Info and Grading for Physics 211 labs

Fall 2009

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Lab logistics:

- Lab write-ups are due one week from the lab. Send me your lab as an attachment to an email to my address listed above.
- Lab handouts will be posted on class the website.
- All work must be neat, organized, and grammatically correct. Unless noted specifically, lab reports must be typed and formatted according to the rubric below.
- Because life happens, you are eligible for one free lab write-up; however, you are still responsible for knowing the lab content.
- You can always call/visit me if you aren't sure what happened in the lab or if you have any other questions.

Category	points	Your points
Author Info - include lab title, date, your name, team members, and course number on the first page at the top.	5	
Introduction – objective of experiment, brief summary of the experiment (what happened and what you found).	15	
Materials & Methods – reference lab handout and be sure to specify any deviations from the handout procedure. A reference looks like this: Materials and methods were followed as described in Lab 2, Kinematics I, physics lab handout downloaded on 9/2/09.	5	
Results – summarize the results of the experiment and list any limitations (including error). If your results included calculations, include example calculations using your data. Consider using tables or lists to show your summarized data. Supporting data should be in an Appendix or attachment to back of report but not included in summarized results	10	
Discussion – discuss your results. Why did it work…or not work? What surprised you? Explain how this experiment demonstrates the principle being examined and its relevance to everyday life. This is also where you answer any questions listed in your lab handout.	30	
Grammar/spelling/writing	35	
Total	100	

Use the same headings listed on the rubric for each of your sections (except "Author Info"). Use complete sentences and proper grammar/spelling. If your analysis includes multiple formulas you can neatly write them in rather than typing if you wish; however, this could also be an excellent time to hone your presentation skills and learn to use the equation editor in Microsoft….just ask for a demonstration/lesson anytime.

Example lab report: (your report will likely be longer – this was a shorter lab; you will also probably need tables in your results section as you will have more data and tables are usually the best way to show data)

Name
Date
Team members

Lab 11
Radioactive Decay & Half-Lives

Introduction

This lab helped us understand radioactive decay and half-lives of a radioactive substance by measuring the activity of Barium over a period of time. The decline in activity per time was measured using the LoggerPro system and produced a real-time graph of radioactivity versus time. From that graph we developed equations that would predict the activity after any specified time.

This experiment was done by first finding the background radiation in our location so we could subtract that from our experimental activity. We then obtained a sample of Barium, placed it under the Geiger counter which began collecting data every five seconds on the computer. We let this happen for 1500 seconds. Once all of our data was collected, we subtracted our background radiation from the recorded radioactivity and created a graph of our results. LoggerPro found the best curve fit line which is listed below in the results section. From this graph we were able to determine what the half-life of Barium (equation listed in results section). We found that the half-life was 2.56 seconds and the decay constant, λ, was 0.00451.

Materials & Methods

The materials used in this experiment along with the procedures were followed as described in, "Lab 11 – Radioactive Decay," accessed 12/7/07 from the Physics 108 class website.

Results

The background radiation was simple to find. It took only three minutes and we were able to get an average of 1.363 using this equation:

$$R = \frac{counts}{5\ seconds}$$

We then moved on to determine what the half-life of Barium 137. To find the half-life, this equation is used:

$$t_{\frac{1}{2}} = \frac{0.693}{\lambda}$$

After collecting data from the Geiger counter for twenty minutes, we plotted a graph on the computer and used the equation, $y = A * \exp(-Ct) + B$, to get a curve fit line on the graph. This line gave us our decay constant, λ, in the half-life equation.

$$\lambda = 0.004511$$

From this we were able to solve for the half-life of Barium 137:

$$t_{\frac{1}{2}} = \frac{0.693}{0.004511} = 2.56\ minutes$$

Discussion

This experiment directly relates to what we are studying in class. In order to use radioactive materials for health reasons in x-ray or other diagnostic imaging, it has to have a relatively short half-life so it does not do that much harm.

The results of this lab were very surprising. I had not thought about being exposed to different types of radiation on a daily basis. Also, seeing that a radioactive material can break down so quickly was not expected. You only hear about the radioactive material that takes years upon years to breakdown. A half-life of 2.56 minutes is extremely fast!

One of the discussion questions asked about the safety aspects of disposal. Because the half-life is so short, I think it would be fine to dump the material down the drain since it is barely radioactive and did not expose us to harmful amounts of radiation.

Recently, I observed a procedure in a hospital that used Barium. I did not realize it was radioactive but how else would I be see the Barium traveling through the body with x-rays. I am amazed that the whole field of diagnostic imaging is based on physics and I never knew that until now!