Radioactive Half-Life Application Questions Answer Page

Radioactive Isotope	Half-Life
Uranium-238	4.5 billion years
Thorium-234	24 days
Protactinium-234	1.2 minutes
Uranium-234	240 000 years
Thorium-230	75 000 years
Radium-226	1 600 years
Radon-222	3.8 days
Polonium-218	3.1 minutes
Lead-214	27 minutes
Bismuth-214	20 minutes
Polonium-214	160 microseconds (10^{-6} seconds)
Lead-210	22 years
Bismuth-210	5 days
Polonium-210	138 days

1. If 100 nuclei remain from a sample of 3,200 nuclei, how many half-lives have passed?
   In the first half-life the 3,200 would decay to 1,600, in the second half-life the 1,600 would decay to 800, in the third to 400, in the fourth to 200 and in the fifth to 100. Five half-lives would have passed.

2. Starting with 50 grams of radium-226, how many grams of Radium-226 are left after 3200 years?
   After 1,600 years there would be 25 g, and after 3,200 years there would be 12.5 g of radium-226.

3. Starting with 200 grams of bismuth-210 on the first of September, how many grams of bismuth-210 would remain on the first of October?
   After five days there would be 100 g, after 10 days there would be 50 g, after 15 days there would be 25 g, after 20 days there would be 12.5 g, after 25 days there would be 6.25 g and after 30 days there would be 3.125 g. Therefore, on the first of October, there would be 3.125 g.

4. After four half-lives, a sample of polonium-218 weighs 12 g. What was the original weight of the sample?
   If the final weight is 12 g, before the fourth half-life there would have been 24 g, before the third half-life there would have been 48 g, before the second half-life there would have been 96 g and before the first half-life, the original sample would have been 192 g.

5. Write your own half-life question for someone else using the chart above. Make sure you answer it yourself and check the other person's answer.
   Answers will vary.