

36. (a) Using the result of problem 3, we find

$$\lambda = \frac{hc}{E} = \frac{1240 \text{ nm} \cdot \text{eV}}{0.511 \text{ MeV}} = 2.43 \times 10^{-3} \text{ nm} = 2.43 \text{ pm} .$$

(b) Now, Eq. 39-11 leads to

$$\begin{aligned} \lambda' &= \lambda + \Delta\lambda = \lambda + \frac{h}{m_e c} (1 - \cos \phi) \\ &= 2.43 \text{ pm} + (2.43 \text{ pm})(1 - \cos 90.0^\circ) = 4.86 \text{ pm} . \end{aligned}$$

(c) The scattered photons have energy equal to

$$E' = E \left( \frac{\lambda}{\lambda'} \right) = (0.511 \text{ MeV}) \left( \frac{2.43 \text{ pm}}{4.86 \text{ pm}} \right) = 0.255 \text{ MeV} .$$