Half-Life

Equation:

(starting amount) x (1/2)number of half-lives = ending amount

1. The half-life of Zn-71 is 2.4 minutes. If one had 100.0 g at the beginning, how many grams would be left after 7.2 minutes has elapsed?

**7.2 / 2.4 = 3 half-lives**

**100.0 g x (1/2)3 = 12.5 g remaining**

1. Os-182 has a half-life of 21.5 hours. How many grams of a 10.0 gram sample would have decayed after exactly three half-lives?

**10.0 g x (½)3 = 1.25 g remain**

**10.0 g - 1.25 g = 8.75 g have decayed**

1. A sample of radioactive waste will have reached an acceptable activity level at .5 curies. If the half-life of the sample is 5 years and the sample can be disposed of after a minimum of 20 years, what must the original activity level of the sample be?

**20/5=4 half lives have passed**

**starting amount x (½)4 = .5 curies**

**starting amount = 8 curies**

5) U-238 has a half-life of 4.46 x 109 years. How much U-238 should be present in a sample 2.5 x 109 years old, if 2.00 grams was present initially?

**(2.5 x 109) / (4.46 x 109) = 0.560 (the number of half-lives that have passed)**

**2.00 g x (1/2)0.560 = 1.36 g remain**

**6)** If you start with 2.97 x 1022 atoms of molybdenum-99 (half-life = 65.94 hours), how many atoms will remain after one week?

**one week = 168 hours**

**168 / 65.94 = 2.548 half lives have passed**

**(2.97 x 1022) x (1/2)2.548 = 5.08 x 1021**

7) If a sample of radioactive waste has an activity of level of 2 curies and a half-life of 4 years, after how many years will the activity of the sample be reduced to .5 curie?

**Make table and Chart: Answer is 8 years**