Physics 104, Fall 2010
Midterm 1 Study Guide

I will not ask you explicitly to do any math on the exam. You are, of course, free to use mathematical arguments where you deem them appropriate. You are allowed to bring one 8.5" by 11" page of notes (both sides) to the exam. The exam will cover the topics listed below. The relevant chapters are listed in the syllabus.

The Scale of the Universe
- No numbers, just the general order of things. (the list in the slides)
  - What's bigger, the solar system or a galaxy?
  - A Universe or a galaxy?

The View From Earth
- How do the stars move in the sky throughout the night?
- How does that movement depend on your position on Earth?
- How does our view of the stars change throughout the year?
- How does the Sun move in the sky throughout the day? Throughout the year?
- How does the Sun move with respect to the background stars throughout the day?
  - Throughout the year?
- How do the planets move over time?

The scientific method.
- What is required for a scientific hypothesis to be valid?
  - Be able to give examples of valid and invalid hypotheses.
- What does a scientist mean by theory?
- What causes scientific theories to change?

The Geocentric (Aristotelian and Ptolemaic) Models of the Universe.
- How does the crystal sphere model of Aristotle work?
- What observation(s) suggested that the crystal sphere model was incorrect?
- What problem does the Ptolemy's epicycle model solve?
- What is problematic about Ptolemy's epicycle model?

The Copernican Model of the Universe
- What is the **major** difference between the Copernican and the Ptolemaic systems?
- Why is the Copernican system "better" than the Ptolemaic system
  - (Besides the fact that it was eventually proven (mostly) correct)
- Why wasn't the Copernican system widely accepted when it was proposed?
- What was wrong with it?

Kepler's Laws
- What are the three laws?
- What is the physical significance of each?
- What makes Kepler's laws so groovy?
  - (why are they better than Copernicus' original model)

Newton’s laws of motion

- What are the three laws and what is their physical significance?
- What is Velocity?
- What is acceleration?
  - How does it depend on Force?
  - How does it depend on Mass?
  - How does it effect velocity?
- What is inertia?

The Universal Law of Gravitation.

- If I drop a baseball and a bowling ball off of the cliff
- What is "universal" about the universal law?

Why was Newton revolutionary?

- How does his accomplishment differ from Kepler's?

What is a conservation law?

Conservation of Momentum

- How does a rocket work from a conservation of momentum viewpoint?

Conservation of Angular momentum

- What happens when the skater tucks her arms in?
- How does Cons. of Angular Momentum apply to Kepler's second law.

Conservation of Energy.

- How does a pendulum work from a conservation of energy viewpoint?
- How does Kepler's second law work from a conservation of energy viewpoint?

Know the three types of energy and be able to give examples.

Special Relativity

- What's strange about the speed of light? Give an example.
- What does this strangeness imply about our conception of time?
- How does this lead to light being the cosmic speed limit?