

$\text{Activity of source} = \lambda N$

$\langle \text{Act} \rangle_{1/2 \text{ life}} = A = \frac{N_0/2}{\ln(2)/\lambda} = \frac{N_0 \lambda}{2 \ln(2)}$

Units decay $[1 \text{ Bq} = 1 \text{ decay s}^{-1}]$
 $[1 \text{ Curie} = 3.7 \times 10^{10} \text{ decay s}^{-1}]$

6. Unif of Forces

intrinsic strength \downarrow range \uparrow

Particle mot^o: $\Psi = e^{i k x}$, $k = \frac{P}{h}$

wavefield mot^o only "sees" obj size $x \leq a$

de Broglie wavelength + special relativity E

$$\lambda_B = \frac{h}{P}$$

$$\Rightarrow E^2 = (pc)^2 + (m_0 c^2)^2$$

$$= m_0 c^2 + KE$$

i extreme relat case!

$$\lambda_0 = \frac{hc}{KE}, KE \gg m_0 c^2$$

Range F by exchange particle: $P = \frac{\pi c}{E_0}$

$$KE \geq E_0$$

large % int

$$\frac{\pi c}{KE} \leq \frac{\pi c}{E_0} \Rightarrow$$

$$KE \leq E_0$$

weak int
really weak

$$W \approx 90 \text{ GeV}$$

$$KE > 90 \text{ GeV}$$

weak F
strong
E. M. F

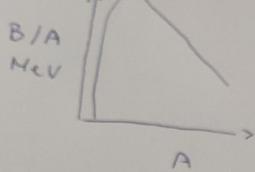
UNIFICATION
 \Rightarrow (at lower
energy broken)

$$[1/40 \text{ eV} = 300 \text{ K}]$$

$$[100 \text{ GeV} = 10^{15} \text{ K}]$$

$B(z, n)$ / light nuclei:

increase to ~8 MeV/nucleon binding E_e^-
negligible
large for even-even nuclei
 $\rightarrow B(z, n)$ vs. nuclear plentraty



deviations ($< 1\%$) from formula are caused by shell effects

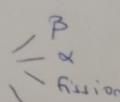
11. Radioactive decay

Brownian decay occurs when rest mass nucleus > total rest mass products

$$\text{Energy released } Q = (\text{mass of nucleus} - \text{mass of products})c^2$$

L \rightarrow as KE or heat

Main decay modes



β^- decay: $Z \rightarrow Z+1$

weak int

$A(\text{mass } n^0)$ conserved

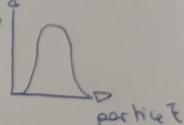
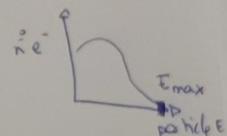
β^+ decay: $Z \rightarrow Z-1$

β^+ can occur in free space

ν -capture: $Z \rightarrow Z-1$

all are observed in nuclei

$\beta^- \beta^+$: can observe E of emitted e^\pm



$E_{released}$ per react^o
is fixed & stored
btw e^- & e^+

