

Classwork: Half-Life Problems

Solve the following half-life problems by writing an equation and using the equation to find the solution. Make sure you find the initial value for each equation. The first problem has been partially worked in order to help you with the remaining problems.

- 1) A hospital prepared a 100-mg supply of technetium-99m, which has a half-life of 6 hours. Use the table below to help you understand how much of technetium-99m is left at the end of each 6-hour interval for 36 hours.

The amount of technetium-99m is reduced by one half each 6 hours as shown in the table below. Fill in the missing information in the table and in the equation below.

Number of 6-hour Intervals	0	1	2	3	4	5	6
Number of Hours Elapsed	0	6	12	18	24	30	36
Amount of Technetium-99m (mg)	100	50	25			3.13	



The amount of technetium-99m is an exponential function of the number of half-lives. The initial amount is 100 mg. The decay factor is $\frac{1}{2}$. One half-life equals 6 hours.

Write an explicit equation if x = the number of half-life intervals.

$$y = 100 \left(\frac{1}{2}\right)^x$$

If h = the number of hours elapsed, then the number of 6-hour intervals (of half-lives) = $\frac{h}{6}$.

Use your equation to find the solution to the amount of technetium-99m that remains after 75 hours.

$$y = 100 \left(\frac{1}{2}\right)^{\frac{75}{6}} \rightarrow \text{HINT: When you use rational exponents in your calculator, put } () \text{ around them!}$$

$$y = \underline{\hspace{2cm}}$$

After 75 hours, about _____ mg of technetium-99 remains.

- 2) Arsenic-74 is used to locate brain tumors. It has a half-life of 17.5 days. Write an exponential decay function for a 90-gram sample. Use the function to find the amount remaining after 140 days.

$$y = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ grams}$$

- 3) Phosphorus-32 is used to study a plant's use of fertilizer. It has a half-life of 14.3 days. Write the exponential decay function of a 50-mg sample. Find the amount of phosphorus-32 remaining after 84 days.

$$y = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ mg}$$

Iodine-131 is used to find leaks in water pipes. It has a half-life of 8 days. Write the exponential decay function for a 200-mg sample. Find the amount of iodine-131 remaining after 72 days.

$$y = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ mg}$$