ConcepTest 14.2 The Wave

At a football game, the "wave" might circulate through the stands and move around the stadium. In this wave motion, people stand up and sit down as the wave passes. What type of wave would this be characterized as?

- 1) polarized wave
- 2) longitudinal wave
- 3) lateral wave
- 4) transverse wave
- 5) soliton wave

ConcepTest 14.2 The Wave

At a football game, the "wave" might circulate through the stands and move around the stadium. In this wave motion, people stand up and sit down as the wave passes. What type of wave would this be characterized as?

- 1) polarized wave
- 2) longitudinal wave
- 3) lateral wave



The people are moving up and down, and the wave is traveling around the stadium. Thus, the motion of the wave is perpendicular to the oscillation direction of the people, and so this is a transverse wave.

Follow-up: What type of wave occurs when you toss a pebble in a pond?

ConcepTest 14.3a Wave Motion I

Consider a wave on a string moving to the right, as shown below.

What is the direction of the velocity of a particle at the point labeled A?





ConcepTest 14.3a Wave Motion I

Consider a wave on a string moving to the right, as shown below.

What is the direction of the velocity of a particle at the point labeled A?



The velocity of an oscillating particle is (momentarily) *zero* at its maximum displacement.



Follow-up: What is the acceleration of the particle at point A?

ConcepTest 14.6a Wave Speed I

A wave pulse can be sent down a rope by jerking sharply on the free 1) speed increases end. If the tension of the rope is increased, how will that affect the speed of the wave?

- 2) speed does not change
- 3) speed decreases

ConcepTest 14.6a Wave Speed I

A wave pulse can be sent down a rope by jerking sharply on the free end. If the tension of the rope is increased, how will that affect the speed of the wave?



- 2) speed does not change
- 3) speed decreases

The wave speed depends on the square root of the tension, so if the tension increases, then the wave speed will also increase.

ConcepTest 14.7a Sound Bite I

When a sound wave passes from air into water, what properties of the wave will change?

- 1) the frequency f
- 2) the wavelength I
- 3) the speed of the wave
- 4) both f and I
- 5) both v_{wave} and I

ConcepTest 14.7a Sound Bite I

When a sound wave passes from air into water, what properties of the wave will change?

- 1) the frequency f
- 2) the wavelength I
- 3) the speed of the wave
- 4) both *f* and I

5) both v_{wave} and I

Wave speed must change (different medium). Frequency does not change (determined by the source). Now, $v = f\lambda$ and since v has changed and f is constant then λ must also change.

Follow-up: Does the wave speed increase or decrease in water?

ConcepTest 14.8b Speed of Sound II

Do you expect an echo to return to you more quickly or less quickly on a hot day, as compared to a cold day?

- 1) more quickly on a hot day
- 2) equal times on both days
- 3) more quickly on a cold day

ConcepTest 14.8b Speed of Sound II

Do you expect an echo to return to you more quickly or less quickly on a hot day, as compared to a cold day?

more quickly on a hot day

- 2) equal times on both days
- 3) more quickly on a cold day

The speed of sound in a gas increases with temperature. This is because the molecules are bumping into each other faster and more often, so it is easier to propagate the compression wave (sound wave).

ConcepTest 14.12a Pied Piper I

You have a long pipe and a short pipe. Which one has the higher frequency?

- (1) the long pipe
- (2) the short pipe
- (3) both have the same frequency
- (4) depends on the speed of sound in the pipe

ConcepTest 14.12a Pied Piper I

You have a long pipe and a short pipe. Which one has the higher frequency?

- (1) the long pipe
- (2) the short pipe
 - (3) both have the same frequency
 - (4) depends on the speed of sound in the pipe

A shorter pipe means that the standing wave in the pipe would have a shorter wavelength. Since the wave speed remains the same, the frequency has to be higher in the short pipe.