PHYS 1512: 14 (Final Week)

Connor Feltman

University of Iowa

23 January 2020

Equations

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

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

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

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

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

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

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 MeV

Homework Question Chp 31 #35

DECAY

Strontium ${}_{38}Sr^{90}$ 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, ${}_{38}Sr^{90}$ is a particularly serious health hazard. How long (in years) will it take for 99.9467% of the ${}_{38}Sr^{90}$ 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 2.00 102 MeV. The number of fissions occurring each second is 1.20 1017. Determine the power (in watts) that the reactor generates.

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

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:

$$ {}_1^1H + {}_1^0n \implies {}_1^2H + \gamma $$

The masses are ${}_1^1H$ (1.0078 u), ${}_1^0n$ (1.0087 u), and ${}_1^2H$ (2.0141 u). The γ-ray photon is massless. How much energy (in MeV) is released by this reaction?