# 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
        o  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
        o ground state energy
    - selection rules: $\Delta n = \pm 1$
- reflection and transmission of waves
    - step potential
        o solutions, wavenumbers
            ▪ sketches of wave functions
        o reflection and transmission coefficients

Not covered: finite square well, barrier potentials