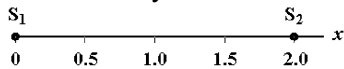# AP Physics 2 - Chapters 13 and 14 Practice

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ 1. The speed of a 10-kHz sound wave in seawater is approximately 1 500 m/s. What is its wavelength?
   a.   5.0 cm   b.   10 cm   c.   15 cm   d.   20 cm   e.   29 cm

_____ 2. Ocean waves with a wavelength of 120 m are coming in at a rate of 8 per minute. What is their speed?
   a.   8.0 m/s   b.   16 m/s   c.   24 m/s   d.   30 m/s   e.   4.0 m/s

_____ 3. A piano string of density 0.005 0 kg/m is under a tension of 1 350 N. Find the velocity with which a wave travels on the string.
   a.   260 m/s   b.   520 m/s   c.   1 040 m/s   d.   2 080 m/s   e.   4 160 m/s

_____ 4. If $y = 0.02 \sin (30x - 400t)$ (SI units), the frequency of the wave is
   a.   30 Hz   b. $15/\pi$ Hz   c. $200/\pi$ Hz   d.   400 Hz   e. 800π Hz

_____ 5. The figure shows a string which has a heavy section and a light section. The mass per unit length of the heavy section is 16 times as large as that of the light section. When the string is under tension, the speed of a pulse traveling in the heavy section is _____ times the speed of that same pulse traveling in the light section.

   a. $\dfrac{1}{16}$ b. $\dfrac{1}{4}$ c. $\dfrac{1}{2}$ d.   2   e.   4

_____ 6. Calculate the intensity level in dB of a sound wave that has an intensity of 15×10^{-4} W/m².
   a.   20   b.   200   c.   92   d.   9   e.   10

_____ 7. A jet plane has a sound level of 150 dB. What is the intensity in W/m²?
   a.   1   b.   100   c.   10   d.   1 000   e.   10 000

_____ 8. A car approaches a stationary police car at 36 m/s. The frequency of the siren (relative to the police car) is 500 Hz. What is the frequency (in Hz) heard by an observer in the moving car as he approaches the police car? (Assume the velocity of sound in air is 343 m/s.)
   a.   220   b.   448   c.   526   d.   552   e.   383

_____ 9. While you are sounding a tone on a toy whistle, you notice a friend running toward you. If you want her to hear the same frequency that you hear even though she is approaching, you must
   a.   stay put.   c.   run away from her at the same speed.
   b.   run towards her at the same speed.   d.   stay put and play a note of higher frequenc

____ 10. A friend hands you an equation sheet with the following equation for the Doppler effect: $f' = \dfrac{(v - v_0)}{(v + v_s)} f$. This
version of the equation is correct with signs as given only if
   a. the observer and source are approaching each other.
   b. the observer is approaching the source while the source is moving away from the observer.
   c. the observer is moving away from the source while the source is approaching the observer.
   d. the observer and source are moving away from each other.
   e. the observer and source are moving in perpendicular directions.

____ 11. A string is stretched and fixed at both ends, 200 cm apart. If the density of the string is 0.015 g/cm, and its tension is 600 N, what is the wavelength (in cm) of the first harmonic?
   a. 600   b. 400   c. 800   d. 1 000   e. 200

____ 12. Two point sources emit sound waves of 1.0-m wavelength. The sources, 2.0 m apart, as shown below, emit waves which are in phase with each other at the instant of emission. Where, along the line between the sources, are the waves out of phase with each other by π radians?

S_1 ●——————————————● S_2 x
0   0.5   1.0   1.5   2.0

   a. $x = 0, 1.0$ m, 2.0 m   c. $x = 0.25$ m, 0.75 m, 1.25 m, 1.75 m
   b. $x = 0.50$ m, 1.5 m   d. $x = 0.75$ m, 1.25 m

____ 13. Transverse waves $y_1 = A_1 \sin(k_1 x - \omega_1 t)$ and $y_2 = A_2 \sin(k_2 x - \omega_2 t)$, with $A_2 > A_1$, start at opposite ends of a long rope when $t = 0$. The magnitude of the maximum displacement, y, of the rope at any point is
   a. $A_1 - A_2$.   b. $A_2 - A_1$.   c. $A_1 + A_2$.   d. $(A_1 - A_2)\dfrac{k_1}{k_2}$.

The figure below shows wave crests after a stone is thrown into a pond.
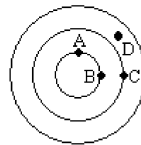
____ 14. Refer to the picture. The phase difference in radians between points A and C is
   a. 0.   b. $\dfrac{\pi}{2}$.   c. π.   d. $\dfrac{3\pi}{2}$.   e. 2π

____ 15. Refer to the picture. The phase difference in radians between points A and D is
   a. π.   b. 2π.   c. 3π.   d. 4π.   e. 5π.

_____   16. Two pulses are traveling towards each other at 10 cm/s on a long string at $t = 0$ s, as shown below.
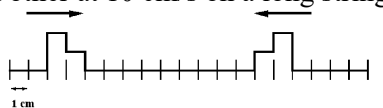
Which diagram below correctly shows the shape of the string at 0.5 s?

a.

c.

b.

d.
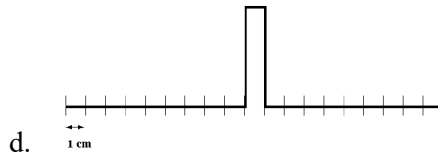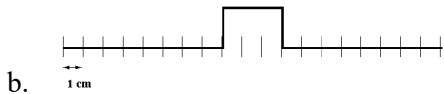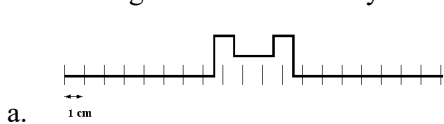
AP Physics 2 - Chapters 13 and 14 Practice
Answer Section

MULTIPLE CHOICE

1. C
2. B
3. B
4. C
5. B
6. C
7. D
8. D
9. C
10. D
11. B
12. D
13. C
14. E
15. C
16. B