

(4.3) ^{11}C decays through emission of positrons of a maximum energy of 1.0 MeV. Calculate the recoil energy of the daughter.

Constants and units:

$$\text{MeV} := 1.60217733 \cdot 10^{-13} \cdot \text{joule} \quad \text{eV} := 10^{-6} \cdot \text{MeV} \quad \text{amu} := 1.6605402 \cdot 10^{-27} \cdot \text{kg}$$

$$m_e := 5.4857990 \cdot 10^{-4} \cdot \text{amu}$$

Given data:

$$E_{\text{max}} := 1 \cdot \text{MeV} \quad m_d := 11 \cdot \text{amu}$$

Calculations:

$$\text{mdc2} := 931.5 \cdot 11 \cdot \text{MeV} \quad (m_d c^2 \text{ from eqn. (4.23); } E = 931.5 \cdot A \cdot \text{MeV})$$

$$E_d := m_e \cdot \frac{E_{\text{max}}}{m_d} + \frac{E_{\text{max}}^2}{2 \cdot \text{mdc2}} \quad \text{Eqn. (4.32)} \quad E_d = 9.867 \cdot 10^{-5} \cdot \text{MeV} \quad E_d = 99 \cdot \text{eV}$$