
Motivations

Despite the social anxiety of working with strangers, I truly feel group members in general work best when there is someone else to hold them accountable. I am not convinced that friends work well together all the time. I welcome criticism on this front with data. Here are the reasons for my distrust:

- Close friends may tend to think the same way, thus falling for the same pitfalls.
- Both friends are more likely to convince themselves that they know the answer and move on without actually having to explain it to someone.
- One person usually does all the work (or one person regularly does the measuring and the other regularly records values in a spreadsheet).

My conclusion to this is that, for the time being, **lab partners will be randomly assigned**.

I also believe that making mistakes is where all the learning happens. I welcome mistakes. For this reason, I try to avoid giving away answers. Struggling through something, while not fun for you or me, will help solidify your understanding.

- I care more about attitude than I care about correctness.
- Until a better grading system is devised, I revert to numerical feedback (scores) on assessing understanding. This is purely for motivation, not personal judgement.
- Treat this lab as physics tutoring to reinforce [most of] the topics from lecture.

Expectations

Attitude

- Be prepared to be wrong.
 - Textbook physics does not always match practical lab physics.
- Expect that you will need help.
 - There is no shame in asking for help or not knowing what to do.
 - **Just because you are unknowledgeable on a topic does not mean you are unintelligent.**
- Try to enjoy physics. I'll be happier if you're happier.
 - Keep in mind that a happy grader is often a generous grader.
 - What makes me happy is that you try and that you show effort. It doesn't need to be correct effort, it just needs to be genuine effort. This means not being lazy with units, or not calling something "good enough" when there is still work to be done.
 - Often, the attitude takes care of the grade.

Workmanship

- Work with your partner **FIRST**.
 - If you and your partner don't have an answer, ask neighbors or other friends.
 - This is one reason why I encourage working with strangers. When you are assigned partners, you have friends in other groups that you can go to for help.
 - Going to your friend at another table and not explaining what you learned to your current lab partner(s) will hurt your grade if they miss that explanation from you.
- Ask me for help. Priority will be given to those who are furthest behind.
- Get familiar with all parts of the data collection, even if your partner collects most of the data.
- Outside [online] help is welcome; if you use it, be honest and cite it.

Lab write ups

- Keep track of units.
- May answer in incomplete sentences, as long as your answer is **UNAMBIGUOUS**.
 - lack of units is usually ambiguous
- The more you write, the more I can provide feedback. (However, I don't want/need essays.)

Feedback and Response

I keep in mind your remarks at the end of the year. If you want to help make this better for other students, let me know what I can do.

What elements of the course (PHYS 1501/PHYS 1502) most contributed to your learning?

“The physics textbook, my lecture notes, and the prelabs helped prepare me for every lab session.”

- Good to hear. This is the point of the pre labs.

“The feedback on assignments were great and very in depth. Helped me to understand what I did wrong very easily.”

- I am glad you found it helpful. I will keep doing these for future students.

“David was a really good TA and he made a lot of effort to make sure that we understood not only the main objectives of the lab, but also finer points about our experiments that really made me appreciate physics a lot more than I have before.”

- Thank you. I fear that some do not like investigating the nuance between textbook physics and lab physics. I’m glad you were not one of them.

What improvements to the course (PHYS 1501/PHYS 1502) would you recommend?

“Total revamp. Worst course I have taken in 5 semesters at Vanderbilt.”

- This doesn’t help me much. I’m sorry you had a bad experience.

“Making the timeline run more similarly to lecture would be helpful.”

- Better. This is outside of my control, but your concern does get passed on to administrators, so thank you for voicing that.
- To speak on their behalf, they more or less believe that physics labs should be a ‘science skills’ practicum that deals mostly with physics and sometimes with biophysics—not necessarily a repeat class of the lecture portion. Some labs deviate from lecture on purpose because it is felt that the skills gained in another lab might apply to other disciplines and because you would have no other opportunity to learn that if it weren’t forced upon you in physics. This is particularly true when there are topics in lecture that are not conducive to lab, which happens more in PHYS 1502.

“I feel like I had to know more a more nuanced version of some physics concepts for lab than I did for lecture, sometimes before I had even learned about it in lecture. This led to me feeling frustrated and overwhelmed in lab instead of motivated.”

- While I do think the nuance is important, I do not want it to be a stressful portion of the lab. As such, I am outlining the above motivations to let you know that I want you to be accepting of the nuance between textbook physics and practical lab physics, but not pedantic. Textbook physics will get you far in the lecture. [Un]fortunately, the practical portion will likely only remain in the lab [even though it is relevant practically everywhere outside of lecture].

“Some of the labs were really long and I ended up learning less because I was trying to just finish the assignment.”

- In an effort to speed up the discussion before quizzes, I have started addressing common problems from the previous lab in a review document that I share with the class. This can be treated as a springboard for questions to ask at the start of (or preferably before) lab, or it can serve as an informal study guide to the upcoming lab quiz.

“Open note quizzes?”

- This may have some merit, but I suspect that if this were adopted by the department, the quizzes would be more difficult and take more time. This would give even less time to complete the lab.

“Eliminate all labs with the ‘design your own procedure’ to find X Y Z structure. While having to design a procedure does challenge critical thinking about physics, if we haven't learned that yet in lecture or didn't understand it in lecture then you can't make a good procedure and get increasingly frustrated. David wasn't helpful during these parts since he was vague. It was clear he wanted us to learn and figure it out ourselves, but he didn't give enough direction for us to get there. Often we would end up going in the completely wrong direction after talking with him and he would come by an hour later when it wasn't working again and tell us oh that's so messed up you need to restart you're not getting the right type of data or it's deeply flawed data. I essentially taught myself the wrong way to measure tension on the crash carts, not learning the right way.”

- I personally feel like these labs are the most useful. Yes, they are more work for you. Yes, they are even more work than usual for me to grade. Because of the incomplete picture of the concept that students have at this point in the semester, grading is usually more lenient. This is entirely an effort lab. While there are objectively more-correct ways to take data, that is something I cannot teach until you understand why other methods are flawed.
- I would argue that knowing of the ‘wrong way’ that is inefficient (or wrong) is just as important as knowing of the ‘right way.’ Yes, you may not have actually performed the intended procedure during that lab, but if/when the procedure for making such a measurement the ‘correct way’ was needed in a future lab, your [different] lab partner will likely have done a different procedure. This allows you to benefit from each other's experience.
- Remember that Thomas Edison famously knows 1,000 ways on how NOT to make a lightbulb and that this is still useful knowledge.

Do you have any other comments?

“Maybe do shorter intros david”

- Duly noted. I have started migrating my comments from the previous lab to the review document sent out via email before lab. I recognize all info to complete the current lab is already in the lab packet. I will try to keep comments brief and let groups ask questions where needed, except for when I need to address common problems that I anticipate will apply to every group.

“I would have appreciated more straightforward answers to questions in lab. I understand you are trying to help us learn, but when a majority of the lab does not finish on time and has to stay upwards an hour later it is not beneficial to our learning.”

- I politely disagree. While neither of us wants to stay later than we have to, if I had told you the answer upfront, you would likely have not remembered it for next week's lab quiz. There IS something to be said about the number of people who do not finish on time, but I suspect that is due to the lab asking too much for a 3 hour session. On the bright side, at least you do not have work to take home after lab.
- I also suspect that the shorter intros (or complete lack thereof) gave rise to questions from a larger number of groups. This makes it harder for me to address everyone's question on time. As such, I encourage you to ask your friends from other lab stations for help to avoid waiting for me. For when the same question is shared by multiple groups, I will invite all parties to one table for discussion.

“David Curie is an amazing instructor. He put on emphasis on student understanding rather than completion of the lab. He tried to ensure that everyone understood the concepts each week, and he made an effort to help students outside of class if necessary. Although the lab section is only once a week, I learned so much more from David than my actual lecture because of the passion he exhibited towards guaranteeing that each student understood the material.”

- Thank you. I am glad we saw eye-to-eye on the emphasis of lab understanding/comprehension over lab grade/completion.

Grading Examples

Show me that you know what you are talking about. You may keep it terse.

- You do not get extra points for being extra correct, BUT, I will be able to provide more feedback if you walk me through your logic. Showing your work helps.
- A few additional [slightly] incorrect comments that appear after the correct answer will not harm you.
- If your reasoning is incorrect but you somehow got the correct answer, that does not count for full credit in my eyes.

Pay attention to the following hypothetical question. Notice how answers may harbor incorrect statements but still get full credit. Also notice when an answer is brief (but correct) and when it is too vague/incomplete.

Q: Describe a skunk to someone who has never seen one or heard of one. (2 pt)

A: It's a smelly animal that is slightly larger than a house cat, or about the size of a raccoon if you already know what a raccoon is. It is usually black with a white stripe down its back. sprays people and other animals. much stink.

- This is sufficient. The incomplete sentences at the end don't bother me.
- My score: 2/2

A: Kingdom: Animalia; Phylum: Chordata; Class: Mammalia; Order: Carnivora; Superfamily: Musteloidea; Family: Mephitidae

- While factually correct [according to Wikipedia], this doesn't give me anything useful that tells me you know practical knowledge of the question. This also only describes the generic type, but doesn't give any specific knowledge of a particular skunk for reference (like a genus and species would, not that this information would be any more helpful either).
- My score: 1/2

A: it has 4 legs, is black and white, and doesn't like it when you approach it.

- Too brief. This description could also apply to dogs or cats.
- My score: 0/2 — 0.5/2 (depending on perceived effort)

A: Skunks are wild carnivorous mammals native to North America and South America. The most conventional skunk is black with a white stripe down its back, but there exist other colorings, such as the spotted skunk. The Looney Toons character Pepé Le Pew is a skunk. They sort of fart a liquid spray on their foes when they feel threatened, and this smell can take forever to get rid of. A home remedy to get rid of this smell is tomato juice, but some Walgreens stores sell skunk deodorizer.

- While more detailed than the first option, this does not receive any more points than full credit. It does allow me to see your chain of reasoning, so if parts of it are incorrect, I can give you the benefit of the doubt if I see other supporting information.
- For instance
 - skunks are omnivorous, not carnivorous
 - they secrete the liquid from designated scent glands on each side of the anus, not from the anus itself (as a fart would imply)
 - the remedy for the smell is not relevant in describing what a skunk is.
- My score: 2/2

[In reference to a particular step in a lab]

Q: Quickly remove the wire. What happens to the current? (1 pt)

A: it changes sign/direction. This is because the direction of the vector \mathbf{v} changes (as it relates to the cross product).

- Clear and concise. Full credit

A: it changes sign.

- Any insight as to why it changes sign? (0.5—0.75 /1)

Q: How would the inductance of a coil change if the number of turns were doubled but other parameters remained the same? (1 pt)

A:

$$L = \frac{\mu_0 \pi N^2 r^2}{d^2}$$

Since inductance (L) depends on the square of the number of turns (N^2), doubling the number of turns (N) would mean the inductance INCREASES by a factor of 4, since our numerator is now 4 times as large (keeping all other variables constant)

- This shows the equation from which you are basing your conclusion and describes clearly how the terms lead to an increase in value of L .
- My score: 1/1

A: It increases by 4

- You mean to say it increases by a FACTOR OF 4. The number 4 by itself doesn't mean anything unless you give it units. If you said it increases by 4 henries, that would be a better answer (but still incorrect in this context).
- My score: 0.5/1 (because I'd believe your factor of 4 was deduced correctly somehow)
- Would give 1/1 if showed equation and clearly showed that L was 4 times as large (even if final statement was mixed up or lacking clarity)

A: It decreases by 4

- Same problem with description above. Also, the conclusion is drawn the wrong way.
- If no work shown: 0/1
- If work shown but conclusion wrong: 0.5/1

Q: Calculate the effective focal length of the combined 10 and 20 cm lenses. (0.5 pt)

A: 7 cm

- Didn't show work,
- My score: 0.25/0.5

A:

$$\begin{aligned} \frac{1}{f_{\text{eff}}} &= \frac{1}{f_1} + \frac{1}{f_2} \\ &= \frac{1}{10 \text{ cm}} + \frac{1}{20 \text{ cm}} \\ &= \frac{3}{20 \text{ cm}} \end{aligned}$$

$$\Rightarrow f_{\text{eff}} = \frac{20 \text{ cm}}{3}$$

$$\approx 6.67 \text{ cm}$$

$$\approx 7 \text{ cm}$$

- My score: 0.5/0.5

A: 7

- No units, no work shown
- My score: 0/0.5

If you are asked for a comparison and your results don't turn out as expected, you can either:

1. Redo the measurement (preferred, especially if you recognize human error).
2. Explain a specific reason why your measurements were off. The further the values are away, the more possible explanations there are.

Q: Are your measurements consistent? (1pt)

A: Yes

If true: full credit (you did all of your work to measure things carefully)

Still, it is better for your sake to indicate what level of reasoning tells me so

Better: Yes, because the uncertainties overlap.

Or: Yes, because both measurements give nearly the same result even when measured by completely different techniques

***Sometimes, both measurements will be consistently wrong. This is more easily identified if you can compare your answers to well-known values (e.g. from a class average, published results, universal constants).**

A: No they are not.

- No explanation
- My score: (0–0.5 /1)

A: No. The first measurement was too large because [reasons]. This could be corrected by [solutions].

- While data collection may have been at fault, full score will likely be given because they understood their fault.
- Excusable faults are akin to “This method doesn't account for friction, so it makes sense that the overall speed is calculated to be too large.”
- **An excusable fault is NOT “We didn't hold the meter stick correctly”**
- If thoughtful reasons given, my score: (1/1)

If you read this document to here, send me an email acknowledging so for 1 free point applied to your next quiz that needs it. The deadline to submit a response is by 4:00 pm on the day of our second lab (Lab 1).

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A simple statement such as “I have read all of your guidelines” will do.