Nuclei Mindmap..

#Nucleus :→

* Mass ∝ Volume of nucleus
* 1 a.m.u. = 1 atomic mass unit
  $= \frac{1}{12}^{th}$ of mass of C-12
  $= 1.660539 \times 10^{-27}$ Kg
* Radius of Nucleus :—
  $R = R_0 A^{1/3}$ $R_0 = 1.2$ fm
* Density of Nucleus :—
  density $= 2.3 \times 10^{17}$ Kg/m^3

#Nuclear Binding Energy :—

* Nuclear Force :— independent of charge, short range.
* Mass-Energy Equivalent $E = mc^2$
* Electron's Rest Mass-Energy—
  $E = 511$ KeV
  $1eV = 1.6 \times 10^{-19}$ V
* Energy from 1 amu = 931.5 MeV
* $B.E. = ([Zm_p + (A-Z)m_n) - M)c^2$
* B.E. per nucleon :— $E_{bn} = \frac{E_b}{A}$
* E_{bn} → low for $A < 30$ and $A > 170$

#Radioactivity :→

* Law of Radioactivity :—
  $\frac{dN}{dt} = -\lambda N$ $R = R_0 e^{-\lambda t}$
  $N = N_0 e^{-\lambda t}$ 1 Becquerel = 1 decay/sec
  $T_{1/2} = \frac{\ln(2)}{\lambda}$ 1 curie $= 3.7 \times 10^{10}$ Becquerel
  $T_{1/2} = \frac{0.693}{\lambda}$ $N = N_0 \left[\frac{1}{2}\right]^n$
  $\tau = \frac{1}{\lambda}$ $n = \frac{t}{T_{1/2}}$

#Types Of Radioactivity :→

* α-decay :—
  ${}_{Z}X^{A} \longrightarrow {}_{Z-2}Y^{A-4} + \alpha$-particle
* β-decay :—
  (a) ${}_{Z}X^{A} \longrightarrow {}_{Z+1}Y^{A} + \beta^- + \bar{\nu}$ (β^- decay)
  (b) ${}_{Z}X^{A} \longrightarrow {}_{Z-1}Y^{A} + \beta^+ + \nu$ (β^+ decay)
* γ-decay :—
  ${}_{Z}X^{A} \longrightarrow {}_{Z}Y^{A} + \gamma$ (γ radiation)

#Q-Value :→

$Q = B.E._{products} - B.E._{reactant}$

Also,

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

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