CHEMISTRY- 1

Module-1

(To develop basic concept of quantum mechanics and its applications in bonding and spectroscopy)

1. Structure Bonding: Failure of classical mechanics, uncertainty principle, wave nature of particles, Schrödinger equation (need not be derived), interpretation of wave functions, Molecular Orbital theory of diatomic molecules and metallic bonding.

   (No of lectures-7)

2. Spectroscopy and photochemistry: Interaction and radiation with matter, microwave, IR and UV-Vis spectroscopy: Basic Concepts of selection rules and application to molecular structure determination.

   (No of lectures-5)

Module - 2

(To develop the basic concepts of thermodynamics and its application to chemical systems)

1. Thermodynamics and chemical equilibrium: variables of states: 1^{st} law of thermodynamics and applications to ideal gas, enthalpy and heat capacity, Measurement of enthalpy and heat capacity, thermo-chemical calculation 2^{nd} law of thermodynamics concepts of entropy, entropy in physical and chemical changes, molecular interpretation of entropy.

   The free energy concepts: application to gases: Gibbs Helmholtz equation: free energy change and criterion of spontaneity of chemical equation; free energy change and criterion of spontaneity of chemical reactions and chemical equilibrium.

   Physical, ionic and chemical equilibrium.

   (No of lecturers- 9)

2. Phase rule: one and two component systems H_2O , S, Cd-Bi and Fe-C systems

   (No of lecturers- 3)

Module - 3

(To develop basic concepts about the rates of reactions Basic idea on homogeneous and heterogeneous catalysis process)

1. Reaction Kinetics and catalysis: collision theory; order and molecularity of reaction kinetics of zero, 1^{st} and 2^{nd} order reactions; activation energy, theory of absolute reaction rates, homogeneous and heterogeneous catalysis.

(No of lectures-6)

Module-4

(To develop concepts of electrochemistry and solid state)

1. Electro chemistry: Electro chemical cells, EMF and free energy change of electrochemical reactions, electrode potentials and measurements with reference to standard hydrogen electrode and their application to redox processes, Measurement of EMF, determination of pH, Dry cells , fuel cells and storage cells

(No of lectures – 6)

2. Solid state: crystal systems , Bravais lattices, closed packed structures, ionic solids, crystal defects including Schottky and Frankel defects

(No of lectures-4)

BOOKS:

1. Physical chemistry by G.M.Barrow, 5^{th} edition, Tata McGraw Hill, New Delhi 1992
2. Physical Chemistry by P.W. Atkins, $5^{th}/6^{th}$ edition, oxford
3. Textbook of Chemistry –I, Kalyani Publisher.

BCH 191Chemistry practical

(Any TEN experiments to be performed)

1. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
2. Determination of Total hardness of water by EDTA method.
3. Estimation of calcium present in the limestone.
4. Preparation of aspirin.
5. Standardization of $KMnO_4$ using sodium oxalate.
6. Determination of ferrous iron in Mohr's salt by potassium permanganate.
7. Determination of Rate constant of acid catalyzed hydrolysis of ester.
8. Determination of dissolved oxygen in a sample of water.
9. Determination of Viscosity of a lubricating oil by red wood Viscometer.
10. Determination of Flash point of a given oil by Pensky Marten's Flash point apparatus.
11. Determination of available chlorine in bleaching powder.
12. Determination of carbon residue of a lubricating oil by Conardson method.
13. Determination of aniline point of a lubricating oil.
14. Determination of partition coefficient of iodine in oil-water mixture.
15. Determination of acid value of a lubricating oil.

BOOK : B. Tech practical Chemistry-Kalyani publisher