(14.6) The total kinetic energy of the fragments from thermal fission of ^{239}Pu is 177.7 MeV and the average fragment masses are 100.34 and 139.66 u respectively. What are the kinetic energies of the average light and heavy mass fragments?

Definition of constants, known values, and units:

$$MeV := 1.6021773 \cdot 10^{-19+6} \cdot joule$$

$$M_{light} := 100.34 \cdot \frac{gm}{mole} \qquad M_{heavy} := 139.66 \cdot \frac{gm}{mole} \qquad E_{tot} := 177.7 \cdot MeV$$

The fissioning nucleus is normally at rest. Hence, momentum: $m_1 v_1 = m_2 v_2$, square, multiply by 1/2, and factor out E as $(1/2)mv^2$ for a non-relativistic case.

$$E_{light} := \frac{E_{tot}}{\left(\dfrac{M_{light}}{M_{heavy}} + 1\right)} \qquad E_{light} = 103.4 \cdot MeV$$

$$E_{heavy} := \frac{E_{tot}}{\left(\dfrac{M_{heavy}}{M_{light}} + 1\right)} \qquad E_{heavy} = 74.3 \cdot MeV$$

Check: results

$$E_{light} + E_{heavy} = 177.7 \cdot MeV$$