

What you need to know how to do for exam I

Be able to:

1. explain wave-particle duality and the concept of adding amplitudes
2. express a general state in terms of basis states ("spectral decomposition")
3. obtain the Schrodinger equation by analogy to classical energy conservation
4. use separation of variables to solve the S.E.
5. time evolve a quantum mechanical state
6. derive the energy eigenvalues and eigenvectors for free particles, constant potentials, and step-wise potentials, in any dimension
7. express orthonormality, linear operators, and closure in terms of the Dirac formalism
8. change from one basis to another; the position and momentum bases included
9. use projection operators to describe the outcome of measurements
10. create and/or verify hermitian operators; be able to create an observable from a classical quantity
11. express quantum mechanics postulates in both discrete and continuous bases, with functional dependence or without
12. find eigenvectors and eigenvalues of matrix operators
13. determine C.S.C.O.
14. determine what measurements produce what outcomes, with what probabilities, and in what state the measurement leaves the system
15. express states in terms of tensor products
16. find expectations values and root-mean-square deviations
17. find probability densities and currents
18. find the time evolution of an expectation value; see Ehrenfest's theorem
19. identify constants of motion
20. find Bohr frequencies of a system
21. understand the difference between linear superpositions and statistical mixtures