Physics 112 Spring 2021 Final Exam Notes
Final: Monday, May 24, 2021, 8–11 a.m.

Logistics:

The final exam will be administered via gradescope, much like the previous tests. The final will be designed to be completed in a 2-hour time period, but you may take the full 3-hour period if you wish. That should allow plenty of time to deal with any technical issues scanning or uploading your work.

This will be an open-book, open-notes exam. You may refer to any of our class materials, both printed and on-line. You may not use any other internet resources, or consult with anyone else about the exam until after the submission deadline. Even though this is a take-home test, I expect that you will abide by the "Principles of Intellectual Honesty" appearing in the Lafayette College Student Handbook. Any work you turn in *as* your own should *be* your own.

We will hold the final during the scheduled time slot. I will be monitoring email and have our Zoom class ready to go in case you have any questions.

Submission requirements:

- You must *complete and submit* your exam *before* 11:00 a.m. on Monday. Gradescope *will* cut you off. I *will* assess late penalties for late submissions.
- You may make as many submissions as you like within your 3-hour window. I highly recommend taking no more than two and a half hours for your exam, and then uploading the results so far. If you still have any time left, you can work some more and then resubmit your work. *Do not risk running out of time and failing to upload anything.*
- All problems *must* begin with either a fundamental principle or with an equation from the equation sheet. Simply getting the correct final answer is not sufficient. You must also display correct reasoning for getting that answer. If any question is unclear, please ask immediately. Be sure to show your work **clearly**. Partial credit may be given for work *if* it can be understood.
- *Please* make sure your submission is clear, dark, and easy to read.
- *Please* use a scanner or a scanner app. *Do not* just use a photo. See the `gradescope.com` site for more information on how to submit a PDF assignment.

- Use a *separate page* for each problem.
- *If I can't read your work, I can't give you credit.*
- *Allow time for the upload.* Allowing some students to submit late work would effectively penalize those who submit it on time.

Following these instructions will be a significant help to me in reading your work and giving you appropriate credit. Thank you in advance for your cooperation.

Topics: The final exam will be cumulative, incorporating topics covered throughout the semester. The style will be very similar to the tests this semester.

Atomic and nuclear physics (Chs. 29 and 30) will account for about $\frac{1}{8}$ of the final. Specifically, you should be able to calculate rates of nuclear decay using half-life (or time constant) information, identify products in nuclear reactions, and be able to convert mass differences to energy using $E = (\Delta m)c^2$. You should also be able to apply other physics concepts covered this semester within a nuclear context.

The following general areas may be covered:

Ch. 15 & 16	Waves
Ch. 17	Wave Optics
Ch. 18	Ray Optics
Ch. 20	Electric Forces and Fields
Ch. 21	Electric Potential and Potential Energy
Ch. 22 & 23	DC Circuits
Ch. 24	Magnetism
Ch. 25	Induction; Electromagnetic Waves
Ch. 28 & 29	Quantum and Atomic Physics
Ch. 30	Nuclear Physics

Omissions: The following topics originally on the syllabus will not be on the final:

Sections 15:7	Doppler Effect
Sections 18.2,4	Reflection; Images formed by Refraction
Ch. 19	Optical Instruments
Section 21:6	Electrocardiogram
Section 23:4	Measuring Voltage and Current
Section 23:7	RC Circuits
Section 23:8	Nervous System
Section 24:8	Magnetic Materials
Section 28:1	X-rays
Section 28:2	Photoelectric Effect
Section 28:8	Quantum Theory
Section 29:6–9	Multielectron Atoms, Molecules, & Lasers
Section 30:6	Medical Applications
Section 30:7	Ultimate Building Blocks of Matter

Lab-Inspired Questions: There may be lab-inspired questions on the final. For example, there may be questions which are similar to physical situations you encountered in lab.

You will not be responsible for calculating or propagating uncertainties, though we do hope you find those topics useful in your future endeavors.

Hints

Some questions may apply concepts from several chapters to a single problem.

Review the equation sheet carefully so that you know what the symbols mean and when each equation applies. It is important to understand what the individual symbols mean, but it is also important to understand the broader context for the equations so you know when they do or do not apply, and how to combine them in a particular situation.

Do not attempt to memorize specific examples. Instead, be sure you understand the basic physical principles and the reasoning behind their use.

Draw pictures with clear labels. Use those labels in your equations. This helps make sure your intent is clear.

Do not memorize specialized equations. Start each problem with a general principle

or an equation from the equation sheet. *If you start your solution with a specialized equation that is not on the equation sheet, you may lose substantial credit.* Then, if numerical values are needed, substitute them for the appropriate symbols. This shows that you know what the relevant physics is and what the symbols mean.

If you are unable to obtain a result for some part of a problem and a subsequent part uses that result, use a symbol for the unknown result. For example, write "where v_b (in m/s) is the speed from part b."

Present your work clearly and carefully so that it can be read and understood.

Avoid round-off errors. Your final answer should normally be within 1% of the correct answer. Keep additional digits in your intermediate calculations.

Don't panic. You should have plenty of time.

Get a good night's sleep!