Example: The Compton Effect

Suppose that Europium (Eu) x rays are used in a Compton Effect experiment and are directed at stationary electrons ($m_e = 9.11 \times 10^{-31}$ kg) in a carbon target. Suppose further that these x rays have an energy of 41.535 keV and are completely backscattered.

a. What is the wavelength of the incident Europium x rays?

b. What is the wavelength of the scattered photons?

c. What is the kinetic energy of the recoiling electron?

d. What is the velocity of the electron and is it relativistic?

More Examples:

1. **Consider an e^--e^+ collision in which the electron and positron are annihilated.**

   Where does the photon energy come from and what the value of the energy?

   What is the wavelength of the photon produced?

2. **Suppose that a 1 mW He-Ne laser shines on a screen. How many photons strike the screen each second. (No wonder we are not aware of individual photons!)**

3. **A photoelectric experiment is conducted with a sodium surface with ϕ = 2.28 eV. When the surface is illuminated with light with a wavelength of 410 nm, what are the speed and kinetic energy of the emitted e^-? Is the e^- relativistic? What are the speed and kinetic energy of the emitted e^- if the incident light is 700 nm on the same sodium surface?**