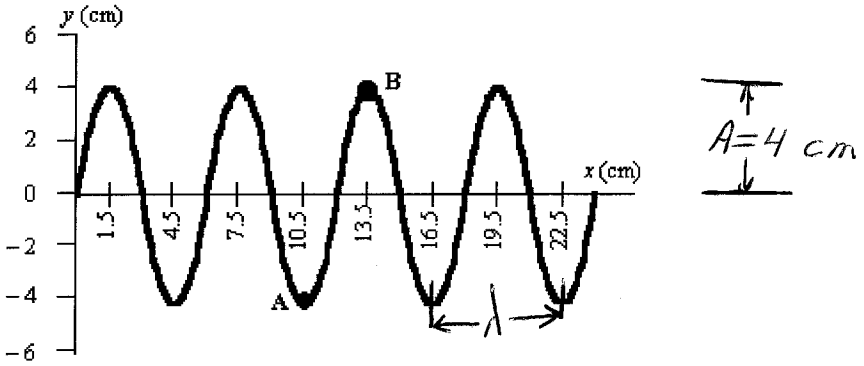
Phys 132 - Fund Phys 2 - Homework 12
Wednesday, Mar 7, 2007

Name: Solutions
Refer to Chapter 16 or the "Waves Handout".

The displacement of a vibrating string versus position along the string is shown in the figure. The periodic waves have a speed of 10.0 cm/s. **A** and **B** are two points on the string.



1. What is the amplitude of the wave?
A) 2 cm
B) 4 cm
C) 8 cm
D) 12 cm
E) 16 cm

2. What is the wavelength of the wave?
A) 3.0 cm
B) 6.0 cm
C) 9.0 cm
D) 12 cm
E) 15 cm

x distance between two peaks or troughs.

3. What is the frequency of the wave?
A) 0.60 Hz
B) 0.90 Hz
C) 1.1 Hz
D) 1.3 Hz
E) 1.7 Hz

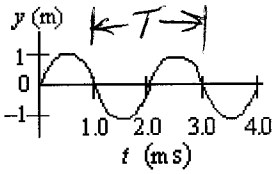
$$f = \frac{v}{\lambda} = \frac{10.0\ cm/s}{6.0\ cm} = 1.7\ Hz$$

4. What is the difference in phase between the points A and B?
A) (π/4) radians
B) (π/2) radians
C) π radians
D) (3π/4) radians
E) 2π radians

- A full cycle has a phase $\phi = 2\pi$ radians
- From A to B is ½ cycle

$$\phi_{AB} = \frac{1}{2} 2\pi = \pi$$

5. The speed of sound in a certain metal block is 3.00×10^3 m/s. The graph shows the amplitude (in meters) of a wave traveling through the block versus time (in milliseconds). What is the wavelength of this wave?



The period is $T = 2\ ms = 0.002\ s$

$f = 1/T = \frac{1}{0.002\ s} = 500\ Hz$

$\lambda = \frac{V}{f} = \frac{3000\ m/s}{500\ Hz} = 6.0\ m$

A) 0.5 m
B) 1.5 m
C) 3.0 m
D) 4.0 m
(E) 6.0 m

6. What is the wavelength of a wave with a speed of 12 m/s and a period of 0.25 s?

A) 0.25 m
B) 1.5 m
(C) 3.0 m
D) 24 m
E) 48 m

$\lambda = \frac{V}{F} = \frac{12\ m/s}{1/(0.25\ s)} = 12(0.25) = 3.0\ m$

$2)\ f = 1/T$

7. A wave has a frequency of 58 Hz and a speed of 31 m/s. What is the wavelength of this wave?

A) 1.9 m
B) 3.5 m
C) 0.29 m
(D) 0.53 m
E) 31 m

$\lambda = \frac{V}{F} = \frac{31\ m/s}{58\ Hz} = 0.534\ m$

8. The tension in a taut rope is increased by a factor of 9. How does the speed of wave pulses on the rope change, if at all?

A) The speed remains the same.
B) The speed is reduced by a factor of 3.
C) The speed is reduced by a factor of 9.
(D) The speed is increased by a factor of 3.
E) The speed is increased by a factor of 9.

$V = \sqrt{\frac{F_T}{m/L}}$

$\sqrt{9} = 3$

9. A transverse periodic wave described by the expression

$$y = \sin\left[2\pi\left(\frac{x}{2} + \frac{t}{10}\right)\right]$$

(where y and x are in meters and t is in seconds) is established on a string. Which one of the following statements concerning this wave is false?

A) The wave is traveling in the negative x direction. $A = 1$ (nothing mult by sin())
B) The amplitude is 1.0 m.
C) The frequency of the wave is 0.10 Hz. direction $= -x$ (x & t have same sign)
D) The wavelength of this wave is 2.0 m.
(E) The wave travels with speed 5.0 m/s.

$2\pi f = \frac{2\pi}{10} \rightarrow F = \frac{1}{10} = 0.1\ Hz$

$\frac{2\pi}{\lambda} = \frac{2\pi}{2} \rightarrow \lambda = 2.0\ m$

$V = f\lambda = (0.1)(2.0) = 0.2\ m/s$