

Nuclear Changes

① Decay - unstable (radioactive) nuclei release particles and/or emit energy particles

① Alpha  $\alpha$   ${}_{2}^{4}\text{He}^{+2}$  (2p+2n) helium-4 nuclei  $(\frac{4}{2}\text{He})$

- wants  $2e^{-}$  - "ionizing" radiation
- stopped by a sheet of paper
- ingestion = worse (bioaccumulate - Iodine)

$\beta$  ② Beta (electron)  $(\frac{0}{-1}e)$

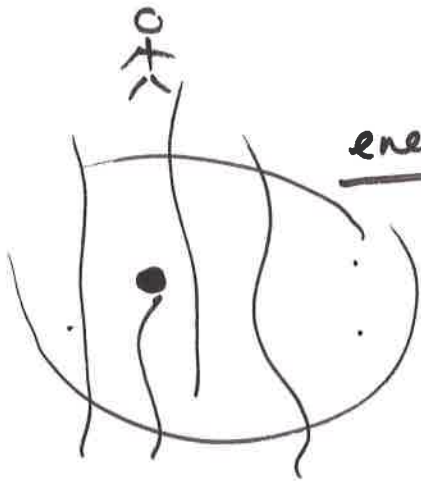
Neutron  $\rightarrow$  proton (absorbed in nucleus)  
 $\rightarrow$  electron (ejected)

- stopped 3mm Al

energy - gamma ray ( $\gamma$ ) - high energy photon

- no mass

- stopped by 3mm lead



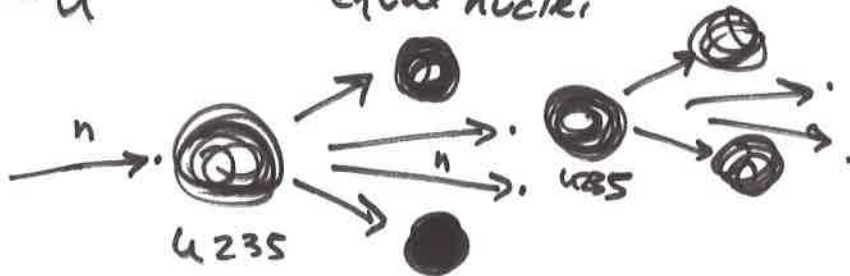
p+N EQ - Alpha Decay



Beta Decay



② Fission - heavy nucleus splits into approx 2 equal nuclei



$$E = mc^2$$

p+N change mass

- matter changes to energy  $\frac{E}{\hbar} = \frac{mc^2}{\hbar}$
- mass comes from a change in  $p+n$  size

③ Fusion - smaller nuclei fuse together  
- requires amazing heat, pressure

