

PHYS 1512: 14 (Final Week)

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Equations

$$B.E. = (\Delta m)c^2 \quad (\text{Binding Energy}) \quad (1)$$

$$r \approx (1.2 * 10^{-15} m) A^{\frac{1}{3}} \quad (\text{atomic radius}) \quad (2)$$

$$A = N + Z \quad (\text{Atomic Mass number}) \quad (3)$$

$$A = A_o e^{-\lambda t} \quad (\text{Radioactive decay}) \quad (4)$$

$$N = N_o e^{-\lambda t} \quad (\text{Radioactive decay}) \quad (5)$$

$$\lambda = \frac{0.693}{T_{1/2}} \quad (\text{Half-life}) \quad (6)$$

Homework Question Chp 31 #12

Conservation laws

The binding energy of a nucleus is 359.5 MeV. What is the mass defect of the nucleus in atomic mass units?

** $1u = 931.5 \text{ MeV}$

Homework Question Chp 31 #35

DECAY

Strontium ${}_{38}\text{Sr}^{90}$ has a half-life of 29.1 yr. It is chemically similar to calcium, enters the body through the food chain, and collects in the bones. Consequently, ${}_{38}\text{Sr}^{90}$ is a particularly serious health hazard. How long (in years) will it take for 99.9467% of the ${}_{38}\text{Sr}^{90}$ released in a nuclear reactor accident to disappear?

Homework Question Chp 31 #4

Radius

By what factor does the nucleon number of a nucleus have to increase in order for the nuclear radius to increase by a factor of 4?

Homework Question Chp 32 #24

Electric potential energy in motion

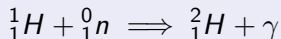
The energy released by each fission within the core of a nuclear reactor is 2.00×10^2 MeV. The number of fissions occurring each second is 1.20×10^{17} . Determine the power (in watts) that the reactor generates.

$$1 \text{ J} = 1.6 \times 10^{-19} \text{ eV}$$

Homework Question Chp 32 #32

Electric potential energy in motion

In one type of fusion reaction a proton fuses with a neutron to form a deuterium nucleus:



The masses are ${}_1^1\text{H}$ (1.0078 u), ${}_0^1\text{n}$ (1.0087 u), and ${}_1^2\text{H}$ (2.0141 u). The γ -ray photon is massless. How much energy (in MeV) is released by this reaction?