

Questão 9

Nuclear fusion is a reaction in which atomic nuclei merge to form the nucleus of a new atom. The mass of the new atom's nucleus is lower than the sum of the merging nuclei's masses, a difference that is released as energy. This is, for instance, the reaction that occurs in the Sun. The energy released during fusion can be calculated by the equation $E = \Delta mc^2$, where Δm is the difference between the initial and final masses in the reaction, and c is the speed of light. When calculating the aforementioned energy, nucleus mass can be conveniently quantified using the atomic mass unit (u), which is roughly equivalent to 900 MeV ($1 \text{ u} \rightarrow 900 \text{ MeV}$). Consider the hypothetical nuclear fusion reaction $^{222}\text{X} + ^4\text{Y} \rightarrow ^{221}\text{Z}$. Note that the masses of ^{222}X , ^4Y , and ^{221}Z are 222 u, 4 u, and 221 u, respectively. The amount of energy released in this reaction is

- a) 5 MeV.
- b) 450 MeV.
- c) 900 MeV.
- d) 4500 MeV.

RESPOSTA

Alternativa: D

De acordo com o texto a energia liberada na reação de fusão nuclear é proporcional à diferença entre as massas inicial e final.

$$\text{Massa Inicial: } m_i = m_x + m_y = 222u + 4u = 226u$$

$$\text{Massa Final: } m_f = m_z = 221u$$

$$\text{Variação da massa: } \Delta m = m_f - m_i = 221u - 226u = -5u \text{ (o sinal negativo indica a redução da massa)}$$

Dado que cada unidade de massa atômica equivale a 900 MeV, a energia total liberada na reação é:

$$\Delta E = 5 \cdot 900 = 4500 \text{ MeV}$$