

(10.7) What is the maximum velocity that a deuteron of 2 MeV can impart to a ^{16}O atom?

$$\text{MeV} := 1.60217733 \cdot 10^{-13} \cdot \text{joule}$$

$$N_A := 6.022 \cdot 10^{23} \cdot \text{mole}^{-1}$$

$$M_d := 2 \cdot \text{gm} \cdot \text{mole}^{-1}$$

$$M_{O16} := 16 \cdot \text{gm} \cdot \text{mole}^{-1}$$

$$E_d := 2 \cdot \text{MeV}$$

$$E_O := \frac{M_d M_{O16}}{(M_d + M_{O16})^2} \cdot E_d$$

$$E_O = 3.165 \cdot 10^{-14} \cdot \text{kg} \cdot \text{m}^2 \cdot \text{sec}^{-2} \quad E_O = 0.198 \cdot \text{MeV}$$

$$v_{max} := \sqrt{\frac{2 \cdot E_O}{\left(\frac{M_{O16}}{N_A}\right)}}$$

Classical mechanics

$$v_{max} = 1.543 \cdot 10^6 \cdot \text{m} \cdot \text{sec}^{-1}$$

$$2 \cdot v_{max} = 3.087 \cdot 10^6 \cdot \text{m} \cdot \text{sec}^{-1}$$