

CH-333 Advanced Physical Chemistry

Credit Hours: 3-0

Pre-requisite: Nil

Course Objectives

1. This course will provide the students with an extensive theoretical knowledge about different kinetic theories of gases, chemical kinetics of third order reactions as well as the comparison between classical and quantum mechanics, And application of Schrodinger wave Equation for particle in one-dimensional box. Student will also be able to understand the electrochemistry and its application.

Contents

2. Photochemistry. Principles of photochemistry. Laws of photochemistry. Einstein's law of photochemical equivalence. Rates of intramolecular processes. Chemical reactions and their quantum yields. Hydrogen – bromine and hydrogen – chlorine reactions.

3. Statistical Thermodynamics. Microstates, macrostates, and multiplicity, Maxwell-Boltzmann statistics, Fermi-Dirac and Bose-Einstein statistics (introductory level only), partition function

4. Quantum Chemistry. Limitation of classical mechanics, Wave and particle nature of matter, de Broglie's equation, Heisenberg's uncertainty principle. Schroedinger wave equation and its solution for particle in 1-dimensional box. Concept of quantization of energy.

5. Electrochemistry: An introduction to electrochemistry, chemical reactions and redox potentials, electrochemical cells and types of electrodes. Nernst's equation and its application, cell potential and thermodynamics. Electrode potential, liquid junction potential, transference number. Ions in aqueous solution. Ionic activity and Debye Hückel theory..

Course Outcomes

1. On successful completion of the course the student will be able to:

Explain the behavior of gases while using kinetic molecular theory.

Explain several thermodynamic quantities and their applications in Chemistry.

Explain the chemical kinetics of third order reaction with effect of different reaction conditions.

Use fundamental concepts of quantum mechanics to solve different problems in Chemistry

Recommended Books

1. Alberty, R. A., Robert J.S. and Mounji G. B. “ Physical ” Chemistry . 4th ed, JohnWiley and Sons (2004).
2. McQuarrie, D. A., Physical Chemistry; A Molecular approach, Viva Books Pvt.Limited, 2008.
3. Atkins, P., Physical Chemistry, 10th Edition, Published in Great Britain by Oxford University Press (2014)
4. Ira. N Levine., Physical Chemistry, 5th Edition, Publish by McGRAW-HILL, printed in Singapore (2003).
5. Electrochemical Methods: Fundamentals and Applications, 2nd Edition, by Allen J. Bard, Larry R. Faulkner. 2000
6. Ball, D W., Physical Chemistry 1st ed.”Brooks/Cole Co. Inc. (2003).
7. Smith, E. Brain, Basic Chemical Thermodynamics” 5th ed., Imperial College Press(2004).
8. Chorkendorff, I. and Niemantsverdriet, J.W. “ Concept of Modern Catalysis and Kinetics 1st ed., John Wiley and Sons (2003).
9. Espenson, J. H. Chemical Kinetics and Reaction Mechanism 2nd ed., McGraw Hill(2002).