

Longitudinal & Transverse Waves

Simulation: edtechsims.com/longitudinal-transverse-waves

Name: _____ Class: _____ Date: _____



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By the end of this activity, you should be able to:

- describe how particles move in transverse and longitudinal waves relative to the direction of wave travel
- identify crests, troughs, compressions and rarefactions
- identify amplitude and wavelength on a wave diagram
- give examples of transverse and longitudinal waves
- apply the wave equation $v = f\lambda$

Part A: Transverse Waves

On the sim: Click Transverse. Tick both Show Particles and Show Wave Form. Leave the sliders at their starting values.

A1 Focus on ONE particle. Describe how it moves as the wave passes. [1]

.....

.....

A2 State the direction in which the wave travels across the screen. [1]

.....

A3 Using your answers to A1 and A2, complete the sentence:

In a transverse wave, the particles vibrate _____ to the direction of wave travel.

A4 Click Pause. Fig. 1 shows a transverse wave like the one on your screen.

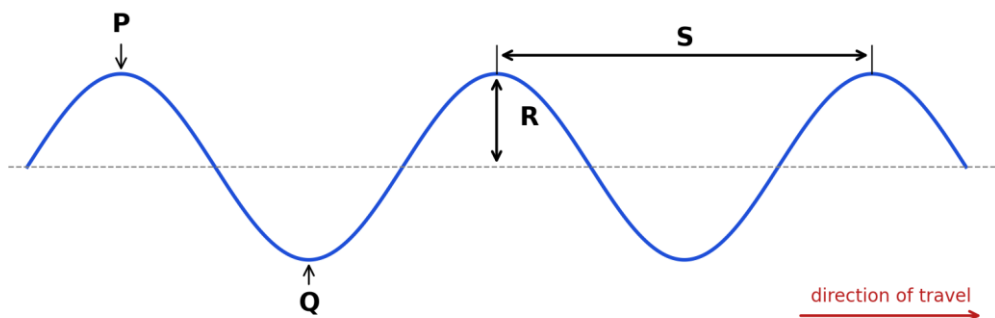


Fig. 1

State what is shown by each of the letters P, Q, R and S.

P:

Q:

R:

S:

A5 Click Play. Does any particle travel from the left side of the screen to the right side? What does the wave transfer from left to right? [2]

.....

.....

Part B: Longitudinal Waves

On the sim: Click Longitudinal. Keep both boxes ticked.

B1 Focus on ONE particle. Describe how it moves as the wave passes. [1]

.....

.....

B2 Complete the sentence:

In a longitudinal wave, the particles vibrate _____ to the direction of wave travel.

B3 Click Pause. Fig. 2 shows the particles in a longitudinal wave.

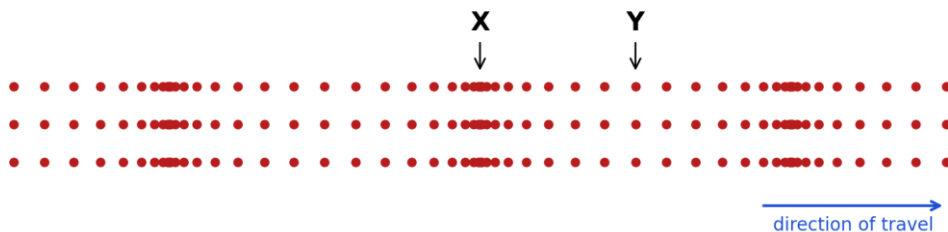


Fig. 2

(a) Name the regions labelled X and Y. [2]

X:

Y:

(b) On Fig. 2, draw a double-headed arrow to show one wavelength. Label it λ . [1]

(c) Describe, in terms of the spacing of particles, the difference between X and Y. [2]

.....

.....

Part C: Comparing the Two Waves

On the sim: Click Compare Both and watch both waves for about 30 seconds.

C1 Complete Table 1.

[4]

	Transverse wave	Longitudinal wave
Direction of particle vibration relative to wave travel		
Features formed		
Two examples		
Do the particles travel along with the wave?		

Table 1

C2 Open Check Your Understanding at the bottom of the sim. Answer all 5 questions and submit.

My score: _____ / 5. One thing I got wrong or was unsure about:

.....

Part D: Applying Your Knowledge

D1 Tick (✓) the correct column for each wave in Table 2.

[4]

Wave	Transverse	Longitudinal
Sound travelling through air		
Light		
Ripples on the surface of a pond		
Seismic P-wave		
Seismic S-wave		
A slinky pushed and pulled along its length		
A slinky shaken from side to side		
Radio waves		

Table 2

D2 A sound wave has a frequency of 440 Hz and a wavelength of 0.75 m. Calculate the speed of the sound wave.

[2]

speed = ... m/s

D3 Ripples on a pond travel at 0.24 m/s. The frequency of the ripples is 3.0 Hz. Calculate the wavelength of the ripples. [2]

wavelength = ... m

Part E: Practice Questions

E1 Fig. 3 shows the displacement–distance graph for a transverse wave at one instant.

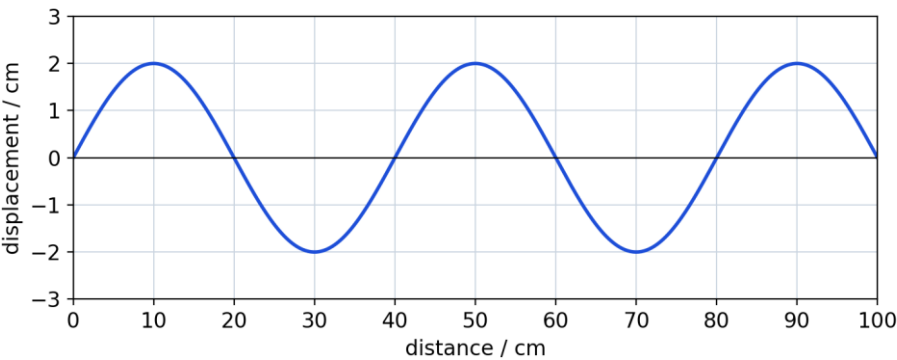


Fig. 3

(a) State the amplitude of the wave. [1]

amplitude = ... cm

(b) Determine the wavelength of the wave. [1]

wavelength = ... cm

(c) The frequency of the wave is 5.0 Hz. Calculate the speed of the wave in m/s. [2]

speed = ... m/s

E2 A loudspeaker produces a sound wave in air.

(a) Describe how the sound wave travels through the air. Refer to the air particles in your answer. [3]

.....

.....

.....

.....

(b) Explain why sound cannot travel through a vacuum. [1]

.....

.....

E3 A student produces a longitudinal wave on a slinky. Fig. 4 shows part of the slinky at one instant.

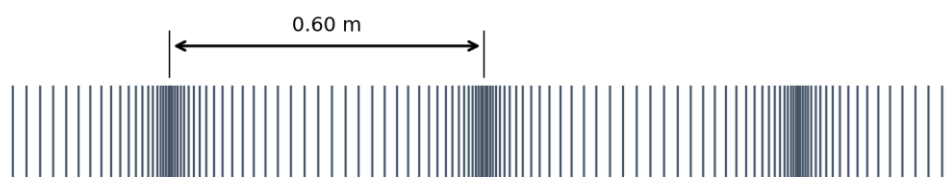


Fig. 4

The student counts 5 compressions passing a fixed point in 2.0 s.

(a) Calculate the frequency of the wave.

[1]

frequency = ... Hz

(b) Calculate the speed of the wave along the slinky.

[2]

speed = ... m/s