

M.Sc. Semester I - Chemistry
PAPER: CHEM 403: PHYSICAL CHEMISTRY - I
[CSIR- UGC - NET - TOPICS: 7(P), 8(P), 12 (I)]

Total Credits – 3

Total Hours – 45

Objectives:

- To understand the principles of activity and fugacity as well as to impart fundamental concepts of solution thermodynamics involving ideal and non-ideal systems and to compute phase & reaction equilibrium data.
- To predict the behaviour of macroscopic quantities of compounds based on molecular properties using statistical thermodynamics.
- To identify the changes in concentration of radioactive material with time and to determine nuclear binding energies as well as the amount of energy released in a nuclear reaction.

Unit-1 Chemical Thermodynamics

Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.

Unit-2 Statistical Thermodynamics

Statistical thermodynamics: Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems.

Unit-3 Nuclear Chemistry

Nuclear binding energy, Radioactivity, Artificial isotopes, nuclear fission, Syntheses of trans-uranium elements, the separation of radioactive Isotopes, Nuclear fusion, Applications of isotopes, Sources of ^2H and ^{13}C , radio-analytical techniques and activation analysis.

References:

1. Physical Chemistry by Peter Atkins and Julio de Paula Ninth Edition Published by Oxford University Press, 2010.
2. Inorganic Chemistry by Catherine E. Housecroft and Alan G. Sharpe Second Edition, Published by Pearson Education Limited 2005.
3. Modern Nuclear Chemistry, Second Edition. Walter D. Loveland, David J. Morrissey, and Glenn T. Seaborg, Published by John Wiley & Sons, Inc. 2017.
4. Principle of Physical Chemistry by Puri Sharma Pathania 47th Edition Published by Vishal Publishing co. 2018.
5. Textbook of physical chemistry 2nd Edition by Samuel Glasstone Published by Macmillan, 1948.