SPH **Lab Books**

"Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work." (National Research Council (1996). National Science Education Standards. Washington, DC: The National Academies Press. p. 23. doi:10.17226/4962)

There are two different kinds of scientific knowledge: *what we know* and *how we know it*. We will use an inquiry model to develop our physics knowledge. To that end, you will maintain a Lab Book, that is, a portfolio in Brightspace under the category "Lab Skills". Scanned pdfs of the handouts or Google Docs of all Demos, QuickLabs, and notes, associated data, writeups abstracts, and reflections from the larger Labs and Take-Home Labs will go into the lab book. You will maintain a Table of Contents, a Google Doc provided for you to update regularly and add to the lab book. The lab book will be assessed at the end of every month, mostly for completion and correctness.

QuickLabs (QL) are short experiments and often include calculations that need to be completed before the next class to help drive the theory we are learning. You will scan a pdf of the handout or write-up in the lab book at that time. Each cycle will have many QuickLabs.

There will be several larger Labs (L) and various Take-Home Labs (THL) which will be due a week or two after the data collection date. We will spend some time in class co-developing the procedure of the larger labs; all notes about the procedure and data collected during the lab will go into the lab book, even in rough form. These larger labs will have a lot of analysis or discussion. Most of the time the results and write-up will be submitted online or presented to the class, although there might be a sheet to hand in separately in class. The Take-Home Labs will be submitted via Desmos; you will write an abstract for each and upload it to the lab book.

In addition, I will be performing many demonstrations (D) throughout the course that follow a PEOE model. Some of these are Interactive Learning Demos (ILDs), which are often multipart demos that involve a lot of graph-sketching. Every time I do a demo, you will write it up the same way.

There are five components to a demo write-up:

Date: put this in the same spot and use the same format every time. Each demo must be dated, even the ones done on the same day.

Description: include a brief but complete description of the demo. You can use point-form; diagrams are often especially helpful. Don't write an essay – describing the demo should take no more than 1-2 minutes. Descriptions are already included in some demo handouts and all ILDs.

Prediction & Explanation: This is the most important part of the demo and the one we will be spending the most time on. Make a prediction and explain it. Your prediction cannot be marked incorrectly. Go with your instinct – a lot of times you will be right! Sometimes you will be wrong – that's part of the learning process. You can always change your prediction before the demo.

I will perform the demonstration and you will write or sketch your:

Observation: If your prediction was right, you can say "as predicted." Don't change your prediction at this point. If you were wrong, well, that's how you learn. We will discuss the important points here. Again, don't write an essay. Point form and diagrams rule. Once you have recorded the observations, you will write the

Explanation: We will discuss the explanation of the demos most of the time, but occasionally we won't. If we don't discuss the explanation in class, that means you have to explain it on your own using either the textbook or theory we have learned in class.

Finally, the demo might lead to some further questions; e.g. “Would this work if we used a different colour of light?” You should include those questions at the end of the demo. Don’t ask questions that are answered by the demo itself.

If you don’t have time to finish writing up a demo in class, spend 5 minutes at lunch or after school to do so. Upload it to Brightspace as soon as possible. Keep your lab book up to date. **Do not, however, spend time retyping demos or QuickLabs**. You won’t get any extra marks and it is a waste of time.

Assessing the Lab Book

Lab books (including demos, QuickLabs, and Lab notes/abstracts) are will be assessed once a month, usually near the end of each month.I will not remind you that they are due. I will focus on a few demos and labs to comment on in particular. If you miss a class, it is your responsibility to get any information about demos from one of your classmates or to come in at lunch or after school and complete the missed lab. If you are missing any part of demo or lab from your lab book, you will get one month to include it or complete it. I will reassess only the <u>previous</u> month’s demos/labs the next month. For example, if you miss the February and March deadlines but hand it in for the April deadline, I will mark March’s demos/labs but not February’s. Keeping your lab book up-to-date will prevent scrambling at the last minute. It is always better to have *something* in the portfolio rather than nothing.

Large lab write-ups or presentations are assessed separately from the Lab Book in each of the Inquiry and Communication categories.

Lab Skills Assessment

I have demonstrated scientific investigation skills related to inquiry in the four areas of skills: initiating and planning, performing and recording, analysing and interpreting [under Inquiry], and communicating [under Communication].

No evidence → Beginning → Refining → Achieving → Mastering

Initiating and Planning I can... • formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulate educated hypotheses to focus inquiries or research • select appropriate instruments and materials, and identify appropriate methods, techniques, and procedures, for each inquiry • apply knowledge and understanding of safe laboratory practices and procedures when planning investigations	Performing and Recording I can... • conduct inquiries, controlling relevant variables, adapting or extending procedures as required, and using appropriate materials and equipment safely, accurately, and effectively, to collect observations and data • compile accurate data from laboratory and other sources, and organize and record the data, using appropriate formats, including tables, flow charts, graphs, and/or diagrams
Analysing and Interpreting I can... • synthesize, analyse, interpret, and evaluate qualitative and/or quantitative data; solve problems involving quantitative data; determine whether the evidence supports or refutes the initial prediction or hypothesis and whether it is consistent with scientific theory; identify sources of bias and/or error; and suggest improvements to the inquiry to reduce the likelihood of error • draw conclusions based on inquiry results and research findings, and justify their conclusions with reference to scientific knowledge	Communicating I can... • communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats • use appropriate numeric, symbolic, and graphic modes of representation for qualitative and quantitative data • express the results of any calculations involving data accurately and precisely, to the appropriate number of decimal places or significant figures