

TRANSVERSE WAVES & PULSES

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Lesson Description

In this lesson we:

- Define transverse pulses and waves.
- Identify constructive and destructive interference.
- Solve problems relating to waves and pulses.



Summary

PhET Simulation

- http://phet.colorado.edu/sims/wave-on-a-string/wave-on-a-string_en.html

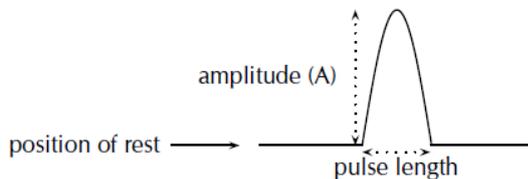
Transverse Pulses

A **pulse** is a single disturbance which moves through a medium.

A **transverse** pulse where all of the particles disturbed by the pulse move perpendicular (at a right angle) to the direction in which the pulse is moving.

The **amplitude** of a pulse is a measurement of how far the medium is displaced momentarily from a position of rest.

The **pulse length** is a measurement of how long the pulse is.



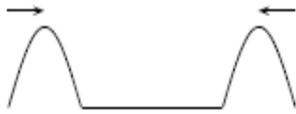
(Picture: www.everythingscience.co.za)

The **principle of superposition** states that when two disturbances occupy the same space at the same time the resulting disturbance is the sum of two disturbances.

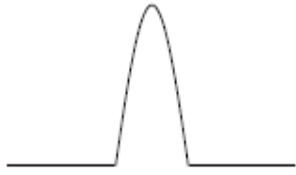
Constructive interference takes place when two pulses meet each other to create a larger pulse. Could be two crests meeting or two troughs meeting.

Destructive interference takes place when two pulses meet and result in a smaller amplitude disturbance.

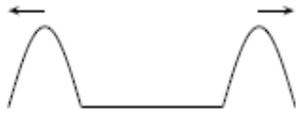
pulses move towards each other



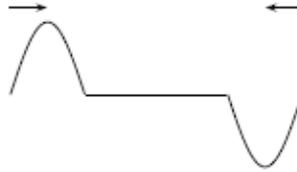
pulses constructively interfere



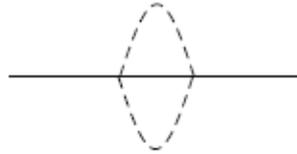
pulses move away from other



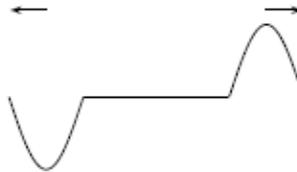
pulses move towards each other



pulses destructively interfere



pulses move away from other



Transverse Waves

A **wave** is a periodic, continuous disturbance that consists of a train of pulses.

Note: There is no net displacement of the particles of the medium (they move up and down and return to their equilibrium position), but there is a net displacement of the wave.

A **crest** is a point on the wave where the displacement of the medium is at a maximum.

A **trough** is a point on the wave where the displacement of the medium is at a minimum.



Test Yourself

Question 1

Provide the correct term for each of the following:

- A single disturbance in a medium
- The distance of one complete wave measured between any two adjacent points in phase.
- The maximum disturbance of the medium from rest.
- The time taken for one complete wave to pass a point.
- The number of waves passing a point per second.
- The substance that carries the wave.

Question 2

The unit Hertz is equivalent to...

- s^{-1}
- s
- $m^{-1}.s$
- $m.s^{-1}$

Question 3

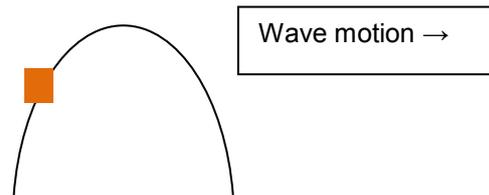
The speed of a wave is found by

- a. wavelength/frequency
- b. frequency/wavelength
- c. wavelength x frequency
- d. wavelength x period

Question 4

A cork is bobbing in a pond as ripples pass through the water.

Which way will the cork be moving as a ripple passes it from left to right?



- a. up
- b. down
- c. left
- d. right

**Improve your Skills****Question 1**

A boat, out on the ocean experiences waves (swells) passing, lifting it 8 m from trough to crest. Waves pass every 7 s and are a measured distance of 10 m apart from crest to adjacent crest.

- a.) What is the amplitude of the waves?
- b.) Calculate the frequency of the waves.
- c.) Assuming none of the conditions change, how long will it take for these waves to reach the shore 24 km away?

Question 2

Two pulses move towards one another. Pulse 1 has amplitude of 5 cm and moves from left to right. Pulse 2 has amplitude of -3 cm and moved from right to left.

- a.) Draw a sketch to indicate these pulses relative to one another.
- b.) Identify the type of interference that will occur when the pulses meet. Provide a reason for your answer.
- c.) Calculate the amplitude of the resulting pulse when the two pulses meet.
- d.) Draw a sketch indicating what happens to the pulses when they have passed one another.

**Links**

- www.everythingscience.co.za