

Chemistry.

*Electronic structure of atoms.* The Bohr theory. Heisenberg uncertainty principle. The nature of the light. Photoelectric effect. The de Broglie relation. Atomic orbital shapes . Electron configurations and periodicity.

*Chemical bonds.* Atomic weight and molecular weight. The mole concept. Electronegativity. Metals and nonmetals. Covalent, polar-covalent, ionic bond. Hybrid orbitals. The resonance concept. Delocalized bonding. Metal bond. Intermolecular bonds. Molecular geometry

*Chemical thermodynamics.* The first law of thermodynamics. Hess' law. Spontaneity of chemical reactions. Entropy. The second law of thermodynamic. Free energy and useful work. Free energies and equilibrium.

*States of matter.* The ideal gas. The combined gas law. Dalton's law of partial pressures. Kinetic molecular theory. The real gases Vapor pressures of liquids. Crystalline solids. Liquid crystals. Heating and cooling curves. Changes of states. Clausius-Clapeyron equation. Phase diagrams.

*Chemical equilibrium.* The equilibrium constant. Thermodynamics and chemical equilibrium The pressure and the temperature in the chemical equilibrium.

*Acids and bases.* Acid-base equilibria in aqueous solution. Ionization of water and pH. Dissociation of weak electrolytes. Buffers. Hydrolysis. Acid-base indicators.

*Properties of the solutions.* Concentration units. Raoult's law. Fractional distillation. Colligative properties of the solutions.