

Sample Half Life Problems

- ① Americium-141, which is in smoke detectors, has a half life of 432 years.

If your smoke detector has 3.3×10^{-7} g of Am-241, how much is left after 1296 yrs?

Soln: $1296 \div 432 = 3$ half-lives.

$$3.3 \times 10^{-7} \text{ g} \xrightarrow{1^{\text{st}} \frac{1}{2} \text{ life}} 1.65 \times 10^{-7} \text{ g} \xrightarrow{2^{\text{nd}} \frac{1}{2} \text{ life}} 8.25 \times 10^{-8} \text{ g} \xrightarrow{3^{\text{rd}} \frac{1}{2} \text{ life}} 4.125 \times 10^{-8} \text{ g}$$

- ② a) The medical isotope I-131, is used to treat thyroid cancer. A patient may take up to 130 mg per day. If 8.125 mg is left after 32 days, what is I-131's half life?

$$130 \text{ mg} \xrightarrow{\quad} 65 \text{ mg} \xrightarrow{\quad} 32.5 \text{ mg} \xrightarrow{\quad} 16.25 \text{ mg} \xrightarrow{\quad} 8.125 \text{ mg}$$

4 half-lives.

$$32 \div 4 = 8$$

\therefore 8 days is I-131's half-life.

- b) I-131 undergoes β decay.
Write the nuclear equation.

