Physical chemistry

1-**Solutions**: solution composition , Partial molar quantities, Ideal solution , Ideally dilute solution.

2-**Nonideal solution** : Activities and Activity coefficients, Excess functions, Solutions of electrolytes, The Debye-Hukel theory of electrolyte solutions, Ionic association, Standard-state thermodynamic properties of solution component, Nonideal gas mixtures.

3-**Reaction equilibrium in nonideal systems**: The equilibrium constant, Reaction equilibrium in non-electrolyte solutions ,Reaction equilibrium in electrolyte solutions, Reaction equilibrium involving pure solids or pure liquids, Reaction equilibrium in nonideal gas mixtures,Temperature and pressure dependences of the equilibrium constant, Standard states ,Coupled reactions ,Gibbs energy change for reaction.

4-M**ulticomponent phase equilibrium**: Colligative properties, Vapor-pressure lowering, Freezing-point depression and boiling-point elevation , Osmotic pressure, Two-component phase diagrams, Two-component liquid -vapor equilibrium, Two-component liquid-liquid equilibrium , Two-component solid-liquid equilibrium, structure of phase diagram, three-component systems.

5-E**lectrochemical systems**: Electrochemical systems , Thermodynamics of electrochemical systems, Galvanic cells, Thermodynamic of galvanic cells, liquid-junction potentials , Application of EMF measurements , The electrical double layer.

6-**Kinetic-molecular theory of gases**: Pressure of an ideal gas, Temperature , Distribution of molecular speeds in an ideal gas, Applications of the Maxwell distribution, Collisions with a wall and effusion, Molecular collisions and mean free path, The barometric formula, The Boltzmann distribution law, Heat capacities of ideal polyatomic gases.

7-**Reaction kinetics**: Measurement of reaction rates, Integration of rate laws, Determination of rate law, Rate law and equilibrium constants for elementary reactions, Reaction mechanisms, Temperature dependence of rate constant, Relation between rate constants and equilibrium constants for complex reaction, The rate law in nanideal systems, Unimolecular reactions, Trimolecular reactions, chain reactions and free-radical polymerizations, Fast reactions, Reactions in liquid solutions, Catalysis, Enzyme catalysis, Heterogeneous catalysis, nuclear decay.