| | Alpha Particle | Beta Minus Particle | Beta Plus Particle | Gamma Ray |
|---|---|---|---|---|
| Symbol | $^{4}_{2}He$ or $^{4}_{2}\alpha$ | $^{0}_{-1}\beta$ or $^{0}_{-1}e$ | $^{0}_{+1}\beta$ or $^{0}_{+1}e$ | $^{0}_{0}\gamma$ (or just $\gamma$) |
| How it changes the nucleus | mass # ↓ 4<br>atomic # ↓ 2<br>(lose $2p^+ + 2n^0$) | mass stays same<br>atomic # ↑ 1<br>(convert $n^0 \rightarrow p^+$) | mass stays same<br>atomic # ↓ 1<br>(convert $p^+ \rightarrow n^0$) | mass stays same<br>atomic # same<br>(no changes) |

1. Write the equation for $^{234}Pa$ undergoing alpha decay.

$^{234}_{91}Pa \rightarrow {}^{4}_{2}He + {}^{230}_{89}Ac$

2. Write the equation for $^{40}Ar$ undergoing beta minus decay.

$^{40}_{18}Ar \rightarrow {}^{0}_{-1}e + {}^{40}_{19}K$

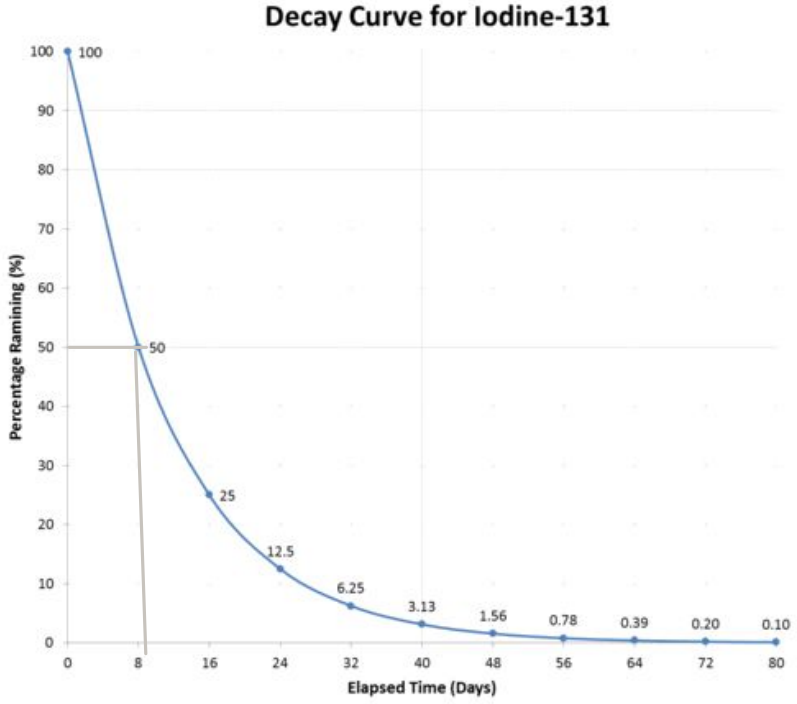
3. Write the equation for $^{38}Ca$ undergoing beta plus (positron) decay.

$^{38}_{20}Ca \rightarrow {}^{0}_{+1}e + {}^{38}_{19}K$

4. What fraction of a substance remains after 4 half lives? $\frac{1}{2^n} = \frac{1}{2^4} = \frac{1}{16}$

5. What fraction of a substance remains after 7 half lives? $\frac{1}{2^n} = \frac{1}{2^7} = \frac{1}{128}$

6. According to the graph, what is the half life of Iodine-31? ~8 days



**Bonus Questions** (not asked on quiz, but might show up on test):

7. The half life of a radioactive isotope is 10 days. After 50 days, the sample has decayed and 2 g of the original isotope is left. How much was in the original sample?

$\frac{50 \text{ days total}}{10 \text{ days/half life}} = 5 \text{ half lives}$

$5 \rightarrow \frac{1}{2^5} = \frac{1}{32}$ $\quad 2\text{g left} \times \frac{32}{1} = 64\text{g originally}$

8. The half life of a radioactive isotope is 3 years. A sample originally contained 200 g of radioactive isotope. After a certain amount of time the sample contains only 25 g of radioactive isotope. How old is the sample (how much time has passed)?

$\frac{25\text{g}}{200\text{g}} = \frac{1}{8} \rightarrow 3 \text{ half lives}$

$3 \text{ years} \times 3 = 9 \text{ years old}$