

Midterm 2 Study Guide

Please read this first!

Dear students: Below I have compiled a list of relevant readings and problems from the text to prepare you for the exam. Where possible, I identified odd questions so that you can find solutions to them in the back of the book. The even questions shouldn't be hard to solve with some judicious internet research (though be careful on the web; there be dragons out there). The problems are from the twelfth edition. If you have the eleventh, I recommend you check with a friend to be sure that the problems are the same between the two editions. Finally, even if I recommended a problem requiring a calculator, the exam will not require or permit one.

As usual before an exam, I expect to be swamped with questions. Please follow the following priority in seeking help on questions, so that I can help everyone and still have a life this week:

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

In other words, I want you to make an effort to find the answer before contacting me. To prove that you read this, when you do email me about the exam, please write "I made an effort" in the subject line of your email. **If you do not** include that subject line, I will respond, but only to tell you to try the other options first. Rest assured, I don't dislike you or dislike hearing from you, but I'm simply trying to encourage good study practices and keep a manageable inbox.

Chapter 6

6.1 Reading

Sections:

- Momentum
- Impulse
- Impulse Changes Momentum
- Conservation of Momentum
- Collisions
- More Complicated Collisions

6.2 Definitions

- Impulse
- Impulse-momentum relationship

6.3 Problems

19, 23, 31, 39, 67, 90, 91

6.4 Equations

Know how to use these:

$$Ft = \Delta(mv)$$
$$(mv)_{\text{initial}} = (mv)_{\text{final}}$$

Chapter 7

7.1 Reading

Sections:

- Work
- Potential Energy
- Kinetic Energy
- Work-Energy Theorem
- Conservation of Energy

7.2 Definitions

- Law of conservation of energy
- Potential energy

7.3 Problems

7, 15, 23, 31, 33, 53, 87

7.4 Equations

Know how to use these:

$$W = Fd$$
$$KE = \frac{1}{2}mv^2$$
$$PE = mgh$$
$$\mathcal{P} = \frac{\Delta E}{\Delta t}$$

Chapter 9

9.1 Reading

Sections:

- The Universal Law of Gravity
- Gravity and Distance: The Inverse-Square Law
- Weight and Weightlessness
- Ocean Tides
- Black Holes

9.2 Definitions

- Weight
- Weightless
- Black hole

9.3 Problems

15, 41, 45, 55, 103

9.4 Equations

Know how to use this:

$$F = \frac{Gm_1m_2}{r^2}$$

9.5 Remarks

Note that black holes are simply collapsed stars. Read section 9.7 carefully to understand the concept of escape velocity and how it pertains to black holes.

Chapter 11

11.1 Reading

Sections:

- Characteristics of Atoms
- Atomic Imagery
- Atomic Structure
- The Periodic Table of the Elements
- Molecules

11.2 Definitions

- Electron
- Proton
- Neutron
- Atom
- Molecule
- Element
- Atomic number

11.3 Problems

12, 33

11.4 Remarks

Atoms with higher atomic numbers both have more protons and are heavier than atoms with lower atomic numbers. Some elements with low atomic numbers are H (hydrogen), He (helium), and C (carbon). Some elements with high atomic numbers are U (uranium) and Pl (plutonium). You should also know the relative masses of protons, neutrons, and electrons.

Chapter 15

15.1 Reading

Sections:

- Temperature
- Heat
- Specific Heat Capacity
- Thermal Expansion

15.2 Definitions

- Temperature
- Internal energy
- Heat
- Specific heat capacity

15.3 Problems

7, 13, 26, 55, 70

15.4 Remarks

We discussed both specific heat and conductivity. While conductivity determines how quickly heat flows between substances, it is specific heat capacity that determines how quickly the temperature in a substance changes.

Chapter 22

22.1 Reading

Sections:

- Electricity
- Electric Charges
- Electric Potential

22.2 Definitions

- Electric potential
- Electric potential energy

22.3 Problems

5, 50

Chapter 23

23.1 Reading

Sections:

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

23.2 Definitions

- Potential difference
- Electric current
- Ohm's law

23.3 Problems

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23.4 Remarks

Note that the text uses analogies to pressure to describe electric potential differences and even uses the term “electric pressure”. Make no mistake, though: “electric pressure” is not a thing. Charges move from high potential energy to low potential energy. The analogy to pressure is simply there for the sake of understanding current flow better.

Miscellaneous

Don't forget: The Higgs boson was discovered in 2012 at CERN in Geneva, Switzerland. The discovery is important because it is evidence of the Higgs field, the origin of mass.