

This is ACA # 36. It is OK to use your textbook, but if you can answers the questions without it that is OK too.

I recommend you print out this page and bring it to class. [Click here](#) to show a set of five ACA36 student responses, randomly selected from all of the student responses thus far, in a new window.

John , here are [your responses](#) to the ACA and the [Expert's response](#).

The following data was collected for the first order reaction described in the reaction



[A] (M)	Time (seconds)
0.4880	0
0.4665	10
0.4361	25
0.3897	50
0.3482	75
0.3112	100
0.2781	125
0.2440	154
0.1984	200
0.1416	275
	308

0.1220	
0.1010	350
0.0610	462
0.0411	550
0.0305	616
0.0209	700
0.0133	800
0.0054	1000

In chemical kinetics the half-life for a chemical reaction is defined as the time required for the initial concentration to fall to one half its value.

1. In the data above what is the initial concentration for the reactant A?

$[A]_0 = 0.4880 \text{ M}$ 100%

The initial concentration of A is 0.488 M.

2. How long does it take for the initial concentration to fall to half of its initial value?

154 seconds 100%

The time required for the [A] to fall to half its initial concentration, 0.244 M, is 154 seconds.

3. What is the concentration of A at the first half-life?

0.244 M 93%

The concentration of A is 0.244 M.

4. What is the concentration of A at the second half-life?

0.122 M 93%

[A] (at the second half-life) is 0.122 M

5. What is the concentration of A at the third half-life?

0.0610 M 93%

[A] (at the third half-life) is 0.0610 M

5. What is the concentration of A at the sixth half-life?

0.007625 M 66%

[A] (at the sixth half-life) is 0.007625 M

7. How long does it take [A] to fall from 50% of its initial concentration to 25% of its initial concentration (2nd half-life)?

154 seconds 53%

27% 308

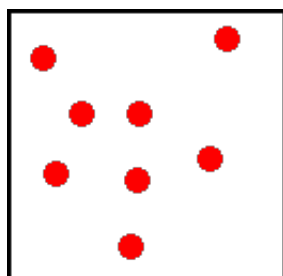
It takes 154 seconds for the [A] to fall from 0.488 M to 0.244 M, it takes another 154 seconds for the [A] to fall from 0.244 M to 0.122 M.

8. What is interesting about the half-life data for this first order reaction?

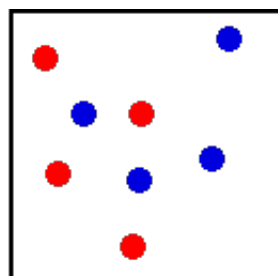
the half life times are constant 60%

For a first order reaction the amount of time required for the [A] to fall to one-half its initial value is the same amount of time. For this reaction the half-life is 154 s.

9. Below are two figures with associated times, what is the half-life of the reaction?



t = 0

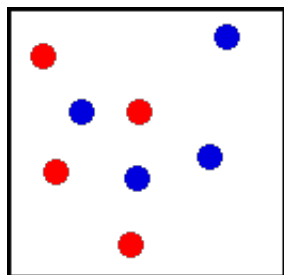


t = 2.0 min

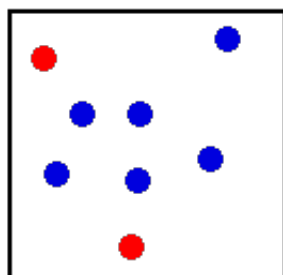
2.0 minutes 80%

For this reaction the half-life is 2.0 minutes. Notice that there are initially 8 red particles in the box on the left. After 2.0 minutes the amount of red particles is one-half its initial value.

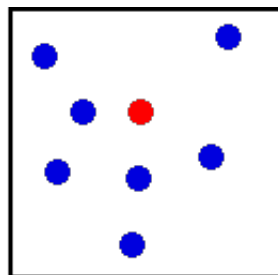
10. Which of the following figures represents the system shown in Q9 after two half-lives?



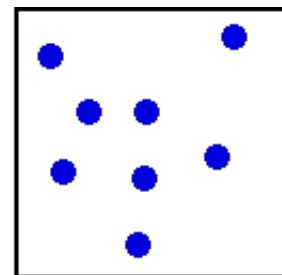
A



B



C



D

B 93%

B is the correct choice for the number of red particles and blue particles after two half-lives. The total time to reach B is 4.0 minutes.

5. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

6. If there is one question you would like to have answered in lecture, what would that question be?

nothing