

Nuclear Reactions

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Inside the nucleus there were two types of particles:

	electric charge	Mass
neutrons:	0	$1.6749 \times 10^{-27} \text{ kg}$
protons:	same charge as an electron except positive $1.603 \times 10^{-19} \text{ C}$	$1.6726 \times 10^{-27} \text{ kg}$

Nuclear Reactions:

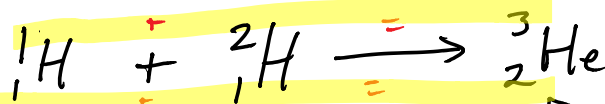
In stars \rightarrow Hydrogen-1 and Hydrogen-2 make Helium-3

mass number \rightarrow
atomic number \rightarrow

$$A = \text{mass number} = \# \text{ of } p^+ + \# \text{ of } n$$

$$Z = \text{atomic number} = \# \text{ of } p^+$$

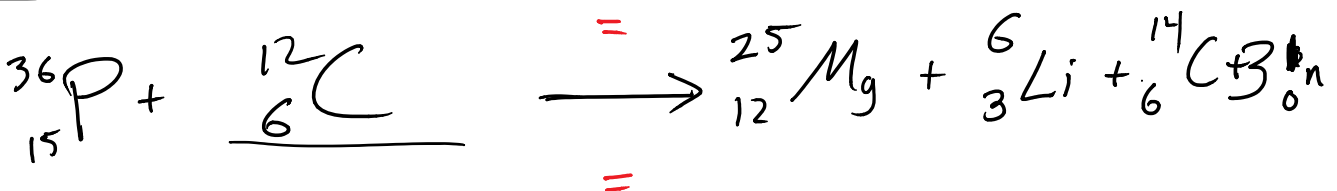
Nuclear Equations



\leftarrow Law of conservation of mass

\leftarrow Law of conservation of charge

Ex.



Decays: There are 3 natural/spontaneous

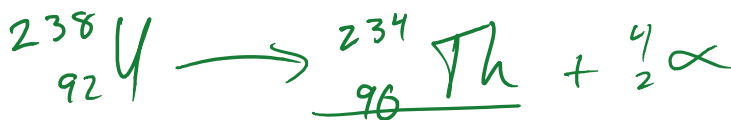
decays for unstable nuclei

${}^4_2\alpha \rightarrow {}^4_2\text{He}$ nuclei shot out of a nucleus
 - High energy, very little penetrating power

${}^0_{-1}\beta$ - High energy electrons \rightarrow a neutron decays into an electron and a proton

γ - High energy light. Extreme penetrating power

Alpha Decay



Units

Nuclei are really small

The units we use are u = atomic mass units.
 and MeV = mega electron Volts

$$1\text{u} = 1.6605 \times 10^{-27} \text{kg}$$

MeV is a unit of energy.

mega $\times 10^6$ \rightarrow MeV \leftarrow volts J/C
 \uparrow
 charge of an electron
 $1.6 \times 10^{-19} \text{C}$

$$1 \text{ MeV} = 1.6 \times 10^{-13} \text{ J}$$

M II for Mass - $r = m r^2$

$$m = \frac{E \leftarrow \text{J}}{c^2}$$

MeV for Mass $\Rightarrow E = mc^2$ $\text{kg} \rightarrow m = \frac{E}{c^2}$
 $c \leftarrow \text{m/s}$

$$m = \frac{1.6 \times 10^{-13} \text{ J}}{(3 \times 10^8)^2} = \frac{1.6 \times 10^{-13}}{9 \times 10^{16}} = 1.8 \times 10^{-30} \text{ kg}$$

$$1 \text{ MeV} \approx 1.8 \times 10^{-30} \text{ kg}$$

$$1 \text{ u} = 1.6605 \times 10^{-27} \text{ kg}$$

$$1 \text{ u} = 931.49 \text{ MeV}$$

$$1 \text{ MeV} = 1.6 \times 10^{-13} \text{ J}$$

Avagadro's #

$$6.023 \times 10^{23}$$

of atoms
in 1 mol