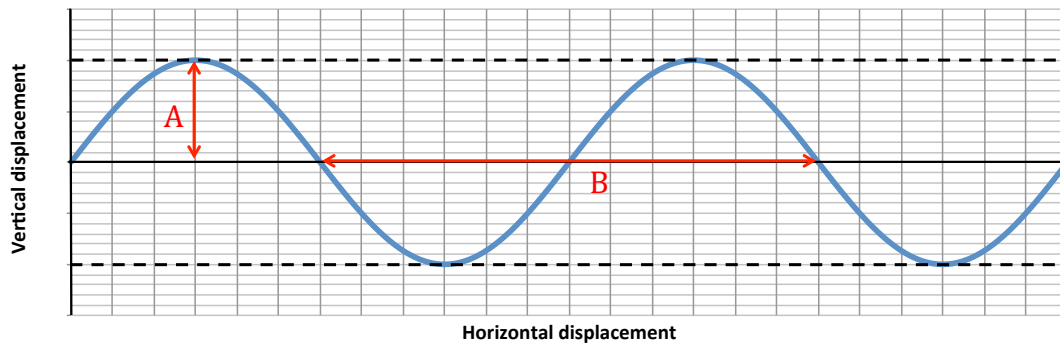


## Waves – PhET sim

Waves carry energy from one place to another. Waves which travel in a medium (a material) cause the particles in the medium to be displaced from their equilibrium position. Particles can either vibrate parallel to the direction the waves are moving or at right angles. These are called longitudinal and transverse waves, respectively.

Let's consider a transverse wave:



We can see a 'snapshot' of the wave at a certain time. The vertical displacement is shown for particles at different horizontal positions.

*✎ What do arrows A and B represent?*

*✎ What units could B be measured in?*

*✎ The frequency of the waves is the number of waves that pass a fixed point in one second. How would you measure the frequency if you were bobbing up and down in a boat as the waves passed underneath you?*

*✎ What units is frequency measured in?*

## PhET simulation

Open the following sim:

[https://phet.colorado.edu/sims/html/wave-on-a-string/latest/wave-on-a-string\\_en.html](https://phet.colorado.edu/sims/html/wave-on-a-string/latest/wave-on-a-string_en.html)

Choose  Manual and  Fixed End. Select the following settings:

Oscillate  Loose End  No End

Amplitude: 0.75 cm      Frequency: 1.50 Hz      Damping: None to Lots      Tension: Low to High

Rulers       Timer       Reference Line

*✎ Look at one of the green particles. What do you notice about the motion compared to the direction of wave travel? Is this a transverse or longitudinal wave?*

*✎ Pause the animation and record the wavelength of the wave.*

*✎ Now use the timer to time 10 complete waves passing a certain point (e.g. out the window).*

*✎ If 10 waves pass in the time you have measured and each wave has the length you have measured, what is the wave speed?*

The wave equation relates wave speed ( $v$ ), frequency ( $f$ ) and wavelength ( $\lambda$ ):

$$v = f \times \lambda$$

*✎ Use your values above to see if this equation works for your measurements.*