

$$\begin{aligned}
 Q &= m_1 c^2 + m_2 c^2 - m_3 c^2 - m_4 c^2 && \text{où } m = \text{masse nucléaire} \\
 Q &= m_1 c^2 + Z_1 m_e c^2 + m_2 c^2 + Z_2 m_e c^2 - m_3 c^2 - Z_3 m_e c^2 - m_4 c^2 - Z_4 m_e c^2 && \text{car } Z_1 + Z_2 = Z_3 + Z_4 \\
 Q &= \underbrace{m_1 c^2 + Z_1 m_e c^2}_{M_{\text{at}}^1 c^2} + m_2 c^2 + Z_2 m_e c^2 - m_3 c^2 - Z_3 m_e c^2 - m_4 c^2 - Z_4 m_e c^2 && (B_e^{1,2,3,4} \sim 0) \\
 Q &= M_{\text{at}}^1 c^2 + M_{\text{at}}^2 c^2 - M_{\text{at}}^3 c^2 - M_{\text{at}}^4 c^2 \\
 Q &= M_{\text{at}}^1 c^2 - 931.5 A_1 + M_{\text{at}}^2 c^2 - 931.5 A_2 - M_{\text{at}}^3 c^2 + 931.5 A_3 - M_{\text{at}}^4 c^2 + 931.5 A_4 && \text{car } A_1 + A_2 = A_3 + A_4 \\
 Q &= \underbrace{M_{\text{at}}^1 c^2 - 931.5 A_1 + M_{\text{at}}^2 c^2 - 931.5 A_2}_{\Delta M_{\text{at}}^1 c^2} - M_{\text{at}}^3 c^2 - 931.5 A_4 - M_{\text{at}}^4 c^2 - 931.5 A_4 \\
 Q &= \Delta M_{\text{at}}^1 c^2 + \Delta M_{\text{at}}^2 c^2 - \Delta M_{\text{at}}^3 c^2 - \Delta M_{\text{at}}^4 c^2
 \end{aligned}$$