unstable nucleus (breaks down), throws off particles

↑

ratio of prot. to neutrons

Smaller, more stable atoms - ratio of 1:1

larger, less stable not ratio of 1:1

Particles created by radioactive decay

beta (β) particle → $^{0}_{-1}e$

• positron → $^{0}_{1}e$

• electron capture $^{0}_{-1}e$ →

• alpha particle → $^{4}_{2}He$

• gamma-ray $^{0}_{0}\gamma$

ex. α particle production

mass # → $^{226}_{88}Ra \rightarrow {}^{4}_{2}He + {}^{222}_{86}Rn$ (226 = 4 + 222; 88 = 2 + 86)

atomic ↓

α particle: $^{4}_{2}He$ (2+)

left over: $^{222}_{86}Rn$ (86+)

$^{138}_{88}$ (88+) → 2n, 2+ alpha

$^{136}_{86}$ (86+)

ex. β particle production

$$^{14}_{6}C \longrightarrow {}^{0}_{-1}e + {}^{14}_{7}N$$

Beta particle — left over

- positron:

$$\longrightarrow {}^{0}_{+1}e$$

ex. electron capture

$$^{201}_{80}Hg + {}^{0}_{-1}e \longrightarrow {}^{201}_{79}Au + {}^{0}_{0}\gamma$$

(e^- absorbed; e^- capture; gamma)

Half-Life

★ time it takes for ½ of sample to decay

ex. 100g ^{247}Am
after 23 min → 50g
after 46 min → 25g

a. $^{247}_{95}Am \longrightarrow {}^{0}_{-1}e + {}^{247}_{94}Cm$

b. How many half-lives for 75% of a ~~350~~ 350 gram sample?

1 cycle 50%
2 cycle 25% > 2 cycles

c. half-life: $\frac{92\,min}{23\,min} = 4$ cycles

$\frac{1000g}{sample} \times \left(\frac{1}{2}\right)^{4}$ → 4 = # of cycles