

Interference

What happens when two waves meet while they travel through the same medium? What affect will the meeting of the waves have upon the appearance of the medium? Will the two waves bounce off each other upon meeting (much like two billiard balls would) or will the two waves pass through each other?

These questions involving the meeting of two or more waves along the same medium pertain to the topic of wave interference.

Wave interference occurs when two waves meet while traveling along the same medium. The interference of waves causes the medium to take on a shape from the total effect of the two individual waves within the medium.

The task of determining the shape of the resultant wave from any interference requires the use of superposition.

The **principle of superposition** is stated as follows: When two waves interfere, the resulting displacement of the medium at any location is the sum of the displacements of the individual waves at that same location.

Constructive interference is a type of interference that occurs at any location along the medium where the two interfering waves have a displacement in the same direction.

Before Interference

During Interference

Constructive interference is observed at any location where the two interfering waves are displaced upward. But it is also observed when both interfering waves are displaced downward.

Destructive interference is a type of interference that occurs at any location along the medium where the two interfering waves have a displacement in the opposite direction.

Before Interference

During Interference

The two interfering waves do not need to have equal amplitudes in opposite directions for destructive interference to occur. The resulting displacement of the medium during complete overlap will be directed in the direction of the larger amplitude.

Before Interference

During Interference

When you combine a wave that has multiple pulses you can have **both** constructive and destructive interference.

Before Interference

During Interference

When multiple wave pulses meet, nodes and antinodes will be created.

A **Node** occurs during interference where the wave position has amplitude of zero; A **Node** has no displacement within the medium

An **Anti-node** has a maximum displacement during constructive interference. This is the point on the interfered wave that has the maximum amplitude.