

62. (a) $\Delta E = \Delta mc^2 = (3.0 \text{ kg})(0.0010)(2.998 \times 10^8 \text{ m/s})^2 = 2.7 \times 10^{14} \text{ J}.$

(b) The mass of TNT is

$$m_{\text{TNT}} = \frac{(2.7 \times 10^{14} \text{ J})(0.227 \text{ kg/mol})}{3.4 \times 10^6 \text{ J}} = 1.8 \times 10^7 \text{ kg} .$$

(c) The fraction of mass converted in the TNT case is

$$\frac{\Delta m_{\text{TNT}}}{m_{\text{TNT}}} = \frac{(3.0 \text{ kg})(0.0010)}{1.8 \times 10^7 \text{ kg}} = 1.6 \times 10^{-9} ,$$

Therefore, the fraction is $0.0010/1.6 \times 10^{-9} = 6.0 \times 10^6$.