

# DEPARTMENT OF INDUSTRIAL CHEMISTRY

## FACULTY OF SCIENCE

### Syllabus for Ph.D. Admission test 2022-23 onwards

#### SECTION -B

**Common named reactions and rearrangements** – applications in organic synthesis. 7. Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations. 8. Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups. (i) Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes.

- (i) Functional groups inter-conversion
- (ii) Connection and Disconnection approach
- (iii) Protection-deprotection of functional groups such as -OH, -CHO, -C=O, -COOH and -NH<sub>2</sub>

**Spectroscopy**- Structure determination of organic compounds by IR, UV-Vis, <sup>1</sup>H & <sup>13</sup>C NMR and Mass spectroscopic techniques.

**Corrosion**: Phenomenon of corrosion, Direct chemical corrosion and its mechanism, Electrochemical corrosion and its mechanism, various type of Corrosion, Factors influencing corrosion, corrosion control. Economic Impact of corrosion, corrosion rate Expressions and Allowances, Corrosion Reactions and Free Energy change, Characteristics of corrosions Environments, Biologically Influenced Corrosion, corrosion control by Cathodic and Anodic Protection.

**Polymer chemistry**: Molar masses; kinetics of polymerization. Molecular weight and molecular weight distribution: Average molecular weight, number - average and weight-average molecular weights, sedimentation and viscosity average, molecular weights, practical significance of molecular weight and molecular weight distribution; size of polymer molecules, determination, of molecular weight (viscosity, osmometry, light scattering).

**Polymer properties** : Glassy state and glass transition temperature, factors influencing T<sub>g</sub>, T<sub>g</sub> and T<sub>m</sub>, Importance of T<sub>g</sub>, amorphous state, viscoelasticity and five regions of viscoelastic behaviour of polymers, rubber elasticity, mechanical properties of polymers, polymer degradation Thermal, oxidative, photo-degradation), polymer stabilization.

#### **Chemical Reaction Engineering.**

Rate of reaction, Elementary and Non-elementary reactions, Molecularity and Order of reaction, Mechanism of reaction, Temperature dependency from thermodynamics, Arrhenius and Collision theories.

### **Chemical Reactor Analysis.**

Integral and differential methods for analyzing kinetic data, Interpretation of constant volume batch reactor data for zero, first, second and third order reactions, Half life period, Auto catalytic reaction, Interpretation of variable volume batch reactor data for zero, first and second order reactions, enzyme catalyzed reactions. Industrial reactors, Space time and Space velocity. Design of single ideal reactor - Batch, CSTR. Multiple reactions: Independent, Parallel and Series reactions, Instantaneous and over all fractional yield.

### **Pollution & its control.**

Introduction to lithosphere, hydrosphere, biosphere, atmosphere. Radiation balance of the earth. Lapse rate & temperature inversion. Air pollution: Introduction, classification, air pollutants & their effects, control of air pollution. Water pollution- Introduction, water pollutants: oxygen demanding wastes, pathogens, nutrients, salts, thermal pollution, heavy metals, pesticides, volatile organic compounds; characterization of wastewater, methods & equipments used in wastewater treatment. Soil & land pollution. Trace elements- pollution & control.

**Interdisciplinary topics** 1. Chemistry in nanoscience and technology. 2. Catalysis and green chemistry. 3. Medicinal chemistry. 4. Supramolecular chemistry.