Scientific papers: data analysis and conclusions
Physics 220, spring 2009

Assignment: Draft (two copies, one with your name on it) of the Data Analysis and Conclusions sections for the half-life experiment by class time Thursday April 16.

A lab report or paper should be persuasive as well as informative. By the information you choose to present, you convince the reader that you have performed the experiment appropriately, and show the reader where your conclusions come from and why they're valid.

The intended audience is people who have had physics at the level of this course, but haven't performed this particular experiment or read the lab writeup. You may assume that you've already written an introduction and procedure section in which you've said what the goal of the experiment is and described the experimental procedure.

Data analysis
Include your data; if there are multiple data points, the data should be presented in a table and/or graph.

Show the results of any calculations or analysis you do of the data. You do not need to show each step in the calculations, but make it clear what equations you used and what the results were.

Graphs of pertinent relationships should be shown, if appropriate. Graphs and tables should have captions (not titles) saying what they represent. Number the graphs and tables separately and refer to them by number in the paper (Fig. 1, Table 1).

Conclusions (or Results)
State the main results and conclusions to be drawn from your experiment. If the goal of the experiment was to measure something, clearly say what the results of the measurement were, with uncertainty. Compare the results with an accepted value, or with a theoretical expression, if applicable. If the same quantity was measured in several different ways, compare the different methods.

Discussion of sources of error is also appropriate, but you must not simply say "human error" without being specific about what you think that error might have been, and then quantifying its effect on the data or result. Remember that a mistake is not the same as an error or uncertainty. Mistakes should be fixed before the results are written up.

If the results of your experiment suggest further directions to pursue, make specific recommendations (but simply saying something like "the experiment could have been improved with newer equipment" is not helpful!). Statements about your enjoyment (or lack thereof) of the experiment are also not appropriate here (sorry!). Leave the reader with a sense of the most important results of the experiment, and, if appropriate, what the next steps would be.

See reverse side of page for grading rubrics that will be used

Grading rubrics for analysis/results sections

Content:
Are the data presented clearly, and with appropriate units?
Is the method of analysis reasonable and carried out correctly?
Are numerical results quoted with appropriate uncertainties?
Are appropriate comparisons made to theoretical/accepted results?
Are the conclusions clearly stated, and are they supported by the data shown in the paper?
Are the figures, graphs, and tables clear and appropriate?
Are there any mistakes in the physics?
Is there anything that is missing from the paper?
Is there anything in the paper that's unnecessary?

Quality of the writing:
Are the ideas in the paper clearly expressed?
Is the paper well organized?

Mechanics:
Is the paper relatively free of grammatical and spelling errors?
Do figures, graphs, and tables have appropriate captions?
Are graphs and tables labeled, including appropriate units?