

42. We assume the neutrino has negligible mass. The photons, of course, are also taken to have zero mass.

$$\begin{aligned}
 Q_1 &= (2m_p - m_2 - m_e)c^2 = [2(m_1 - m_e) - (m_2 - m_e) - m_e]c^2 \\
 &= [2(1.007825 \text{ u}) - 2.014102 \text{ u} - 2(0.0005486 \text{ u})](931.5 \text{ MeV/u}) \\
 &= 0.42 \text{ MeV}
 \end{aligned}$$

$$\begin{aligned}
 Q_2 &= (m_2 + m_p - m_3)c^2 = (m_2 + m_p - m_3)c^2 \\
 &= (2.014102 \text{ u}) + 1.007825 \text{ u} - 3.016029 \text{ u})(931.5 \text{ MeV/u}) \\
 &= 5.49 \text{ MeV}
 \end{aligned}$$

$$\begin{aligned}
 Q_3 &= (2m_3 - m_4 - 2m_p)c^2 = (2m_3 - m_4 - 2m_p)c^2 \\
 &= [2(3.016029 \text{ u}) - 4.002603 \text{ u} - 2(1.007825 \text{ u})](931.5 \text{ MeV/u}) \\
 &= 12.86 \text{ MeV} .
 \end{aligned}$$