43. (a) From Eq. 39-11, $\Delta\lambda = (h/m_e c)(1 - \cos\phi)$. In this case $\phi = 180°$ (so $\cos\phi = -1$), and the change in wavelength for the photon is given by $\Delta\lambda = 2h/m_e c$. The energy E' of the scattered photon (whose initial energy is $E = hc/\lambda$) is then

$$\begin{aligned} E' &= \frac{hc}{\lambda + \Delta\lambda} = \frac{E}{1 + \Delta\lambda/\lambda} = \frac{E}{1 + (2h/m_e c)(E/hc)} = \frac{E}{1 + 2E/m_e c^2} \\ &= \frac{50.0\,\text{keV}}{1 + 2(50.0\,\text{keV})/0.511\,\text{MeV}} = 41.8\,\text{keV} \ . \end{aligned}$$

(b) From conservation of energy the kinetic energy K of the electron is given by $K = E - E' = 50.0\,\text{keV} - 41.8\,\text{keV} = 8.2\,\text{keV}$.