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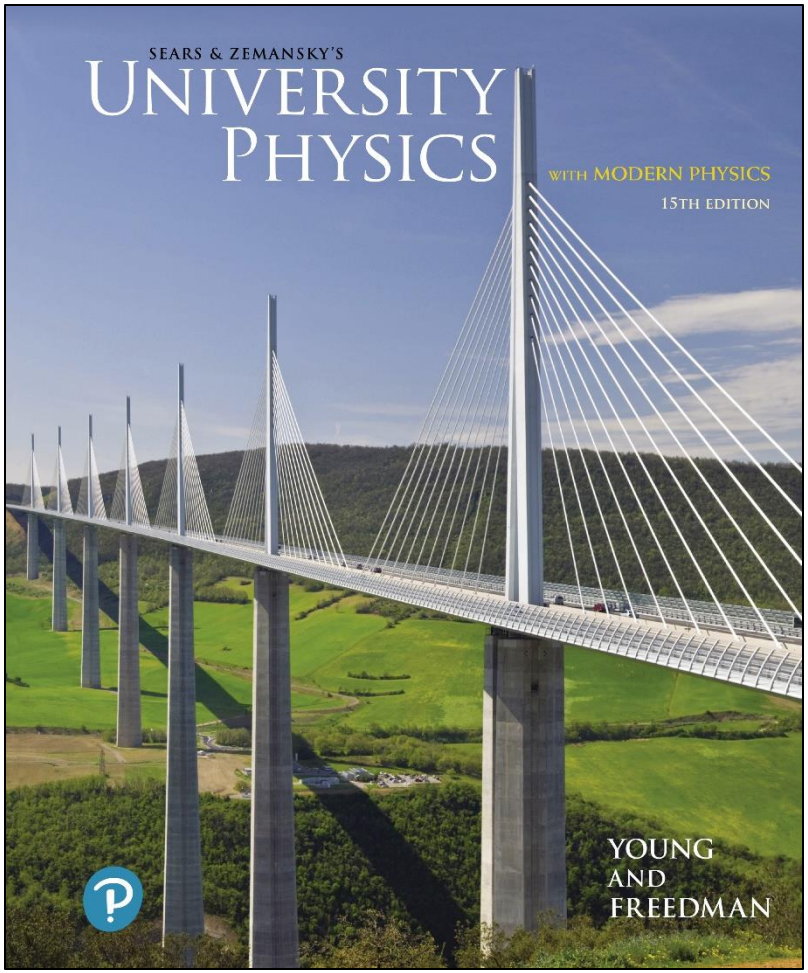
University Physics with Modern Physics

Fifteenth Edition



Chapter 15

Mechanical Waves

Pearson

Q15.1

If you double the wavelength λ of a wave on a string, what happens to the wave speed v and the wave frequency f?

A. v is doubled and f is doubled.

B. v is doubled and f is unchanged.

C. v is unchanged and f is halved.

D. v is unchanged and f is doubled.

E. v is halved and f is unchanged.

A15.1

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B. v is doubled and f is unchanged.

✔ C. v is unchanged and f is halved.

D. v is unchanged and f is doubled.

E. v is halved and f is unchanged.

Q15.2

Which of the following wave functions describe(s) a wave that moves in the –x-direction?

A. $y(x,t) = A \sin(-kx - \omega t)$

B. $y(x,t) = A \sin(kx + \omega t)$

C. $y(x,t) = A \cos(kx + \omega t)$

D. both B and C

E. all of A, B, and C

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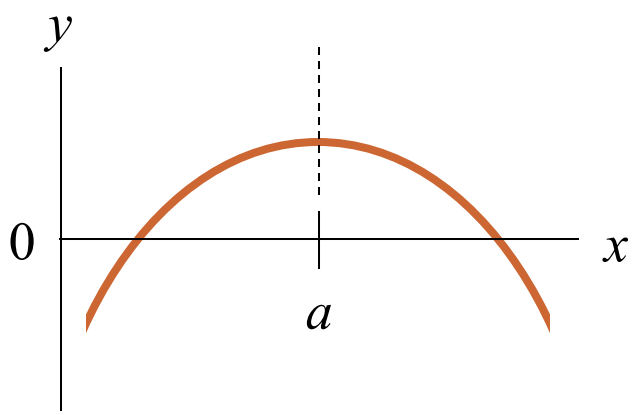
✔ E. all of A, B, and C

Q15.3

A wave on a string is moving to the right. This graph of $y(x, t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. At this time, what is the *velocity* of a particle of the string at $x = a$?



A. The velocity is upward.

B. The velocity is downward.

C. The velocity is zero.

D. Either A or B is possible.

E. Any of A, B, or C is possible.

A15.3

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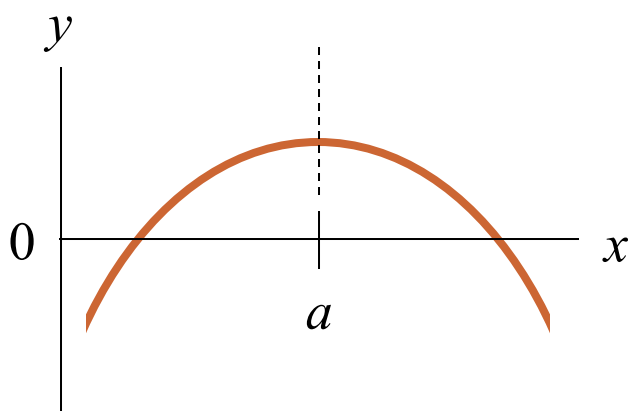


A. The velocity is upward.

B. The velocity is downward.

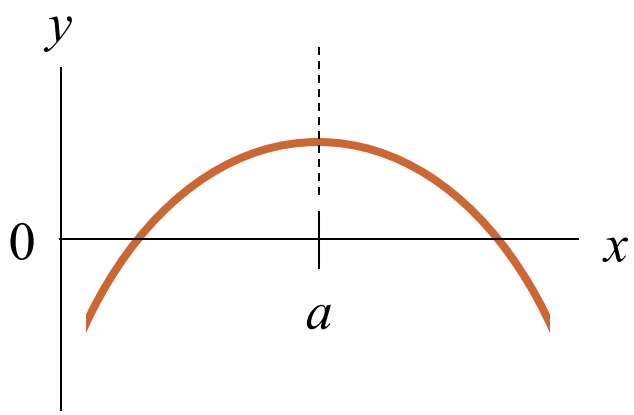
✔ C. The velocity is zero.

D. Either A or B is possible.

E. Any of A, B, or C is possible.

Q15.4

A wave on a string is moving to the right. This graph of $y(x, t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. At this time, what is the *acceleration* of a particle of the string at $x = a$?



A. The acceleration is upward.

B. The acceleration is downward.

C. The acceleration is zero.

D. Either A or B is possible.

E. Any of A, B, or C is possible.

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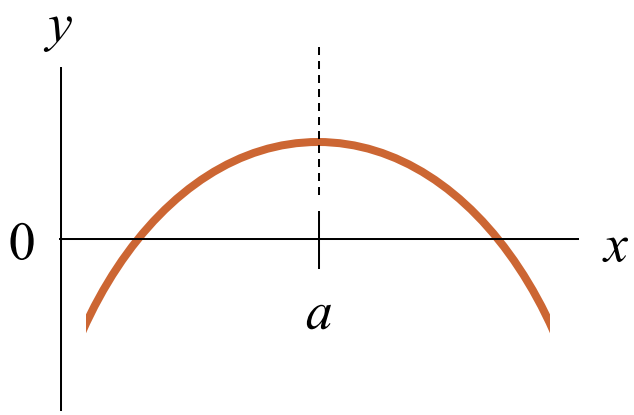
A wave on a string is moving to the right. This graph of $y(x, t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. At this time, what is the *acceleration* of a particle of the string at $x = a$?



A. The acceleration is upward.

✔ B. The acceleration is downward.

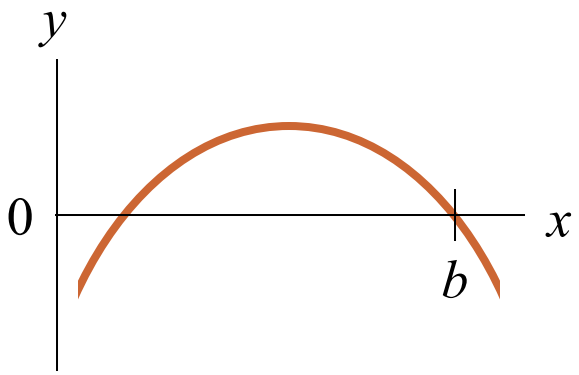
C. The acceleration is zero.

D. Either A or B is possible.

E. Any of A, B, or C is possible.

Q15.5

A wave on a string is moving to the right. This graph of $y(x, t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. At this time, what is the *velocity* of a particle of the string at $x = b$?



A. The velocity is upward.

B. The velocity is downward.

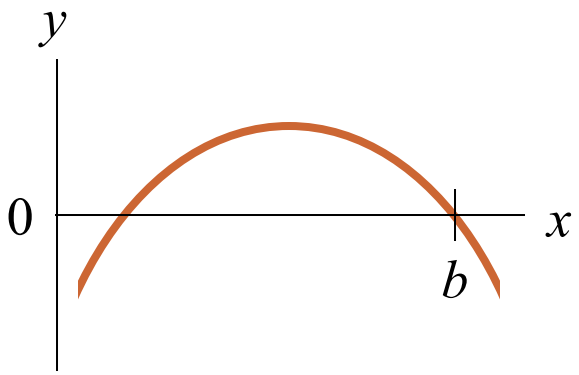
C. The velocity is zero.

D. Either A or B is possible.

E. Any of A, B, or C is possible.

A15.5

A wave on a string is moving to the right. This graph of $y(x, t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. At this time, what is the *velocity* of a particle of the string at $x = b$?



A. The velocity is upward.

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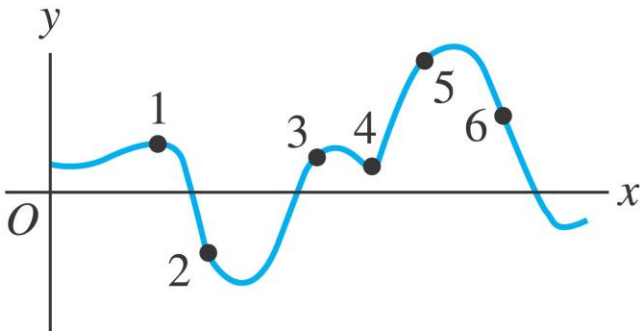
D. Either A or B is possible.

E. Any of A, B, or C is possible.

Q15.6

A wave on a string is moving to the right. This graph of $y(x, t)$ versus coordinate x for a specific time t shows the shape of part of the string at that time. At this time, the velocity of a particle on the string is *upward* at



A. only one of points 1, 2, 3, 4, 5, and 6.

B. point 1 and point 4 only.

C. point 2 and point 6 only.

D. point 3 and point 5 only.

E. three or more of points 1, 2, 3, 4, 5, and 6.

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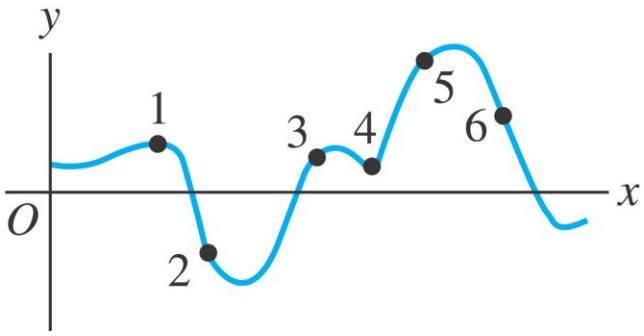

A. only one of points 1, 2, 3, 4, 5, and 6.

B. point 1 and point 4 only.

✔ C. point 2 and point 6 only.

D. point 3 and point 5 only.

E. three or more of points 1, 2, 3, 4, 5, and 6.

Q15.7

Two identical strings are each under the same tension. Each string has a sinusoidal wave with the same average power P_{av}. If the wave on string #2 has twice the amplitude of the wave on string #1, the *wavelength* of the wave on string #2 must be

A. four times the wavelength of the wave on string #1.

B. twice the wavelength of the wave on string #1.

C. the same as the wavelength of the wave on string #1.

D. half of the wavelength of the wave on string #1.

E. one-quarter of the wavelength of the wave on string #1.

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Q15.8

The four strings of a musical instrument are all made of the same material and are under the same tension, but have different thicknesses. Waves travel

A. fastest on the thickest string.

B. fastest on the thinnest string.

C. at the same speed on all strings.

D. Either A or B is possible.

E. Any of A, B, or C is possible.

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Q15.9

While a guitar string is vibrating, you gently touch the midpoint of the string to ensure that the string does not vibrate at that point. The lowest-frequency standing wave that could be present on the string vibrates at

A. the fundamental frequency.

B. twice the fundamental frequency.

C. three times the fundamental frequency.

D. four times the fundamental frequency.

E. There is not enough information given to decide.

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Q-RT15.1

Four strings, each made of the same material and of the same diameter, each carry a sinusoidal wave of frequency 10 Hz. The string tension and wave amplitude are different for different strings. **Rank** the following strings in order from highest to lowest value of the *average wave power*.

A. Tension 10 N, amplitude 1.0 mm

B. Tension 40 N, amplitude 1.0 mm

C. Tension 20 N, amplitude 2.0 mm

D. Tension 10 N, amplitude 4.0 mm

A-RT15.1

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D. Tension 10 N, amplitude 4.0 mm

✔ Answer: DCBA