Physical Chemistry (2)

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Prerequisites
CHM	242	Physical Chemistry (2)	4	2	3	1	CHM 241

Objectives:

- Improve the students' knowledge of the laws of phase transformations of pure substances followed by applications
- Use the typical phase diagrams of gases, liquids, and solids as well as to determine the azeotropic mixtures solutions point.
- Describe the basic principles of chemical equilibria and relationships with thermodynamic function and PH of solutions.
- Describe different types of Chemical Kinetic reactions, integration of rate equations, and zero, first, second order cases, rate constant. Introduce the principles and Kinetics of complex multistep reactions. Consecutive reactions. Concept of rate determining step and reaction intermediate.

Syllabus:

Physical Transformations of Pure Substances, Phase Diagrams, Three Typical Phase Diagrams, Phase Stability, Location of Phase Boundaries, Ehrenfest Classification of Phase Transitions Phase Transitions, Ehrenfest Classification of Phase Transitions. Physical Liquid Surface, Surface Tension. Curved Surfaces.

Phase Transformations: Phases, Definitions. The Phase Rule, Two-Component Systems, vapor Pressure Diagrams. The Lever Rule. Temperature-Composition Diagrams. Distillation of Mixtures, Azeotropes, Immiscible Liquids. Distillation of Partially Miscible Liquids, Liquid-Solid Phase Diagrams, Eutectics.

Chemical Equilibrium: Spontaneous Chemical Reactions, The Gibbs Energy Minimum, Exergonic and endergonic reactions. The Description of Equilibrium, Perfect gas equilibria. The general case of a reaction, the relation between equilibrium constants, molality and mole fractions. The Response of Chemical Equilibria to Conditions, the Response to Pressure. The Response to Temperature. The Response to pH. Revision on the Response of Chemical Equilibria to Conditions. Acid-base equilibria in water and Buffer solutions.

Quantitative chemical kinetics Integration of rate equations, zero, first, second order cases, rate constant.Graphical analysis of rate data for rate constant and half-life determination for each case. Dependence of rate on temperature.Arrhenius equation and activation energy,Kinetics of complex multistep reactions. Consecutive reactions.Concept of rate determining step and reaction intermediate. Surface reactions involving adsorbed reactants (Langmuir and Freundlich adsorption isotherm).

Textbook:

Physical Chemistry, K. J. Laidler, J. H. Meiser, B. C. Sanctuary, Houghton Mifflin Company, 2003, 4th Ed or later [ISBN: 0618123415]

References:

Atkins, P., and J. de Paula. Physical Chemistry. 8th ed. New York, NY: W.H. Freeman and Company, 2001 (ISBN: 9780716735397)