

# Chemistry

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**LECTURES** 42

**TUTORIALS** There will not be classroom tutorials. Once in 2/3 weeks, a set of assignment problems will be given. The solutions will be circulated a couple of weeks later.

**CONTENTS**

## Structure and dynamics

- Failure of Classical Mechanics and the success of Quantum Mechanics
- Wave-particle duality, Uncertainty Principle, Postulates of Quantum Mechanics
- Operators, Schrödinger Equation, Born Interpretation of Wave function
- Solvable quantum problems
- Theorems of Quantum Mechanics
- Solvable quantum problems
- Approximation methods
- Structure of diatomic molecules
- Spectroscopy – Selection rules – Beer-lambert law
- Rotational and vibrational Spectroscopy
- Nuclear Magnetic Resonance Spectroscopy
- Photochemistry

## Chemical Kinetics

- Rates of reaction and rate laws
- Determination of rate laws – Steady-state approximation
- Temperature dependence of rate constants

## Chemical Equilibrium

- Spontaneous chemical reactions – equilibrium
- Response of equilibrium to conditions

## Electrochemistry

- Electrostatics and electrochemical systems
- Galvanic cells – EMF
- The Nernst equation – standard electrode potentials

## Coordination Chemistry

- The Coordination Bond
- Valence Bond Theory
- Crystal Field Theory
- Crystal Field Stabilization Energy
- Molecular Orbital Theory
- Electronic Spectra of Complexes
- Magnetic Properties of Complexes
- Coordination Compounds – Structure and Stability

## Organic Reactions and Mechanism

- Introduction to Reactions & Reagents
- Name Reactions
- Understanding Organic Chemistry
- Structure and Bonding
- Catalysis
- Organometallic Reactions & Reagents
- Introduction to Organic Materials

### REFERENCE BOOKS

- I. N. Levine, *Physical Chemistry*, Tata McGraw-Hill, New Delhi, 2002.
- P. Atkins and J. Paula, *Physical Chemistry*, Oxford University Press, New Delhi, 2008.
- I. N. Levine, *Quantum Chemistry*, PHI Learning Pvt. Ltd., New Delhi, 2009.
- J. E. Huheey, E. A. Keiter, R. L. Keiter, and O. K. Medhi, *Inorganic Chemistry*, Dorling Kindersley Pvt. Ltd., New Delhi, 2006.
- P. Atkins, T. Overton, J. Rourke, M. Weller, and F. Armstrong, *Shriver & Atkins Inorganic Chemistry*, Oxford University Press, New Delhi, 2008.

- R. H. Crabtree, *The Organometallic Chemistry of the Transition Metals*, Wiley Hoboken, N. J. 2009.
- R. T. Morrison and R. N. Boyd, *Organic Chemistry*, Dorling Kindersley Pvt. Ltd., New Delhi, 2008.
- Jerry March, *Advanced Organic Chemistry*, Wiley India Pvt. Ltd., New Delhi, 1999