

8. Let

$$\frac{1}{2}m_e v^2 = E_{\text{photon}} = \frac{hc}{\lambda}$$

and solve for v :

$$\begin{aligned} v &= \sqrt{\frac{2hc}{\lambda m_e}} = \sqrt{\frac{2hc}{\lambda m_e c^2}} c^2 = c \sqrt{\frac{2hc}{\lambda (m_e c^2)}} \\ &= (2.998 \times 10^8 \text{ m/s}) \sqrt{\frac{2(1240 \text{ eV} \cdot \text{nm})}{(590 \text{ nm})(511 \times 10^3 \text{ eV})}} = 8.6 \times 10^5 \text{ m/s} . \end{aligned}$$

Since $v \ll c$, the non-relativistic formula $K = \frac{1}{2}mv^2$ may be used. The result of problem 3 and the $m_e c^2$ value of Table 38-3 are used in our calculation.