

- 1) Fluorine-21 has a half life of approximately 5 seconds. What fraction of the original nuclei would remain after 1 minute?

The answer is solved by creating the fraction  $\frac{1}{2^n}$ . Where n = the number of half lives. If each half life is 5 seconds, then in one minute (60 seconds) there are 12 half lives. Therefore the answer is:

$$\frac{1}{2^{12}} = \frac{1}{4096}$$

- 2) Iodine-131 has a half life of 8 days. What fraction of the original sample would remain at the end of 32 days? Using the same fraction, you must figure out n. If the half life is 8 days, then in 32 days, there are 4 half lives. Therefore the answer is:

$$\frac{1}{2^4} = \frac{1}{64}$$

- 3) The half-life of chromium-51 is 28 days. If the sample contained 510 grams, how much chromium would remain after 56 days? How much would remain after 1 year?

In this problem, the fraction will be multiplied by the initial amount. In the first problem each half life is 28 days, therefore in 56 days two half lives occur. This means that n=2. The solution is as follows:

$$(\text{Initial amount}) \frac{1}{2^n} = (510 \text{ g}) \frac{1}{2^2} = 127.5 \text{ g}$$

The second is solved the same way except that there are 13 half lives over one year. This means n=13. The solution is as follows:

$$(\text{Initial amount}) \frac{1}{2^n} = (510 \text{ g}) \frac{1}{2^{13}} = 0.06 \text{ g}$$

- 5) The half life of Uranium-238 is 4.5 billion years and the age of earth is  $4.5 \times 10^9$  years. What fraction of Uranium-238 that was present when Earth was formed still remains?

4.5 billion is exactly the same as  $4.5 \times 10^9$ . Therefore, the age of the Earth is equal to one half life of Uranium. This means that n=1. The solution is as follows:

$$\frac{1}{2^1} = \frac{1}{2}$$

- 6) Chromium-48 decays. After 6 half-lives, what fraction of the original nuclei would remain?

The answer is solved by creating the fraction  $\frac{1}{2^n}$ . Where n = the number of half lives. If there are 6 half lives, then n=6. Therefore the answer is:

$$\frac{1}{2^6} = \frac{1}{64}$$