Waves Problem Set

1. The wavelength of a harmonic wave divided by its speed of propagation is equal to:

   a. the frequency
   b. the angular frequency
   c. the wave number
   d. the period

2. The greater the amplitude of a wave, the greater its:

   a. frequency
   b. wavelength
   c. wave number
   d. none of the above

3. An E note produced by a piano has a frequency of 660 Hz. What is its wavelength?

   a. 0.5 m
   b. 2.0 m
   c. 11 m
   d. 20 m

4. All of the following are **untrue** about sound waves except:

   a. They can pass through a vacuum.
   b. Their speed does not depend upon the medium of propagation.
   c. They travel as longitudinal waves.
   d. They cannot be reflected.

5. Which of the following phenomena is **not** characteristic of sound waves:

   a. reflection
   b. polarization
   c. diffraction
   d. interference

6. Waves, excluding light, which move through the body of a liquid (not on the surface):

   a. are transverse
   b. are longitudinal
   c. may be either transverse or longitudinal
   d. must be traveling waves

7. If the tension of a stretched string is increased 9 times, the fundamental frequency:

   a. will increase 9 times
   b. will decrease 9 times
   c. will increase 3 times
   d. will remain the same

8. Sound travels about four times more quickly through water than through air. Which of the following is the best explanation for this?

    a. Water is less dense than air.
    b. Water is more dense than air.
    c. The bulk modulus of water is greater than the bulk modulus of air.
    d. Water is more dense than air and the bulk modulus of water is greater than the bulk modulus of air.

9. During the day, the upper atmosphere is cooler than air at ground level, while during the night, the upper levels are warmer than the lower levels. Traveling more slowly through more dense media, the tendency during the day is for sound waves to veer upwards through the atmosphere, while at night the sound waves veer downwards. To which of the following is this situation most analogous?

    a. the refraction of light
    b. convection currents in the ocean
    c. the Doppler effect
    d. the thermal equilibrium of radiation

10. An organ pipe with one closed end is 0.75 m long. Which of the following notes does it produce?

    a. A (110 Hz)
    b. B (248 Hz)
    c. A (220 Hz)
    d. E (660 Hz)

11. The thrash group, Power Mower, normally plays through a stack of amps 10 meters high by 10 meters wide, which produces the intensity level 120 dB in the mosh pit. They saved up real hard and purchased an identical stack and set this one side by side with the original. What is the new intensity level in the mosh pit?

    a. 240 dB
    b. 144 dB
    c. 130 dB
    d. 123 dB

12. Earthquakes produce both transverse and longitudinal waves in the earth. It has been found however, that the transverse waves, upon reaching a certain depth beneath the earth's surface, stop entirely while longitudinal waves continue onward past this depth. Which of following provides the best explanation for this?

    a. The greater pressure at deeper levels opposes the perpendicular displacements of the transverse waves.
    b. Because of the lack of crystalline structure in liquid (in this case, the magma below the crust) it is impossible to produce a shearing stress by displacing a section of liquid.
    c. The transverse waves are reflected by the denser strata at that depth.
    d. The transverse waves reach a threshold beyond which the gravitational force can no longer act to restore wave displacement.

13. Karate Joe is one of those amazing phenoms of late-night movies whose karate chop produces a definite whizzing sound as it cuts the air. In fact, though, Joe has a special skill. When the camera presents a sidelong view of him chopping, the sound produced is a perfect E tone (330 Hz). When the camera is facing him, however, his chop produces an A tone (440 Hz). What is the approximate value of the unbelievable hand speed that Joe attains with his karate chop?

    a. 110 m/s
    b. 80 m/s
    c. 75 m/s
    d. cannot be determined from given information