Vibrations of a transverse wave are perpendicular to the wave motion

Figure 11(a) is a representation of the wave shown in **Figure 10** (on the previous page) at a specific instant of time, *t*. This wave travels to the right as the particles of the rope vibrate up and down. Thus, the vibrations are perpendicular to the direction of the wave's motion. A wave such as this, in which the particles of the disturbed medium move perpendicularly to the wave motion, is called a **transverse wave.**

transverse wave

a wave whose particles vibrate perpendicularly to the direction the wave is traveling

The wave shown in **Figure 11(a)** can be represented on a coordinate system, as shown in **Figure 11(b).** A picture of a wave like the one in **Figure 11(b)** is sometimes called a *waveform.* A waveform can represent either the displacements of each point of the wave at a single moment in time or the displacements of a single particle as time passes.

In this case, the waveform depicts the displacements at a single instant. The x-axis represents the equilibrium position of the string, and the y coordinates of the curve represent the displacement of each point of the string at time t. For example, points where the curve crosses the x-axis (where $y = 0$) have zero displacement. Conversely, at the highest and lowest points of the curve, where displacement is greatest, the absolute values of y are greatest.

Wave measures include crest, trough, amplitude, and wavelength

A wave can be measured in terms of its displacement from equilibrium. The highest point above the equilibrium position is called the wave **crest.** The lowest point below the equilibrium position is the **trough** of the wave. As in simple harmonic motion, amplitude is a measure of maximum displacement from equilibrium. The amplitude of a wave is the distance from the equilibrium position to a crest or to a trough, as shown in **Figure 11(b).**

crest

the highest point above the equilibrium position

trough

the lowest point below the equilibrium position

As a wave passes a given point along its path, that point undergoes cyclical motion. The point is displaced first in one direction and then in the other direction. Finally, the point returns to its original equilibrium position, thereby completing one cycle. The distance the wave travels along its path during one cycle is called the **wavelength,** λ (the Greek letter *lambda*). A simple way to find the wavelength is to measure the distance between two adjacent similar points of the wave, such as from crest to crest or from trough to trough. Notice in **Figure 11(b)** that the distances between adjacent crests or troughs in the waveform are equal.

wavelength

the distance between two adjacent similar points of a wave, such as from crest to crest or from trough to trough

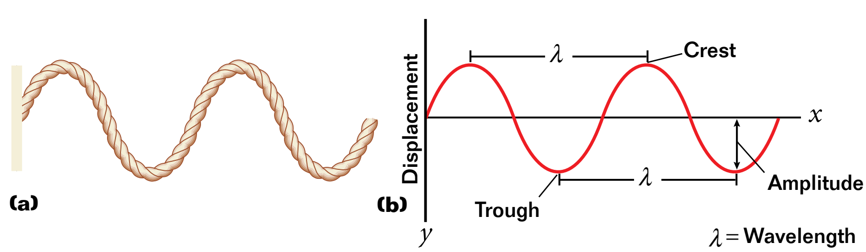

Figure 11
(a) A picture of a transverse wave at some instant t can be turned into **(b)** a graph. The x-axis represents the equilibrium position of the string. The curve shows the displacements of the string at time t.