

39. The initial kinetic energy of the electron is 50.0 keV. After the first collision, the kinetic energy is 25 keV; after the second, it is 12.5 keV; and after the third, it is zero. The energy of the photon produced in the first collision is  $50.0 \text{ keV} - 25.0 \text{ keV} = 25.0 \text{ keV}$ . The wavelength associated with this photon is

$$\lambda = \frac{1240 \text{ eV} \cdot \text{nm}}{25.0 \times 10^3 \text{ eV}} = 4.96 \times 10^{-2} \text{ nm} = 49.6 \text{ pm}$$

where the result of Exercise 3 of Chapter 39 is used. The energies of the photons produced in the second and third collisions are each 12.5 keV and their wavelengths are

$$\lambda = \frac{1240 \text{ eV} \cdot \text{nm}}{12.5 \times 10^3 \text{ eV}} = 9.92 \times 10^{-2} \text{ nm} = 99.2 \text{ pm} .$$