PRE-DP PHYSICS

Name: _____

Period: _____ Date: _____

DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

GIANCOLI READING ACTIVITY

Section 11-7 to 11-9 (6 Points)

1. Big Idea(s): Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.
2. Enduring Understanding(s):
   a. A wave is a traveling disturbance that transfers energy and momentum.
   b. A periodic wave is one that repeats as a function of both time and position and can be described by its amplitude, frequency, wavelength, speed, and energy.
3. Essential Knowledge(s):
   a. Waves can propagate via different oscillation modes such as transverse and longitudinal.
      i. Mechanical waves can be either transverse or longitudinal. Examples should include waves on a stretched string and sound waves.
   b. For propagation, mechanical waves require a medium, while electromagnetic waves do not require a physical medium. Examples should include light traveling through a vacuum and sound not traveling through a vacuum.
   c. The amplitude is the maximum displacement of a wave from its equilibrium value.
   d. Classically, the energy carried by a wave depends upon and increases with amplitude. Examples should include sound waves.
   e. For a periodic wave, the period is the repeat time of the wave. The frequency is the number of repetitions of the wave per unit time.
   f. For a periodic wave, the wavelength is the repeat distance of the wave.
   g. A simple wave can be described by an equation involving one sine or cosine function involving the wavelength, amplitude, and frequency of the wave.
   h. For a periodic wave, wavelength is the ratio of speed over frequency.
   i. The observed frequency of a wave depends on the relative motion of source and observer. This is a qualitative treatment only.
4. Learning Objective(s):
   a. The student is able to use a visual representation to construct an explanation of the distinction between transverse and longitudinal waves by focusing on the vibration that generates the wave.
   b. The student is able to describe representations of transverse and longitudinal waves.
   c. The student is able to analyze data (or a visual representation) to identify patterns that indicate that a particular mechanical wave is polarized and construct an explanation of the fact that the wave must have a vibration perpendicular to the direction of energy propagation.

d. The student is able to describe sound in terms of transfer of energy and momentum in a medium and relate the concepts to everyday examples.

e. The student is able to contrast mechanical and electromagnetic waves in terms of the need for a medium in wave propagation.

f. The student is able to use graphical representation of a periodic mechanical wave to determine the amplitude of the wave.

g. The student is able to explain and/or predict qualitatively how the energy carried by a sound wave relates to the amplitude of the wave, and/or apply this concept to a real-world example.

h. The student is able to use a graphical representation of a periodic mechanical wave (position versus time) to determine the period and frequency of the wave and describe how a change in the frequency would modify features of the representation.

i. The student is able to use a visual representation of a periodic mechanical wave to determine wavelength of the wave.

j. The student is able to construct an equation relating the wavelength and amplitude of a wave from a graphical representation of the electric or magnetic field value as a function of position at a given time instant and vice versa, or construct an equation relating the frequency or period and amplitude of a wave from a graphical representation of the electric or magnetic field value at a given position as a function of time and vice versa.

k. The student is able to design an experiment to determine the relationship between periodic wave speed, wavelength, and frequency and relate these concepts to everyday examples.

l. The student is able to create or use a wave front diagram to demonstrate or interpret qualitatively the observed frequency of a wave, dependent upon relative motions of source and observer.

5. Read section 11-7 to 11-9 in your textbook.

6. Define the following terms. *Note that some of these terms may be repeats of those in earlier sections, but define them here in terms of their context, i.e. wave motion*:

a. mechanical waves _____

_____

b. pulse (not to be confused with heartrate) _____

_____

c. continuous or periodic wave _____

_____

d. crest (not the toothpaste) _____

e. trough (not the container you eat from) _____

f. amplitude (A) _____

_____

g. wavelength (λ) _____

_____

h. frequency (f) _____

i. period (T) _____

j. wave velocity (v) _____

k. transverse wave _____

l. longitudinal wave _____

m. compressions (not the kind used in CPR) _____

n. expansions or rarefactions _____

o. surface waves _____

p. intensity _____

q. spherical wave _____

7. Answer the following questions.

a. Is the velocity of a wave moving along a cord the same as the velocity of a particle of the cord? Why or why not? _____

b. Give a good definition for a wave based on the above. _____

c. All forms of travelling waves transport _____

d. The source of a travelling wave pulse is a disturbance, but what causes the pulse to travel outward?

_____

e. What is the relationship between velocity, *frequency* and wavelength? Between velocity, *period* and wavelength? _____

f. What is the equation used to find the velocity of a transverse wave on a string? Define your variables. _____

g. What is the name for m/L? _____

h. In a longitudinal wave, what is comparable to crests and troughs in a transverse wave? _____

_____

i. What is the most frequently encountered example of a compression wave? _____

j. What is the equation used to find the velocity of a longitudinal wave travelling down a long, solid rod? Define your variables. _____

k. What type of waves are produced in an earthquake? _____

_____

l. What types of waves are propagated in fluids? _____

m. The waves at the beach are what type of wave? _____

n. What is the shape of the movement of a water wave? _____

o. Is a surface wave a transverse wave, longitudinal wave, or both? _____

p. What is the relationship between the energy transported by a wave and the amplitude of that wave?

_____

q. Define intensity in terms of *energy*. _____

r. Define intensity in terms of power for a spherical wave. _____

s. If the power output of a source is constant and projecting spherically, how does intensity vary with distance from a source? _____

_____

t. How does amplitude vary with distance from a source projecting spherically? _____

u. How do amplitude and intensity vary with a 1-dimensional wave? _____

_____

v. In practice, intensity *does* decrease in one-dimensional waves and spherical waves decrease *more* than the above formulas suggest. Why is this so? _____

_____

_____

8. This assignment may be typed or neatly printed. Drawings may be freehand, but try to make use of the 'Shapes' or 'Insert Clipart" functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, "LastnameFirstinitialPerXReadActX-X".