

### Calculating and Using Half-Life

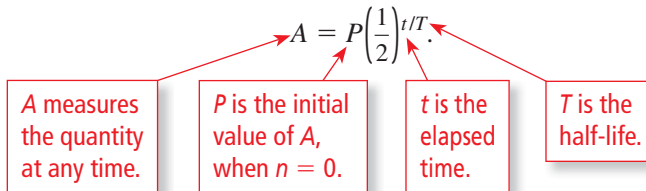
The **half-life** of a substance is the time it takes for the substance to lose half of its pharmacological, physiological, or radiological characteristic.

#### Study Tip

If a quantity begins at 16 units, then the amount after one half-life is one-half of 16 units, or 8 units. The amount after two half-lives is 4 units, and so on.

### Using Half-Life to Calculate Exponential Decay

Consider a substance that has a half-life of  $T$ . The remaining quantity  $A$  that exists after an elapsed time of  $t$  is



#### EXAMPLE 3 Making a Table


The half-life of a drug is the amount of time it takes for 50% of the drug to be removed from a person’s body. Suppose you are injected with 500 milligrams of a drug that has a half-life of 3 hours. How much of the drug will be in your bloodstream after 24 hours?

#### SOLUTION

The formula for the amount left in your bloodstream is

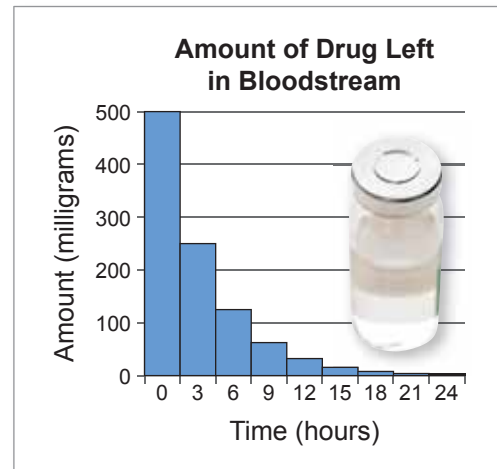
$$A = 500\left(\frac{1}{2}\right)^{t/3} \quad P = 500, T = 3$$

Enter this formula into a spreadsheet and graph the results as shown.



	A	B
1	Time, $t$	Amount, $A$
2	0	500.00
3	3	250.00
4	6	125.00
5	9	62.50
6	12	31.25
7	15	15.63
8	18	7.81
9	21	3.91
10	24	1.95

Formula:  $500(0.5)^{(3/3)}$



About 2 milligrams will be in your bloodstream after 24 hours.

#### ✓ Checkpoint

How much longer will it take for there to be less than 1 milligram of the drug in your bloodstream?

Help at [Math.andYOU.com](http://Math.andYOU.com)