CHAPTER 20 - TRAVELING WAVES

Physics for scientists and engineers: A strategic approach; Randall Knight, 2nd ed.
**** also includes a PhET component (below)**

20.1 The Wave Model. Try to understand what a wave is. What is actually moving in a travelling wave? Important concept: wave speed.

20.2 One-Dimensional Waves. This section shows how waves can be represented graphically: as a history graph and a snapshot graph. Look at the horizontal axis in both graphs: a snapshot graph "freezes" a wave in time and shows the wave pattern (x-axis). The history graph shows what happens at a particular location while a travelling wave moves through this location (t-axis).

20.3 Sinusodial Waves (but SKIP subsection 'Wave Motion on a String' p. 612 - 613). Think about what it means to have TWO VARIABLES, position (x) and time (t), in the wave equation. Look carefully at equation 20.6. What does it mean that v is a 'property of the medium'? To understand this, look at equation 20.1 for determining wave speed. Include example 20.4 in your reading. (Make sure you distinguish the wave number, k, from the spring constant, k!)

20.4 Waves in Two and Three Dimensions. Think of an example of a circular wave front. Try to explain the phase difference for a wave and compare it to the phase constant/shift for harmonic oscillators.

20.5 Sound and Light, subsection Sound Waves (only p. 616-617). Briefly read the section on sound waves and look at Example 20.6. Skip the paragraph on electromagnetic waves and the index of refraction. We will do this later.
(For a later reading: → **20.5 Sound and Light** - Read the portion on electromagnetic waves and concentrate on the index of refraction(p. 619-620; or in the 1st ed. p631-632). Which properties of light are different in window glass and in air?)

20.5, subsection The Index of Refraction* (p.618-619). We have already discussed this in class, but make sure you understand the change to properties of a light wave inside a medium. These formulas are not difficult, but be sure you understand where they come from.
**assigned separately.*

20.6 Power, Intensity, and Decibels. Please read this section carefully. It is important that you know the definitions and units of power and intensity. Make sure that you are able to follow example 20.9 and 20.10. Is the decibel a intensity level or a true intensity?
I STRONGLY urge you to look at Appendix A and briefly review logarithms.

20.7 The Doppler Effect. Please read this section carefully. Figure 20.26 has a lot of critical information -- review it thoroughly. Make sure you understand example 20.11. Do the calculation for the moving observer using equations 20.40.
Try to think about situations of the Doppler Effect that you have experienced: does the pitch of a race car sound higher or lower when it is approaching you?

**COMPUTER SIMULATION:

THIS WEEK: Using a PhET simulation to answer questions (its just like playing a game!). You have already completed most of the reading for waves, but I would like you to review 20.1-20.3 as well and think about a few questions (to target your reading).

PhET simulation:
http://phet.colorado.edu/en/simulation/wave-on-a-string OR Google: "PHYSICS PhET simulations " and scroll down to the 'wave on a string' app. It is FREE (and safe) to download and should easily run on all computers.
PLAY with the different settings and make observations.