

54. (a) We solve  $v$  from  $\lambda = h/p = h/(m_p v)$ :

$$v = \frac{h}{m_p \lambda} = \frac{6.63 \times 10^{-34} \text{ J}\cdot\text{s}}{(1.675 \times 10^{-27} \text{ kg})(0.100 \times 10^{-12} \text{ m})} = 3.96 \times 10^6 \text{ m/s} .$$

(b) We set  $eV = K = \frac{1}{2}m_p v^2$  and solve for the voltage:

$$V = \frac{m_p v^2}{2e} = \frac{(1.67 \times 10^{-27} \text{ kg})(3.96 \times 10^6 \text{ m/s})^2}{2(1.60 \times 10^{-19} \text{ C})} = 8.18 \times 10^3 \text{ V} .$$