Phys 132 - Fund Phys 2 - Quiz 3 Name: _____
Wednesday, March 28, 2007

Fill in your name and answers on the pink ScanTron form.
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1. Two strings have the same mass and the same length. The tension in string 1 is three times the tension in string 2, however. The speed of a transverse wave on string 1 is _____ times the speed of a transverse wave on string 2.

A) $\sqrt{3}$
B) 9
C) 1/3
D) $1/\sqrt{3}$
E) 1/9

2. Which one of the following statements concerning waves is false?

A) A wave is a traveling disturbance.
B) A transverse wave is one in which the disturbance is parallel to the direction of travel.
C) A wave carries energy from one place to another.
D) A wave does not result in the bulk flow of the material of its medium.
E) A wave can have both transverse and longitudinal components.

3. A red car and a blue car are driving on the same straight road. The driver of the red car sounds his horn. In which situation does the driver of the blue car hear the highest horn frequency (all speeds the same).

A) Both cars are moving in the same direction at the same speed.
B) The cars are moving toward each other.
C) The blue car is moving toward the red car, which is stationary.
D) The cars are moving apart.
E) The red car is moving toward the blue car, which is stationary.

4. Light is an electromagnetic wave and travels at a speed of $c = 3\times10^{8}$ m/s. The human eye is most sensitive to yellow-green light, which has a wavelength of $545\,\text{nm} = 5.45\times10^{-7}$ m . What is the frequency of this light?

A) $1.73 \times 10^{12}$ Hz
B) $3.00 \times 10^{10}$ Hz
C) $5.50 \times 10^{14}$ Hz
D) $1.81 \times 10^{6}$ Hz
E) $1.64 \times 10^{2}$ Hz

5. Which wave is purely *longitudinal*?

A) radio waves traveling through air
B) light waves traveling through vacuum
C) surface waves in a shallow pan of water
D) sound waves in air
E) waves on a plucked guitar string

6. A boy is whispering to his friend in the library. The radiated sound power from the boy's mouth is $1.2 \times 10^{-9}$ W and it spreads out uniformly in all directions. What is the minimum distance the boys must be away from the librarian so that she will not be able to hear them? The threshold of hearing for the librarian is $1.00 \times 10^{-12}$ W/m$^2$.

A) 9.8 m
B) 100 m
C) 16 m
D) 35 m
E) 23 m

7. A transverse wave on a string has an amplitude *A*. A tiny spot on the string is colored red. As one cycle of the wave passes by, what is the total distance traveled by the red spot?

A) 1/2 *A*
B) *A*
C) 4*A*
D) 1/4 *A*
E) 2*A*

8. A sound source causes a certain intensity at a certain distance. How much further away is the sound half of the original intensity?

A) $\sqrt{2}$ times as far
B) 4 times as far
C) She can be $\sqrt{2}$ times closer.
D) Twice as far
E) She can be at the same place

9. A small-amplitude transverse wave is traveling on a string. The frequency of the wave is suddenly doubled. Which one of the following is a true statement?

A) The speed of the wave is cut in half.
B) The period of the wave doubles.
C) The wavelength doubles.
D) The speed of the wave doubles.
E) The wavelength is cut in half.

10. To increase the volume (i.e. loudness) of a sound, what must be done?

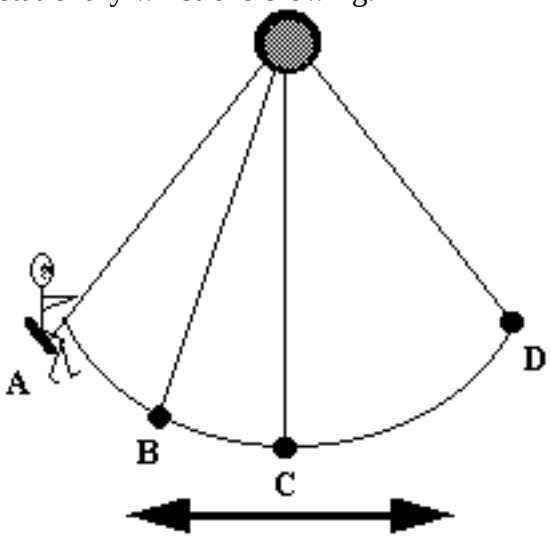
A) Increase the wavelength.
B) Increase the amplitude.
C) Increase the frequency.
D) Raise the speed of sound.
E) Decrease the frequency.

11. A periodic wave is produced on a stretched string. Which one of the following properties is *not* related to the speed of the wave?

A) tension in the string
B) period
C) wavelength
D) frequency
E) amplitude

Use the following to answer questions 12-14:

The diagram shows the various positions of a child in motion on a swing. Somewhere in front of the child a stationary whistle is blowing.





12. At which position(s) will the child hear the lowest frequency for the sound from the whistle?
A) at both **A** and **D**
B) at **C** when moving toward **D**
C) at **B** when moving toward **A**
D) at **C** when moving toward **B**
E) at **B** when moving toward **C**

13. At which position(s) will the child hear the same frequency as that heard by a stationary observer standing next to the whistle?
A) at both **A** and **D**
B) at **B** when moving toward **C**
C) at **C** when moving toward **D**
D) at **C** when moving toward **B**
E) at **B** when moving toward **A**

14. At which position(s) will the child hear the highest frequency for the sound from the whistle?
A) at both **A** and **D**
B) at **C** when moving toward **D**
C) at **B** when moving toward **A**
D) at **C** when moving toward **B**
E) at **B** when moving toward **C**

15. A guitar string produces 4 beats/s when sounded with a 250 Hz tuning fork and 9 beats per second when sounded with a 255 Hz tuning fork. What is the vibrational frequency of the string?
A) 259 Hz
B) 263 Hz
C) 246 Hz
D) 254 Hz
E) 240 Hz

Use the following to answer questions 16-18: A recording engineer works in a soundproofed room that is 43.0 dB quieter than the outside. The sound intensity in the room is $1.20\times10^{-12}$ W/m$^2$.

16. What is the sound intensity outside?
A) $6.3\times10^{-8}$ W/m$^2$
B) $2.0\times10^{-6}$ W/m$^2$
C) $2.5\times10^{-8}$ W/m$^2$
D) $2.4\times10^{-6}$ W/m$^2$
E) $5.5\times10^{-7}$ W/m$^2$

17. What is the ratio of the sound intensity outside the room to the sound intensity inside the room?
A) 20000
B) 2
C) 43
D) $10^{43}$
E) -43

18. What is the sound level (in dB) of sound in the room? (The "reference level" is $10^{-12}$ W/m$^2$.)
A) About -99 dB
B) About 43 dB
C) About 21 dB
D) Exactly -10 dB
E) About -43 dB

Use the following to answer questions 19-21: $y(x,t)=5\sin(30\pi t-40\pi x)$

19. In the above formula, the correct way to identify the frequency is by setting
A) $30\pi=\dfrac{2\pi}{f}$
B) $f=5\,\text{Hz}$
C) $40\pi=\dfrac{2\pi}{f}$
D) $30\pi=2\pi f$
E) $40\pi=2\pi f$

20. In the above formula for a wave, the amplitude *A* is
A) 5
B) $40\pi$
C) $30\pi$
D) 1/20
E) 15

21. In the above wave formula, the wavelength is
A) 0.05 m
B) 0.025 m
C) 20 m
D) 1 m
E) $40\pi$ m

22. The beat period occurring when two tuning forks are vibrating is 0.333 s. One of the forks is known to vibrate at 588.0 Hz. What are the possible vibration frequencies of the second tuning fork?

A) 584.5 Hz or 591.5 Hz
B) 580.3 or 596.7 Hz
C) 587.7 or 588.3 Hz
D) 586.0 or 592.0 Hz
E) 585.0 or 591.0 Hz

Use the following to answer questions 23-24:

A periodic transverse wave is established on a string such that there are exactly two cycles traveling along a 3.0-m section of the string. The wave moves at 20.0 m/s.

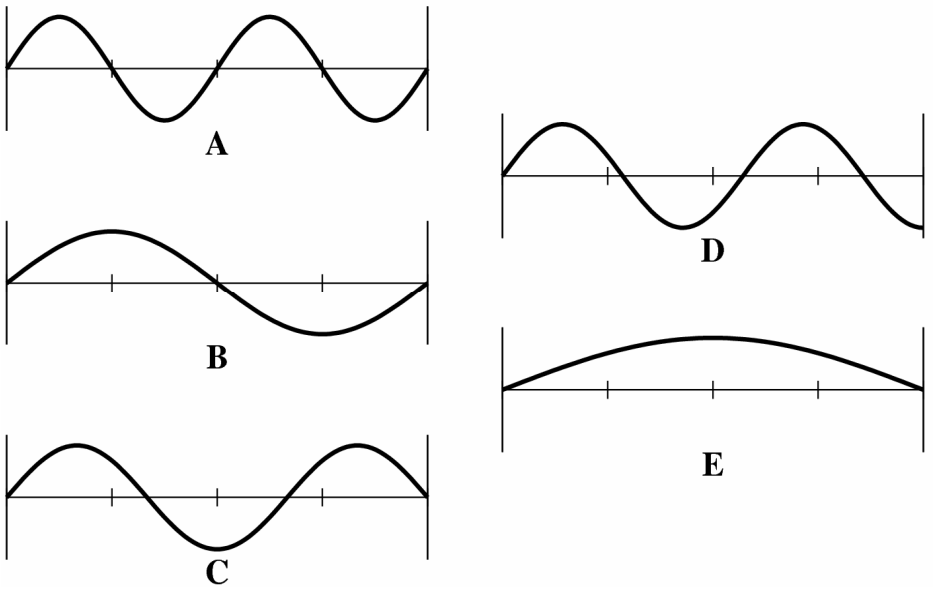
23. How could the speed of the wave be increased?

A) by decreasing the amplitude
B) by increasing the tension in the string
C) by increasing amplitude
D) by decreasing the frequency
E) by increasing the period

24. What is the frequency of the wave?

A) 30 Hz
B) 57 Hz
C) 0.67 Hz
D) 1.33 Hz
E) 13 Hz

Use the following to answer questions 25-28:
Note that not all of these standing waves are possible.




25. Which of the figures represents the *fundamental mode* of a wave on a string that is clamped at both ends?
A) A
B) B
C) C
D) D
E) E

26. Which of the diagrams represents a standing wave that is *not allowed* on a string that is clamped at both ends?
A) A
B) B
C) C
D) D
E) E

27. Which harmonic is depicted in Figure A?
A) Second.
B) Third.
C) Fourth.
D) First.
E) None of the above.

28. If the length of the string is $L$ = 1.2 m and the fundamental frequency is $f$ = 440 Hz, what is the speed of the waves on the string?
A) 528 m/s
B) 0.00273 m/s
C) 367 m/s
D) 0.00545 m/s
E) 183 m/s