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Problem 55.41 (RHK)

We have to show that the energy released when three alpha particles fuse to form ^{12}C is 7.27 MeV. The atomic mass of ^4He is 4.002603 u, and of ^{12}C is 12.000000 u.

Solution:

The energy that will be released when three alpha particles fuse to form ^{12}C can be calculated from the atomic mass of ^{12}C and the atomic mass of ^4He . The energy release will be the energy equivalent to the difference in mass of three ^4He atoms and one ^{12}C . That is

$$\begin{aligned} (3m(^4\text{He}) - m(^{12}\text{C}))c^2 &= (3 \times 4.002603 - 12.000000) \text{ uc}^2 \\ &= 0.007809 \text{ uc}^2 \\ &= 0.007809 \times 931.5 \text{ MeV} \\ &= 7.274 \text{ MeV}. \end{aligned}$$