Know, understand, and be able to use key equations:

1. Time-dependent Schrödinger equation.
2. Time-independent Schrödinger equation
3. Fermi's golden rule
4. Time-correlation formulation for spectral broadening

Understand key concepts/notation:

1. Bra-ket notation.
2. Hermitian operators
3. eigenfunctions/eigenvalues
4. expansion in a complete orthonormal set
5. Dirac delta function
6. Commutators/Simulataneously observable operators
7. Heisenberg Uncertainty Principle
8. De Broglie wavelength
9. Planck's law
10. Expectation values
11. Probabilistic interpretation of the wavefunction
12. Slater determinants
13. Allowable and non-allowable wavefunctions.
14. Allowable and non-allowable operators.

Ground-state wavefunctions, eigenenergies, quantum numbers, and selection rules for:

1. Particle-in-a-box.
2. Harmonic Oscillator
3. Rigid Rotor
4. One-electron atom
5. Angular momentum (L, S, J, etc.)

Atoms & Molecules:

1. Concept of effective nuclear charge.
2. Hartree-Fock
3. Molecular orbital theory; linear combination of atomic orbitals
4. Valence bond theory.
5. Term Symbols
6. Hund's Rules
7. Born-Oppenheimer Approximation

Computational methods/approaches.

1. Perturbation Theory
2. Variational Principle
3. Evaluating expectation values
4. "Fundamental experiments" of quantum mechanics like blackbody radiation and the photoelectric effect.
5. Hartree-Fock