

Nuclei Mindmap..

Nucleus: →

- * Mass \propto Volume of nucleus
- * 1 a.m.u. = 1 atomic mass unit
 $= \frac{1}{12}$ of mass of C-12
 $= 1.660539 \times 10^{-27} \text{ Kg}$

* Radius of Nucleus: →

$$R = R_0 A^{1/3} \quad R_0 = 1.2 \text{ fm}$$

* Density of Nucleus: →

$$\text{density} = 2.3 \times 10^{17} \text{ Kg/m}^3$$

Radioactivity: →

* Law of Radioactivity: →

$$\frac{dN}{dt} = -\lambda N \quad R = R_0 e^{-\lambda t}$$

$$N = N_0 e^{-\lambda t} \quad 1 \text{ Becquerel} = 1 \text{ decay/sec}$$

$$T_{1/2} = \frac{\ln(2)}{\lambda} \quad 1 \text{ curie} = 3.7 \times 10^{10} \text{ Becquerel}$$

$$T_{1/2} = \frac{0.693}{\lambda}$$

$$N = N_0 \left[\frac{1}{2} \right]^n$$

$$n = \frac{t}{T_{1/2}}$$

$$\tau = \frac{1}{\lambda}$$

Nuclear Binding Energy: →

* Nuclear independent of charges, force: short range.

* Mass-Energy Equivalent $E = mc^2$

* Electron's Rest Mass-Energy-

$$E = 511 \text{ KeV}$$

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

* Energy from 1 amu = 931.5 MeV

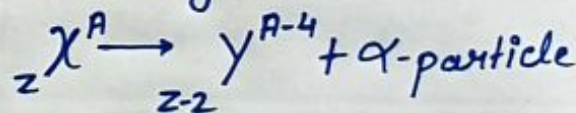
$$* \text{B.E.} = ([Zm_p + (A-Z)m_n] - M)c^2$$

$$* \text{B.E. per nucleon: } E_{bn} = \frac{E_b}{A}$$

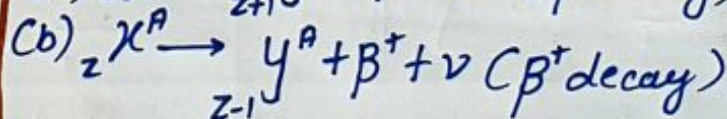
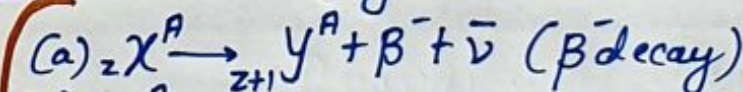
* $E_{bn} \rightarrow$ low for $A < 30$ and $A > 170$

Types of Radioactivity: →

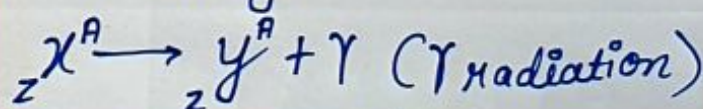
* α -decay: →



* β -decay: →



* γ -decay: →



Q-Value: →

$$Q = \text{B.E. products} - \text{B.E. reactant}$$

Also,

$$Q = (\Delta m)c^2$$

$$Q = (M_{\text{reactant}} - M_{\text{product}})c^2$$