Physics 262: Homework 20
10 points

Problem 1 (2 point)

Use conservation of momentum and energy to show the derivation of the Compton Scattering formula: $\lambda - \lambda' = \frac{h}{mc}(1 - cos(\theta))$.

Problem 2: (2 points)

Accelerating charges produce EM radiation. The classical EM wave theory for charges moving with non-relativistic velocities predicts a radiated power by an accelerating charge given by the Lamour formula, $P = \frac{e^2 a^2}{6\pi\epsilon_0 c^3}$, where a is the acceleration and e is the charge.

If we model the Hydrogen atom as an electron orbiting the nucleus:

- What is the velocity of the electron in the lowest energy orbit in the Bohr model?
- What is the orbital radius of the electron in the lowest energy orbit in the Bohr model?
- What is the centripetal acceleration of the electron in the lowest energy orbit in the Bohr model?
- What is the power radiated?
- Estimate how long it would take for the electron to lose all of its energy and spiral into the nucleus.

Problem 3 (2 point)

Planck found the value of h by fitting his result to the experimental data. Make a plot of the Planck radiation law, $I(\lambda)$ vs λ. Now make plots where the value of h is both a factor of 2 too large and too small. Plot these together on the same graph. Label the axes. Use any plotting software you have at your disposal.

Problem 4 (1 points)

Y&F 38.20

Problem 5 (1 point)

Y&F 38.28

Problem 6 (1 point)

Y&F 38.30

Problem 7 (1 points)

Y&F 38.80