Review for Exam 2

Below you will find a list of topics that you will be responsible for knowing for Exam 2 as well as a list of topics that will not be covered. Remember that you are allowed a formula sheet for the test!

Although I’ve tried to cover everything, anything not explicitly mentioned is your responsibility

Chapter 4

- Atomic Spectra, Rydberg-Ritz series
- Rutherford’s nuclear model
  - impact parameter, $\alpha$ particle scattering
- Bohr’s nuclear model
  - quantization of angular momentum, orbital radius, energy
  - explanation of hydrogen atom spectrum; relation to Rydberg-Rtiz
- Correspondence principle

Chapter 5

- De Broglie hypothesis (wave particle duality), De Broglie wavelength
- Measurement of particle wavelengths,
  - relativistic, non-relativistic, general ($\lambda/\lambda_c$)
- Wave packets
  - waves in general (period, frequency, wave number, phase and group velocity)
  - uncertainty: $\Delta x \Delta k \sim 1$, $\Delta \omega \Delta t \sim 1$
  - particle wave packets
- Probabilistic interpretation of wave packets
  - $P(x) \, dx = |\Psi(x)|^2 \, dx$, $\int |\Psi(x)|^2 \, dx = 1$
- The uncertainty principle
  - $\Delta x \Delta p \geq \hbar / 2$, $\Delta E \Delta t \geq \hbar / 2$

Not covered: Davisson-Germer experiment, consequences of the uncertainty

Chapter 6

- Schrodinger equation in one dimension
  - time dependent solutions
  - time independent solutions
- Infinite square well
  - solutions
  - energies
    - ground state energy
  - probabilities
  - sketching wave functions
- Expectation values and operators
  - computation of expectation values
- representation of operators
- Simple Harmonic Oscillator
  - potential
  - classical turning points
  - solutions (will give specific solutions on test if needed)
  - energies
    - ground state energy
  - selection rules: $\Delta n = \pm 1$
- reflection and transmission of waves
  - step potential
    - solutions, wavenumbers
      - sketches of wave functions
    - reflection and transmission coefficients

Not covered: finite square well, barrier potentials