Physics 10
Exam date: June 8, 2015
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Final Exam Study Guide

Please read this first!

Dear students: here is the study guide for the final. It is formatted a little differently than that of the midterm, but it should be easy to follow. This time around, I worked out of the eleventh edition of the text. **If you own the twelfth edition, please find a friend in the class with the eleventh edition to share.** If you have any questions, remember to consult the following in order of priority:

1. This study guide
2. The textbook (don't forget to check the index, the glossary, the terms at the end of the chapter, etc.)
3. Your lecture and discussion notes
4. Your friends in the class (if you have no friends in the class, make some)
5. Wikipedia and other reputable internet sources (Yahoo answers is not reputable)
6. Me

I fear that last time I gave students the impression that I was unwilling to help by email, and so this time I will not require a specific subject line on email requests for help. **Nevertheless, please understand that you have many resources at your disposal and the more you seek the information on your own, without my help, the better you will retain it.**

Finally, while I am amenable to most questions and requests for information, **please refrain from asking what will and will not be on the exam.** This study guide is written specifically to tell you what you should know for the exam. If it isn't on this study guide, don't worry about it. This comes with one possible exception, as I may be producing an addendum for some cosmology related questions later in the week, but you will receive that from me if it is necessary.

Happy studying and good luck!

What to expect on the exam

- Around 80 multiple choice questions
- A formula sheet with every formula you will need and a few you won't need
- Some helpful unit definitions and conversions
- Atomic numbers for all elements you will need and a few you won't need

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Reading

Most of the following are section headings in the text, while a few are subsection headings. Where necessary, I have noted where you should emphasize your attention.

Chapter 9

- Black Holes

Chapter 11

- Atomic Structure
- The Elements
- The Periodic Table of the Elements
- Molecules
- Dark Matter

Chapter 15

- Temperature
- Measuring Heat
- Specific Heat Capacity
- Expansion of Water

Chapter 22

- Conservation of Charge *(pay particular attention to the paragraph on charge quantization)*
- Coulomb's Law
- Conductors and Insulators
- Electric Field

Chapter 23

- Flow of Charge
- Electric Current
- Voltage Sources
- Ohm's Law

Chapter 25

- Generators and Alternating Current

Chapter 26

- The Electromagnetic Spectrum
- Transparent Materials *(pay particular attention to the paragraph on the speed of light in materials)*
- Opaque Materials

Chapter 32

- Discovery of the Atomic Nucleus
- Discovery of the Electron *(pay particular attention to the paragraph on Millikan's experiment)*
- Bohr Model of the Atom
- Explanation of Quantized Energy Levels: Electron Waves
- Quantum Mechanics
- Correspondence Principle

Chapter 33

- X-rays and Radioactivity
- Alpha, Beta, and Gamma Rays
- The Atomic Nucleus and the Strong Force *(pay particular attention to the first paragraph)*
- Radioactive Half-life
- Transmutation of Elements

Chapter 35

- Michelson–Morley Experiment
- Postulates of the Special Theory of Relativity
- Time Dilation
- Length Contraction
- The Correspondence Principle

Chapter 36

- Reference Frames—Nonaccelerated and Accelerated
- Principle of Equivalence
- Bending of Light by Gravity
- Gravity and Time: Gravitational Red Shift *(the core point is in the first two sentences, but it won't hurt to read the whole thing)*
- Gravitational Waves
- Newtonian and Einsteinian Gravitation

Terms

You should be able to define the following and state why they are important:

- Proton
- Neutron
- Nucleon
- Electron
- Atom
- Element
- Molecule
- Atomic number
- Joule
- Calorie
- Coulomb
- Ampere
- Current
- Alternating current
- Quantization
- Alpha particle
- Beta particle
- Gamma ray
- Photon
- Frame of reference
- Time dilation
- Length contraction
- Special theory of relativity
- General theory of relativity
- Dark matter

Formulae

Know how to use these (bonus points if you can identify which ones have names and name them):

$$F = ma$$
$$E_E = qV$$
$$F_E = \frac{kq_1q_2}{d^2}$$
$$V = IR$$

Questions from the textbook

Chapter 11

- Exercises: 27

Chapter 15

- Exercises: 7

Chapter 22

- Exercises: 21, 23, 25, 41, 42, 43

Chapter 23

- Plug and Chug: 1,3
- Exercises: 11

Chapter 26

- Exercises: 13, 21, 23, 25
- Problems: 3

Chapter 32

- Exercises: 5, 25, 27, 29

Chapter 33

- Exercises: 29, 33
- Problems: 1, 3

Chapter 35

- Exercises: 5, 25

Chapter 36

- Exercises: 5, 9, 11, 13, 21, 37

Other helpful bits from the text

- FYI, page 163
- FYI, page 201
- Check Point, page 387
- Fig. 23.2, page 406
- Fig. 26.3, page 458
- Check Point, page 459
- Blue light boxes, page 579
- Fig. 35.2, page 623
- Fig. 36.10, page 654

Things to think about:

- If two objects of different masses feel the same force acting on them, which accelerates more?
- If the atoms of which I am composed are mostly empty space, then why can't I walk through a wall?
- What is the ratio of the mass between a proton and an electron (i.e. how much more massive is a proton)? What kind of comparison can you make between other types of subatomic particles (i.e. quarks, neutrons, etc.)?
- What device is necessary for producing alternating current?
- What are the various types of electromagnetic radiation and how do they fit on the spectrum?
- How much of the electromagnetic spectrum can we see with our eyes?
- Is sound a type of electromagnetic radiation?
- How does a nucleus change when it emits an alpha ray? What about a beta ray? What about a gamma ray?
- What are the postulates of special relativity?
- What is the focus of general relativity and how is it different from special relativity?
- How old is the universe?
- What is the density of the universe?