AP Physics Lab Notebook

- 1st page: Table of contents
- Each lab should be entered into the table of contents as they are reported.
- Pages should be numbered, and written in pen
- You should write on only the front pages, leaving a slash blank behind it—for ease of reading
- Mistakes should be neatly lined-out

Lab Grading:

5 pts. Title
Should clearly state what relationship is being investigated. (the variables)

10 pts. Introduction
Should be a thorough *general background* of the topic, *not too specific to your lab*. Even if you are investigating a property that is 'scientifically accepted.'

10 pts. Purpose (what are you going to learn? What is the reason for doing it?)

- This section should be specific topics relating to your lab.
- Never use "prove." Better terms are: test, verify, investigate, confirm, support..

10 pts. Hypothesis (What you expect the results to be.)

- Clearly states how the variable will affect the outcome.
- It is testable.
- The hypothesis is in the format, "The hypothesis states…"
- If appropriate, "within a ___% margin of error" that you consider acceptable

5 pts. Materials list

10 pt. Procedure

- (step-by-step experiment, including what trial the control is, and what trials are the variables).
- Provide diagrams of equipment, where appropriate.

20 pt. Observation & Data

- Qualitative (narrative) *and* Quantitative observations
- tables
- diagrams, with dimensions, and multiple views of the experiment
- Graphs: find at least one relationship to graph. Must include title, and labeled axes, including scale and units. Use a best-fit line where appropriate (hint: virtually always!)
- Calculations (are shown, including basic equations used)

30 pt. Conclusion

- Summarize the experiment: what is the relationship/big picture that was discovered?
- must state, 'supports' or 'disproves' hypothesis
- must include possible sources of experimental error, calculation of percent error
- The implications (slope!) of all graphed data must be discussed
- Suggestions for improving the experiment in the future.
  (Not just what you'd like to fix, but how you'd fix it, if you can formulate a way)
- Suggestions for further study, (if you had access to *any* equipment)

- **Use of scientific language will be considered in your grade.**
- **All writing should be objective and 3rd person.**
- **You are writing to an audience who has <u>never seen your experiment</u>. You should make clear descriptions; use writing to 'put them in the room.'**

<u>Notes to students:</u>

- **AP notebooks are used to determine comparable college credit—you want them to show rigor, high standards for achievement, and authentic lab experience.**
- **You want them marked-up. You want them to show growth over time.**
- **You should not have matching labs with your group members.**
  ***Maybe* your hypothesis, materials, procedure, and data will match, but your Introduction, purpose, conclusion, should be your *own*.**

Inquiry labs in AP Physics

Moving kids from seeking the 'right answer' to 'learning the process of science.'

- **I usually start with a 'standard cookbook physics lab' as my (secret) beginning place. They aren't familiar with them, and they are usually narrow enough to prevent them from being totally lost. The y often surprise me in what they choose to investigate!**

- **I give them a pile of materials/list at the start of the lab.**
  I tell them that they don't have to use everything in the pile, and they can use more items, if reasonable.

- **I also give them some direction to begin with ("we will investigate a property of friction forces…")**
  This keeps them from being too lost to get started and wasting a lot of time.

- **I require them to 'tinker' with the pile and come-up with a procedure and hypothesis before they are allowed to start.**
- **I approve their hypothesis before they can begin, making sure it's testable, and the controls/variables are measurable and narrow enough. I will send them back until their hypothesis is narrow and testable, and has controls. If I can see that their experiment will fail, I do NOT correct it—that is OK, and they can still earn an A for doing good science, even if their hypothesis is not supported.**

- **I am very active in walking around and asking questions of them—such as, "What other things might affect your variable?" or, "I'm not sure that you have only one variable here."**

- **When I grade these, I focus on the process, not whether the experiment 'worked.'**
  I teach them that an unsupported hypothesis is just as good as a supported hypothesis—we learn from both.

Our upcoming NGSS will *hopefully* reignite inquiry/engineering throughout all grade levels. I won't lie, these labs take *time.* Good science takes time. I set guidelines such as:
Day 1: Hypothesis and procedure
Day 2: data collection
Day 3: Evaluating data
Day 4: results and conclusion
I also check-up on them each day to be sure that they are making progress. I never say, "we have 4 days to do this experiment." They need more incremental guidance than that.

This lab guideline has evolved with me over about 12 years of teaching AP Physics, and you have my full permission to tweak this into a better model for you—be sure to share it, and to bring your changes back to a future NCNAAPT meeting!

Leanna Felardo
Oroville High School
lfelardo@ouhsd.org