39. We use $m_1 = 4$ u for the mass of the alpha particle and $m_2 = 197$ u for the mass of the gold nucleus in Eq. 10-31:

$$v_{2f} = \frac{2(4)}{4+197}\, v_{1i} = \frac{8}{201}\, v_{1i}$$

we compute the final kinetic energy of the gold nucleus (which must be the same as the kinetic energy lost by the alpha particle – since this is an elastic collision)

$$K_{2f} = \frac{1}{2} m_2 v_{2f}^2 = \frac{1}{2}(197\,\mathrm{u}) \left(\frac{8\, v_{1i}}{201}\right)^2 .$$

We divide this by the initial alpha particle energy $K_i = \frac{1}{2}(4\,\mathrm{u}) v_{1i}^2$ to obtain

$$\frac{K_{2f}}{K_i} = \frac{(197)(8)^2}{(4)(201)^2} \approx 0.078$$

so we find the percentage is 7.8%.