

Syllabus of Ph.D. Entrance Examination 2018

14. CHEMISTRY

- 1. Spectroscopy:** Basic principles and application of IR, UV, ESR and Raman.
- 2. Spectroscopy:** Basic principles and application of NMR and MS.
- 3. Chemical Thermodynamics:** Laws of thermodynamics, Joule-Thomson effect, Partial molar quantities, Gibbs Duhem equation, Chemical potential, Fugacity, ΔG_{mix} and ΔS_{mix} , Thermodynamic probability, Boltzmann distribution law.
- 4. Electrochemistry:** Nernst equation, Electrode kinetics, Electrical double layer, Debye-Hückel theory, Corrosion, Lead storage battery, Fuel cells, EMF and ΔG relationship, Polarography, Potentiometry.
- 5. Transition metals, coordination compounds and supramolecular chemistry:** Magnetic, catalytic and color properties of transition metals. Bonding theories (VBT, CFT, MOT), Octahedral, Tetrahedral, Tetragonal complexes, Electronic spectra of coordination complexes, Term symbol, Reaction mechanisms, General aspects of supramolecular chemistry.
- 6. Nuclear chemistry and radioactivity:** Radioactive disintegration, Half life time and average life time, Nuclear reactions, Fission and fusion, Nuclear forces and nuclear models, Radioactive isotopes and their application, Radio-analytical techniques and activation analysis.
- 7. Reactions and reagents:** Reactive intermediates and organic reaction mechanism: Carbonium ion, Carbanion, Free radicals, Carbene, Nitrene and Benzyne. SN^1 , SN^2 , E^1 , E^2 ,

Addition on carbon-carbon and carbon-heteroatom multiple bond, Aromatic electrophilic and nucleophilic substitution reactions.

8. **Biomolecules:** Chemistry of Peptides, Carbohydrates, Nucleic acids and lipids.
9. **Chemistry of natural products:** Steroids, Alkaloids, Terpenes, Flavanoids
10. Pericyclic reactions, Environmental chemistry and nanotechnology. Computers in chemistry. Catalysis, Green chemistry and Medicinal chemistry