Quantum Chemistry

Classical Mechanics

- Newtonian Mechanics
- Lagrangian Mechanics
- Least Action Principle (Hamilton's principle)
- Hamiltonian Mechanics
- Classical Harmonic Oscillator
- Chemical Connection of Harmonic Motion

Classical Mechanics Failures

- Black Body Radiation
- Photoelectric effect
- Rutherford Model for the Atom
- Atomic Spectrum
- Bohr’s model for the Ato

Basics of Quantum Mechanics

- The Dual Nature for Matter and Wave
- Quantum Mechanic Postulates
  - State of the System and Wave Function
  - Interpretation of Ψ
  - Quantum Mechanical Operators and Observables
  - Quantum Theory of Measurements
  - Absolute Values of Observables
  - Linear Combination of Functions
  - Expectation Values
  - Time- Dependent Wave Functions
- Complementary Remarks
  - Superposition and Heisenberg Uncertainty Principle
  - Importance of the Hermition Property of Operators

Bohr Corresponding Principle

Heisenberg's Matrices Representation

Dirac Bracket Notation

Applications on Quantum Mechanics

Free Particle Motion

Particle in a Potential Box

Comparison between quantum mechanics and classic mechanics

Harmonic Oscillator

Zero-point energy

Hydrogen Atom

Solving ϕ-equation

Solving θ-equation

Solving R-equation

The Total Equation

angular momentum

magnetic moment

spin motion

particle- on-a ring

particle-on- a sphere

Rigid Rotor

Approximate Methods

Perturbation Method - Non-degenerate States

The Variation Principle