2023 Ph H1 Q12

Section: Particles and Waves

Topic: Nuclear Reactions

Question Summary

Fusion: $^{3}_{1}H + {}^{2}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n$. Mass before = 8.347×10^{-27} kg; after = 8.317×10^{-27} kg.

Worked Solution

$\Delta m = 3.0\times10^{-29}$ kg.

$E = \Delta m\, c^2 \approx 2.7\times10^{-12}$ J.

Final Answer

D — 2.7×10^{-12} J

Revision Tips

- Δm = mass(before) − mass(after).
- Use $E = \Delta m\, c^2$ with $c \approx 3.0\times10^{8}$ m/s.
- Fusion releases energy as binding energy per nucleon increases.