

33. (a) The x-ray frequency is

$$f = \frac{c}{\lambda} = \frac{2.998 \times 10^8 \text{ m/s}}{35.0 \times 10^{-12} \text{ m}} = 8.57 \times 10^{18} \text{ Hz} .$$

(b) The x-ray photon energy is

$$E = hf = (4.14 \times 10^{-15} \text{ eV}\cdot\text{s})(8.57 \times 10^{18} \text{ Hz}) = 3.55 \times 10^4 \text{ eV} .$$

(c) From Eq. 39-7,

$$p = \frac{h}{\lambda} = \frac{6.63 \times 10^{-34} \text{ J}\cdot\text{s}}{35.0 \times 10^{-12} \text{ m}} = 1.89 \times 10^{-23} \text{ kg}\cdot\text{m/s} .$$