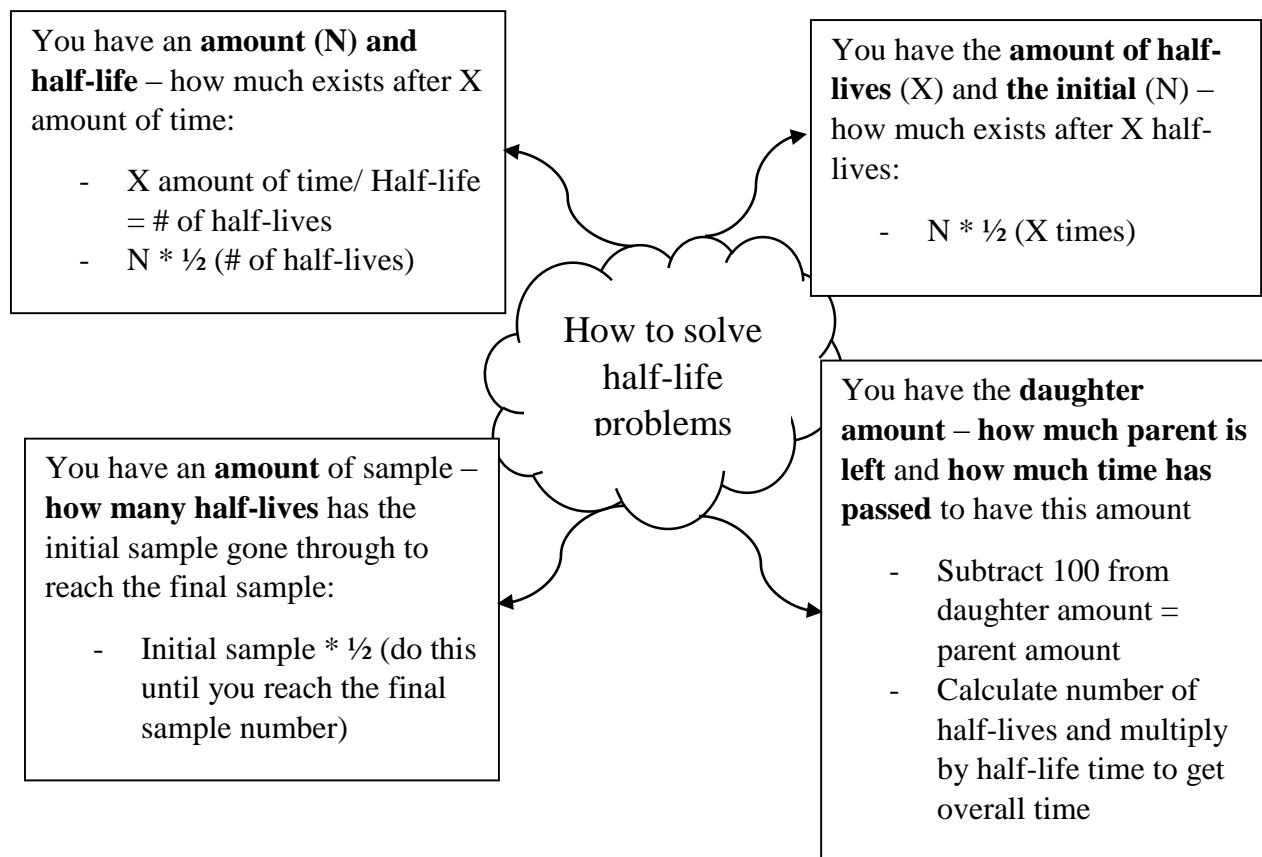


## Half-life Review

**Examples:**

1. Krypton-83 has a half-life of 4.5 hours.

a) How many half-lives have passed after 36 hours?

$$36 \div 4.5 = 8$$

b) An original sample contained 600 g of parent isotope. How much was left after 36 hours?

$$600 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 2.34 \text{ g}$$

c) How much daughter isotope is there? *Use 1.b) to answer this question*

$$600 - 2.34 = 597.66 \text{ g}$$

d) If the initial sample (600 g) was found to only have 75 g of parent, how old is the sample?

$$600 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 75 \text{ g} \rightarrow 3 \text{ half lives}$$

$$3 \times 4.5 \text{ hours} = 13.5 \text{ hours}$$

Date: \_\_\_\_\_

Name: \_\_\_\_\_

2. A sample of calcium-47 was found to contain only 7 g after it had been sitting for 16 days. It is known to have a half-life of 4 days. How much calcium-47 was there initially?

$$16 \div 4 = 4 \text{ half lives}$$

$$7 \times 2 \times 2 \times 2 \times 2 = 112 \text{ g initial mass}$$

3. A sample contained 75 g of the daughter isotope and 5 g parent isotope. This amount of daughter to parent isotope was found after 64 days. What is the half-life of these radioactive species?

$$75 + 5 = 80 \text{ g total}$$

$$80 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 5 \text{ g} \rightarrow 4 \text{ half-lives}$$

$$64 \text{ days} \div 4 = 16 \text{ days} \rightarrow \text{half-life}$$

4. Gadolinium-164 has a half-life of 12 seconds. An initial sample of 40 g parent was found to contain 37.5 g of daughter. How old is the sample?

$$40 - 37.5 = 2.5 \text{ g parent}$$

$$40 \text{ g} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 2.5 \text{ g} \rightarrow 4 \text{ half-lives}$$

$$12 \text{ seconds} \times 4 = 48 \text{ seconds old}$$