34. From Eq. 38-49, $\gamma = (K/mc^2) + 1$, and from Eq. 38-8, the speed parameter is $\beta = \sqrt{1 - (1/\gamma)^2}$.

(a) Table 38-3 gives $m_e c^2 = 511\,\text{keV} = 0.511\,\text{MeV}$, so the Lorentz factor is

$$\gamma = \frac{10.0\,\text{MeV}}{0.511\,\text{MeV}} + 1 = 20.57\ ,$$

and the speed parameter is

$$\beta = \sqrt{1 - \frac{1}{(20.57)^2}} = 0.9988\ .$$

(b) Table 38-3 gives $m_p c^2 = 938\,\text{MeV}$, so the Lorentz factor is $\gamma = 1 + 10.0\,\text{MeV}/938\,\text{MeV} = 1.01$, and the speed parameter is

$$\beta = \sqrt{1 - \frac{1}{1.01^2}} = 0.145\ .$$

(c) If we refer to the data shown in problem 36, we find $m_\alpha = 4.0026$ u, which (using Eq. 38-43) implies $m_\alpha c^2 = 3728$ MeV. This leads to $\gamma = 10/3728 + 1 = 1.0027$. And, being careful not to do any unnecessary rounding off in the intermediate steps, we find $\beta = 0.073$. We remark that the mass value used in our solution is not exactly the alpha particle mass (it's the helium-4 atomic mass), but this slight difference does not introduce significant error in this computation.