Physics 262: Practice Exam 3
100 points

1. (25 points) An electron is moving at a speed such that it's energy is equal to that of a proton at rest. The relationship $p = h/\lambda$ holds for relativistic momentum. What is the wavelength of the electron?

2. (25 points) The work function of a metal is 2 eV. Which transitions in the Hydrogen atom could produce a photon capable of liberating an electron from the metal?

3. (20 points) Sketch the experimental setup for the Rutherford scattering experiment. Describe the result and explain the significance.

4. (10 points) Draw $\psi(x)$ and $P(x)$ for the n=2 bound state wave functions of the finite potential well (Assume such a bound state exists.)

5. (10 points) Consider two stars, one has a surface temperature of $T = 5000$ K, the other is a red giant with 100 times the diameter of the first, but with $T = 3000$ K. Show which star has a higher power output.

6. (10 points) When a photon scatters from an electron, must it's wavelength always change?