PS315 Homework

Instructor: Dr. Darrel Smith Lab Assistant: Elaine Rhoades

This homework is designed to prepare you for your first two labs:

a. the spectroscopy lab, and
b. the charge-to-mass ratio (of the electron) lab.

1. Using the Bohr model for the hydrogen atom, calculate the wavelength emitted when an electron makes a transition from the n=4 to the n=2 quantum state.
   Note: this is one of the Balmer transitions observed in the hydrogen emission lines.

λ = _____ nm

2. After reading the instruction sheets for the charge-to-mass ratio lab,

   a. Calculate the B-field produced on the axis of symmetry in the mid-plane of the two Helmholtz coils, assuming r = 150 mm, N = 120 turns and I = 2.0 amps.

B = _____ tesla

   b. What is the B-field required where the radius of the electron orbit is 4.0 cm. Assume that the accelerating potential is 300 volts, and also assume $e/m = 1.76\times10^{11}$ coulombs/kg.

B = _____ tesla