# PHYSICS LAB WRITE-UP RULES

#-1. Write the paper oriented to a person with an intelligent background who is TOTALLY ignorant of what you did. You may assume a general background knowledge of physics, but DO NOT write as if the reader was present during the design, execution or analysis of the experiment. We prefer 'third person' but you may use 'first person'. Do not use 'second person'. DO NOT SWITCH. Avoid inappropriate tense changes.

#0. Those students who wish (for extra credit) may write an abstract that is placed between the title page and the start of the paper. An abstract is a ONE PARAGRAPH description of what was done and what results were obtained without ANY pretty verbage.

THE FOLLOWING ITEMS ARE NOT THE STANDARD DESIGN IN REAL RESEARCH PAPERS BUT WE WILL DO IT THIS WAY ANYWAY. **ALL PHYSICS LAB WRITE-UPS MUST BE WORD-PROCESSED, NEVER HAND-WRITTEN.**

#1. **TITLE**
The title should:
a. Reflect the purpose.
b. Be concise and short-winded as possible while retaining clarity.
c. Be descriptive - describe the experiment, not the method. (For example, you do not mention the use of a spark timer in the title.) DON'T be cute unless you wish to lose points on the grade.

#2. **PURPOSE**
The purpose should:
a. Restate the title in a somewhat expanded form, adding any secondary purposes not included in the title.
b. Reflect the direct research orientation and omit all references to hidden purposes (such as to make the student aware of equipment). We all know that student labs serve many purposes such as familiarization with the equipment, techniques, and lab processes. For lab reports write as if you are doing original research.
c. ALWAYS be exactly one (1) paragraph long.

#3. **DISCUSSION**

a. BEFORE you even begin to discuss the actual physical procedure you should do the following things. [This is where we grade hardest!!]

1) DISCUSS the general problem you are trying to understand.

2) Often there is an historical backdrop to the research you are doing. Discuss this backdrop and how it meshes with your research. DO NOT DROP NAMES. If Galileo did some experiments that might have something to do with what you are studying don't just say that, tell us what Galileo actually did! Embed this within the discussion WITH smooth transitions. Be sure to cite sources in your discussion.

3) What is the goal you are trying to accomplish?

4) What must be measured to accomplish your goal and why?

5) What problems must be overcome to accomplish your goal.

6) Discuss (in general - without direct reference to the procedure) the technique(s) you have chosen. Be sure to explain how this mechanism will achieve the above goals. Explain any special problems the technique will cause and how you will overcome them.

7) If your mechanism involves any special mathematical processes, then discuss them in GROSS DETAIL. If derivations are necessary then do the derivations in detail. This includes WORDS explaining every step (other than standard algebraic reasoning). Each algebraic step should be listed on a separate line. Do not embed algebraic steps in the text of a paragraph. Each equation should be numbered with the numbers appearing near the right hand margin. Use the numbers of the equations for reference in the discussion.

b. Now AFTER ALL THE ABOVE begin a detailed description of your actual procedure.

1) Avoid at all costs a cookbook approach. Never list the actual parts needed unless the parts are critical to the experiment. Leave out references to such generic stuff as C-Clamps, string, tape, wire, etc. On the other hand, if a spark timer is used then say so. You should refer to the materials as they come up in the normal flow of the procedure discussion.

2) Always draw a VERY NEAT DIAGRAM of the experiment. Keep it simple showing only the critical parts. Use a straightedge to draw all straight lines!! The diagram must be functionally correct, not necessarily must it look like the actual experimental layout. Refer to the diagram as you explain your procedure. PUT THE DIAGRAM INTO THE BODY OF THE DISCUSSION. PREFERABLY IT SHOULD BE ON THE PAGE WHERE IT IS <u>REFERENCED THE FIRST TIME</u>. INCLUDE A FIGURE NUMBER AND A TITLE.

#4. **DATA**

a. NEVER EVER list data in narrative form. Even if you only have one item of data, block it out in the standard data table form.

b. Always use the rules we gave you on table construction. If the table is small, you may have it on the same page with other material.

c. Always use tables for any data.

d. If the table includes computed data, then include a sample of the calculation process just following the table. Please label the sample calculation as such. Please use your real data and indicate which data is being so used.

e. You may combine 'raw data' (original data) and computed data in the same table. In fact it is often wise to do so for readability.

f. When graphing your data follow the rule set already given. Remember, all graphs must have data tables.

g. If you receive 'line equations' from the plotter or from doing hand calculations of least squares be sure to state them in your paper as 'DATA'. The equation(s) are part of the results. Clever people will also put the equation on the graph. DO NOT USE 'X' and 'Y' AS THE GRAPHING PROGRAM DOES. Use the actual variable names as stated in the write-up. If y is velocity, then use 'V' or 'velocity'.

h. You MUST refer to each and every table, figure, and graph in the body of your paper!!!

#5. **ERROR ANALYSIS**

a. LOOK at your GRAPHS and TABLES. Do you see errors? Discuss what caused the errors. Be precise. Think! Compute! NEVER SAY HUMAN ERROR. WHAT ELSE IS THERE??

b. Include all appropriate percentage errors/differences. These should also be stated in or near the tables as appropriate.

c. As you become more proficient, try to do more involved measures of precision. Try to explain (with words) the problems inherent in the lab from a mathematical standpoint instead of just listing the errors and precision problems.

d. Try to be precise as to what the errors were and the magnitude of the errors. Try to show what effect the errors had on the final result.

#6. **CONCLUSION**

a. State explicitly how the research fared. Have the guts to say you failed if you think you did. Your grade is based on how well you write it up, not how close you got!!!! Look back at the PURPOSE and compare the purpose with the RESULTS.

b. You should also state how you could improve on your efforts if you were to do it again.