

PHYSICS 210: WAVES and MODERN PHYSICS; Lab 10: Radioactive Half-life

CAUTION: RADIOACTIVE MATERIALS

NO EATING OR DRINKING IN THE LAB

HANDLE THE SOURCES CAREFULLY AND AS LITTLE AS POSSIBLE

WASH YOUR HANDS THOROUGHLY AFTER LAB

1. Set up

- a. Materials needed: Geiger counter, sample holder and radioactive source
- b. Set up the counter to count for five-minute intervals

2. Collecting data

- a. Run a five-minute count with the source not in the sample holder (this is a background count)
- b. Place the source in the sample holder and then do a five-minute count
- c. Remove the source from the sample holder and do another a five-minute count
- d. Repeat steps "2b" and "2c"

3. Data table

- a. Record in a data table the three background counts, the two sample counts, the diameter of the Geiger tube, the distance from the source to the bottom of the Geiger tube and the mass of the sample

4. Calculations

- a. Calculate the average background count
- b. Calculate the average sample count
- c. Estimate the fraction of all the radiation that is emitted by the source that is detected by the Geiger tube (assume only 3 % of the gamma rays that enter the Geiger tube are detected)
- d. Calculate the current activity of the source
- e. Calculate the number of atoms in the sample
- f. Calculate the half-life of the sample

5. Questions

- a. Use a percent error calculation to compare your value for the half-life to the standard value
- b. Why would you expect the two values to be different?
- c. Why is it necessary to do a background count?
- d. If you fail to account for the background count, does the calculated half-life increase or decrease?

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