Physics 1B - Midterm #1 Study Guide

This study guide should help you prepare for Midterm #1, covering Chapters 14, 15, and 16. The exam will consist of three free-response problems, and each problem will contain three or four parts. Each part will be worth **10 points** and the entire exam will be worth **100 points**. Some parts will require more work than others. You will have to show your reasoning to get full credit. One 3" x 5" index card and a calculator (graphing calculator OK) are permitted**. Notes, books, cell phones, and any other electronics are not allowed.**

The exam will be similar to the homework and to the sample problems from lecture and discussion. However, all of the answers on the midterm will be algebraic rather numerical (i.e., you will be asked to express one variable in terms of other variables). Thus, a calculator is not necessary but may still be helpful. In addition to making sure you understand the concepts, a good way to prepare is to rework some of the homework problems (or do other exercises in the book) algebraically rather than numerically.

The midterm will only contain topics from the following list (though not all of the listed items will show up on the exam). Keep in mind that some of topics that we've covered in class but which do not show up in this list may come up on the cumulative final, so they are still worth learning!

(1) Meaning of and relationships between wave speed v, wavelength λ, period T, frequency f, angular frequency ω, and wave number k.

(2) Non-damped, non-driven simple harmonic oscillators (i.e., mass-spring systems, simple pendulums, and physical pendulums), including the differential equations describing the motion, use of initial conditions to get solutions for displacement, velocity, and acceleration as functions of time, and using conservation of mechanical energy in mass-spring systems.

(3) Transverse waves on a string, including transverse displacement, transverse velocity, and transverse acceleration of each element of the string, the wave speed (or phase speed), the difference between wave speed and transverse speed, the relationship between the string's shape and its transverse velocity and acceleration, and the wave equation.

(4) Normal transverse modes on a string of set length tied down at both ends, including transverse displacement, transverse velocity, and transverse acceleration of each element of the string corresponding to each normal mode, allowed wavelengths and frequencies, nodes and anti-nodes, and representing the modes graphically.

(5) Normal longitudinal modes in a pipe of set length, either open at both ends or open at one end, including displacement, velocity, and acceleration of each element of the fluid corresponding to each normal mode, allowed wavelengths and frequencies, nodes and anti-nodes of displacement and pressure fluctuation, mathematical relationship between displacement and pressure fluctuation, and representing the modes graphically both in terms of displacement and pressure fluctuation.

(6) Interference of sound waves: constructive and destructive interference of waves of same wavelength and frequency, constructive and destructive interference of waves of different wavelength and frequency (i.e., beats).