Name _____   Date _____   Period _____

The Half-Life of Ba-137m

Find the Lab

■ In your web browser, go to **www.gigaphysics.com**, then click **Virtual Labs**, and then click **Geiger-Müller Tube**.

■ If someone else used the computer for this lab before you, click **New Experiment**. This will ensure that you have your own random source for the experiment.

Part I: Measure the Background Radiation

■ First we need to account for the radiation in the air, building materials, etc.—things other than the radioactive sources. (Yes, the lab is programmed to simulate these background sources.) To measure the background radiation, set the **Radiation source** to none (background), the **Type of barrier** to none, and the **Count Duration** to 10 seconds.

■ Click Start Count to begin counting the number of background particles that hit the counter in 10 seconds. After the count has completed, record your answer below.

Background: _____ counts in 10 seconds

Part II: Data Collection

Please read the directions for all of part II now. In this part you will need to take some measurements just a few seconds apart, and it's best to know what you will be doing ahead of time.

■ Change the **Radiation source** to Ba-137m. You may leave the **Type of barrier** and **Count duration** as they were in part I.

■ Click **New Ba-137m Source** to ensure that your source is strong enough to get good measurements. (Ba-137m has a half-life of only a few minutes, so it will diminish quickly.)

■ Click **Show timer** to begin the clock. Immediately thereafter, click **Start count** to find the number of Ba-137 counts in ten seconds. Enter it in the first line of the data table at the top of the next page. This count goes in the 'including background" column since you have not yet removed the background counts that you measured in part I.

■ Repeat this experiment every thirty seconds for the next eight minutes, filling in each row of the data table as you go. *Important: Be sure that the starts of each count are 30 seconds apart; don't wait 30 seconds after the end of a count to begin the next. In other words, you should be clicking the* **Start count** *button at 0:30, 1:00, 1:30, etc.*

Continued on the next page…

Elapsed time (in seconds)	Counts in 10 seconds (including background)	Counts in 10 seconds (excluding background)
0		
30		
60		
90		
120		
150		
180		
210		
240		
270		
300		
330		
360		
390		
420		
450		
480		

- Remember that some of the counts you measured were not really from the Ba-137m source, but from the background. To account for the background, subtract the background radiation count from part I from each of your counts and enter the result in the "excluding background" column above.

Part III: Graph your data.

- Graph the Ba-137 counts per 10 seconds (excluding background) vs. the elapsed time on the grid on the next page. Draw a smooth curve on the grid to represent the points' shape; don't just connect the dots.

Continued on the next page…

counts/10 sec.
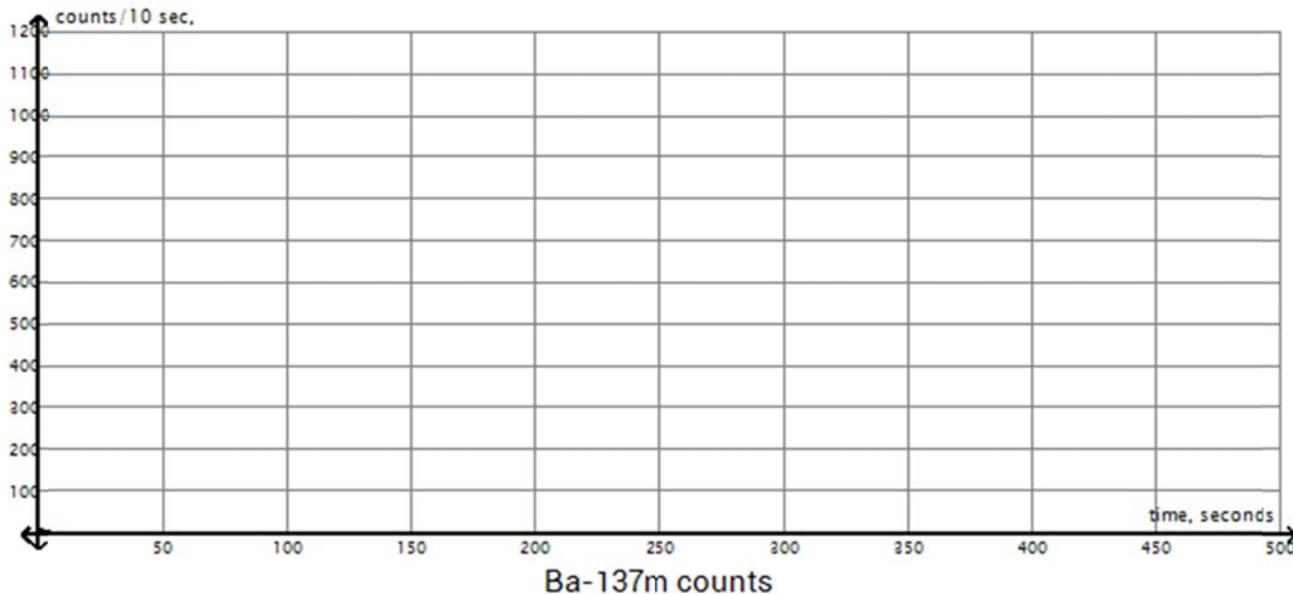
Ba-137m counts

Part V: Determine the Half-Life

At what time were there 400 counts in 10 seconds from the Ba-137m source? _____

At what time were there 200 counts in 10 seconds from the Ba-137m source? _____

What is the half-life of Ba-137m, or in other words, how long did it take for the activity of Ba-137m to drop by half, from 400 to 200? _____

If you had instead measured the time to drop from 600 to 300 counts per 10 seconds, should your value for the half-life have been much different? Explain.

_____

_____

_____

Now suppose that you had a much larger Ba-137m source that was producing 16,000 counts in 10 seconds. Based on your results from this lab, how long would it be until the same source produced only 2,000 counts in 10 seconds? Explain how you arrived at your answer.

_____

_____

_____

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