



# GATE Syllabus

Part II – LIFE SCIENCE (XL)  
Section–XL-P Chemistry



**tutorialspoint**

S I M P L Y E A S Y L E A R N I N G

[www.tutorialspoint.com](http://www.tutorialspoint.com)



<https://www.facebook.com/tutorialspointindia>



<https://twitter.com/tutorialspoint>

## PART II – LIFE SCIENCE (XL)

### Course Structure

Section-Code	Topics
Section XL-P	Chemistry
Section XL-Q	Biochemistry
Section XL-R	Botany
Section XL-S	Microbiology
Section XL-T	Zoology
Section XL-U	Food Technology

## Section – XL-P: Chemistry

### Course Syllabus

#### Unit 1: Atomic Structure and Periodicity

- Planck's quantum theory
- Wave particle duality
- Uncertainty principle
- Quantum mechanical model of hydrogen atom
- Electronic configuration of atoms and ions
- Periodic table and periodic properties:
  - Ionization energy
  - Electron affinity
  - Electronegativity
  - Atomic size

#### Unit 2: Structure and Bonding

- Ionic and covalent bonding
- MO and VB approaches for diatomic molecules
- VSEPR theory and shape of molecules

- Hybridization
- Resonance
- Dipole moment
- Structure parameters such as bond length
- Bond angle and bond energy
- Hydrogen bonding and van der Waals interactions
- Ionic solids
- Ionic radii and lattice energy (Born-Haber cycle)
- HSAB principle

### **Unit 3: s, p and d Block Elements**

- Oxides
- Halides and hydrides of alkali
- Alkaline earth metals
- B, Al, Si, N, P, and S
- General characteristics of 3d elements
- Coordination complexes:
  - Valence bond and crystal field theory
  - Color, geometry
  - Magnetic properties
  - Isomerism

### **Unit 4: Chemical Equilibria**

- Colligative properties of solutions, ionic equilibria in solution, solubility product, common ion effect, hydrolysis of salts, pH, buffer and their applications
- Equilibrium constants ( $K_c$ ,  $K_p$  and  $K_x$ ) for homogeneous reactions

### **Unit 5: Electrochemistry**

- Conductance
- Kohlrausch law
- Cell potentials
- EMF
- Nernst equation
- Galvanic cells
- Thermodynamic aspects and their applications

## Unit 6: Reaction Kinetics

- Rate constant
- order of reaction
- molecularity
- activation energy
- Zero, first and second order kinetics
- catalysis and elementary enzyme reactions

## Unit 7: Thermodynamics

- First law of Thermodynamics:
  - Reversible and irreversible processes
  - Internal energy
  - Enthalpy
  - Kirchhoff equation
  - Heat of reaction
  - Hess's law
  - Heat of formation
- Second law:
  - Entropy
  - Free energy and work function
- Gibbs-Helmholtz equation
- Clausius-Clapeyron equation
- Free energy change
- Equilibrium constant and Trouton's rule
- Third law of thermodynamics

## Unit 8: Structure-Reactivity Correlations and Organic Reaction Mechanisms

- Acids and bases, electronic and steric effects, optical and geometrical isomerism, tautomerism, conformers and concept of aromaticity
- Elementary treatment of SN1, SN2, E1 and E2 reactions, Hoffmann and Saytzeff rules, addition reactions, Markownikoff rule and Kharash effect
- Aromatic electrophilic substitutions, orientation effect as exemplified by various functional groups
- Diels-Alder, Wittig and hydroboration reactions
- Identification of functional groups by chemical tests