

Quantum Mechanics

(PhD entrance exam topics)

1. Postulates of quantum mechanics, pure and mixed states, density operator, the measurement process, representations
2. Mean (expectation) value and variance of physical quantities (observables). The uncertainty relation
3. Evolution of the quantum system, evolution operator, Ehrenfest theorems, conservation laws. Schrödinger and Heisenberg pictures
4. The harmonic oscillator in quantum mechanics
5. Angular momentum in quantum mechanics
6. Central force field, the Coulomb problem
7. The Stern-Gerlach experiment, spin, Pauli equation
8. Stationary perturbation theory, and its simple applications
9. Time dependent perturbations, atom in an external time varying field
10. Systems of identical particles, fermions and bosons

Suggested readings:

C. Cohen-Tannoudji: Quantum mechanics, Vols. 1-2, 2-nd Edition, Wiley, 1991
S. Gasiorovicz: Quantum Physics 3-rd Edition, Wiley 2003
L.D. Landau, E.M. Lifshitz: Quantum Mechanics (nonrelativistic theory) 3-rd Edition
(Course of Theoretical Physics, Volume 3) Elsevier 2005