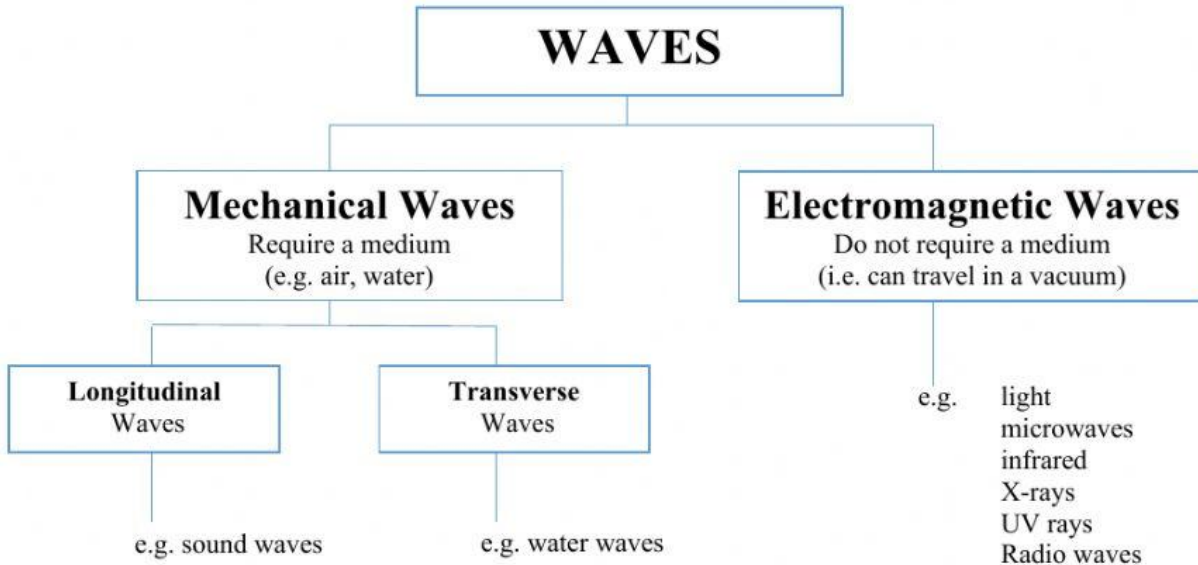


Waves introduction



Study the diagram and note the difference between Mechanical waves and Electromagnetic waves. We will start by studying Mechanical waves.

A pulse is a single disturbance in a medium. A wave is a series of pulses. Let's first examine PULSES before we move on to waves.

Pulse: Is a single disturbance that moves through a medium

In a **transverse** pulse the displacement of the medium is perpendicular to the direction of motion of the pulse. This means that if the pulse is moving from left to right, the particles of the medium are moving up and down. Think of a water wave moving through the ocean and imagine a surfer sitting on the backline. As the wave moves towards the shore, the surfer bobs up and down (perpendicular to the motion of the wave.).

DEFINITION: Transverse Pulse

A 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.

Waves have moving *crests* (or *peaks*) and *troughs*. A crest is the highest point the medium rises to and a trough is the lowest point the medium sinks to.

crests and troughs on a transverse wave are shown in Figure 8.3.

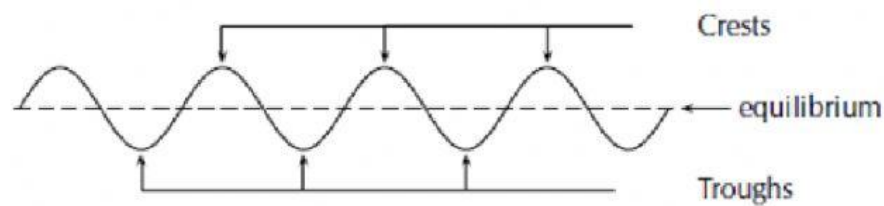


Figure 8.3: Crests and troughs in a transverse wave.

DEFINITION: Crests and troughs

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

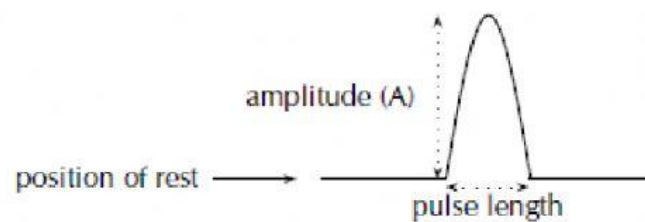
DEFINITION: Amplitude

The amplitude of a pulse is the maximum disturbance or distance the medium is displaced from its rest (equilibrium) position.

Quantity: Amplitude (A)

Unit name: metre

Unit symbol: *m*



DEFINITION: *Principle of superposition*

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

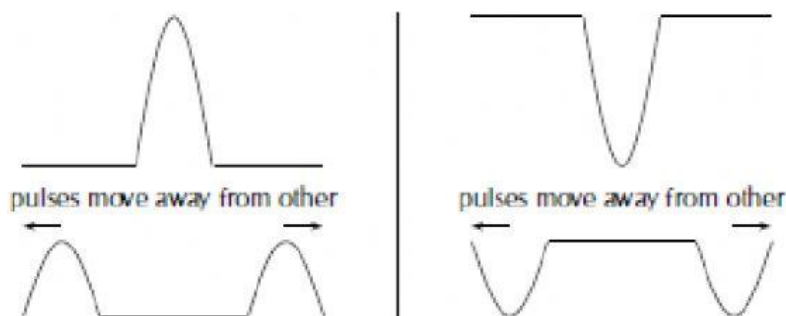
After pulses pass through each other, each pulse continues along its original direction of travel, and their original amplitudes remain unchanged.

Constructive interference

Constructive interference takes place when two pulses meet each other to create a larger pulse. The amplitude of the resulting pulse is the sum of the amplitudes of the two initial pulses. This could be two crests meeting or two troughs meeting.

DEFINITION: *Constructive interference*

Constructive interference is when two pulses meet, resulting in a bigger pulse.



Superposition of two pulses: constructive interference.

Destructive interference

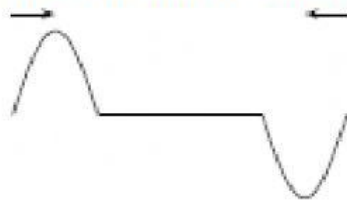
Destructive interference takes place when two pulses meet and result in a smaller amplitude disturbance. The amplitude of the resulting pulse is the sum of the amplitudes of the two initial pulses, but the one amplitude will be a negative number.

In general, amplitudes of individual pulses are summed together to give the amplitude of the resultant pulse.

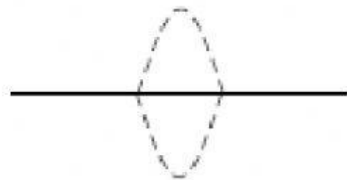
DEFINITION: Destructive interference

Destructive interference is when two pulses meet, resulting in a smaller pulse.

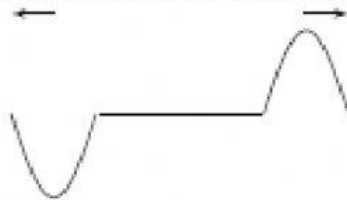
pulses move towards each other



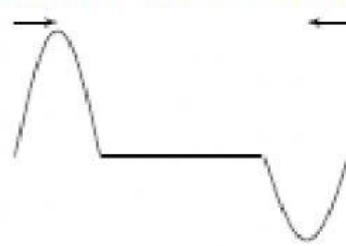
pulses destructively interfere



pulses move away from other



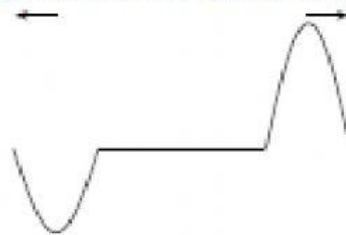
pulses move towards each other



pulses interfere



pulses move away from other



End of chapter exercises:

1. Which of the following is not a longitudinal wave?

- a) light
- b) sound
- c) ultrasound

2. Which of the following media can a longitudinal wave like sound not travel through?

- a) solid
- b) liquid
- c) gas
- d) vacuum