Physics 112 Spring 2022 Final Exam Notes
Final: Wednesday, May 11, 2022
12–3 p.m. Hugel 103

Help: Our final class, Friday, May 6, 2022, will be devoted to review and to answering questions. There are no Supplemental Instruction sessions during finals week. I will regularly monitor the Moodle Forum up through our final exam, and will be available in person to answer questions in the afternoon on Tuesday, May 10, 2022.

Logistics:

- 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.
- This will be an closed-book exam, similar in style and format to our previous hour tests.
- 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.

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:

Topics:

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 18.2,4	Reflection; Images formed by Refraction
Ch. 19	Optical Instruments
Section 21:6	Electrocardiogram
Section 23:4	Measuring Voltage and Current
Section 23:6	Capacitors in Parallel and Series
Section 23:7	RC Circuits
Section 23:8	Nervous System
Section 24:8	Magnetic Materials
Section 25:5 (partial)	Polarization
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.

Review Strategies

- 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 applied and the reasoning behind their use.
- Read equations as sentences telling a story, not just as jumbles of symbols.
- Be able to explain a logical chain of reasoning.
- Review homework problems—particularly pen & paper problems.
- Look at related textbook problems. For example, if we did problem 38, look at problems 37 & 39. They are usually similar. Answers to odd-numbered problems are in the back of the book.
- If you want to practice finding a way to start a problem, try reading and setting up lots of other problems from the back of the text. You don't need to work through all the arithmetic on every problem, but reading a wide variety of problems is a good way to see many different ways in which similar physics principles can show up.
- Make good use of the Study Area on MasteringPhysics. For example, you can find many worked examples there. You can also find extensive class recordings.
  - The "Conceptual Videos" section of the MasteringPhysics Study area includes a number of short animations illustrating various concepts. These are not indexed in the "Study by Chapter" section, so it is worth browsing through this list of videos.

Problem-Solving Strategies

- Read the whole problem carefully.
- Make a big sketch with clear labels. Use those labels in your equations. This helps make sure your intent is clear, both to yourself and to the grader.
- Try expressing in words what is happening—what is the story?

- 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.
- Pay attention to units. They can sometimes be a clue about how to approach a problem. (*e.g.* note that Intensity has units of W/m^2, while power has units of W.)
- 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.
- Reread any written explanations to make sure they say what you meant to say.
- Don't panic. You should have plenty of time.
- Get a good night's sleep!