ball, D. W. (2017), **Physical Chemistry**, 2nd Edition, Cengage Learning, India.

3. Castellan, G. W. (2004), **Physical Chemistry**, 4th Edition, Narosa.

4. Kapoor, K.L. (2015), **A Textbook of Physical Chemistry**, Vol 1, 6th Edition, McGrawHill Education.

5. Kapoor, K.L., **A Textbook of Physical Chemistry**, Vol 3, 5th Edition, McGraw HillEducation.

Practical:

1. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), **Senior Practical Physical Chemistry**, R.Chand & Co, New Delhi.

2. Kapoor, K.L. (2019), **A Textbook of Physical Chemistry**, Vol.7, 1st Edition, McGrawHill Education.

3. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. (2003), **Experiments in PhysicalChemistry**, 8th Edition, McGraw-Hill, New York

Additional Resources:

1. Moore, W.J. (1972), **Physical Chemistry**, 5th Edition, Longmans Green & Co. Ltd.
2. Glasstone, S. (1948), **Textbook of Physical Chemistry**, D. Van Nostrand company, NewYork.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.