

Interference of Waves

Read from **Lesson 3** of the **Waves** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/waves/u10l3c.html>

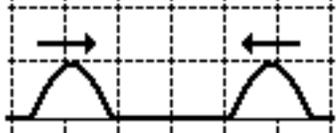
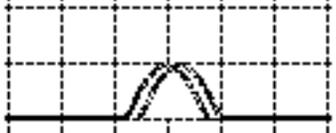
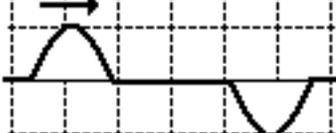
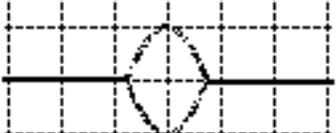
MOP Connection: Waves: sublevel 6

TRUE or FALSE: Identify the following statements as being either true (T) or false (F).

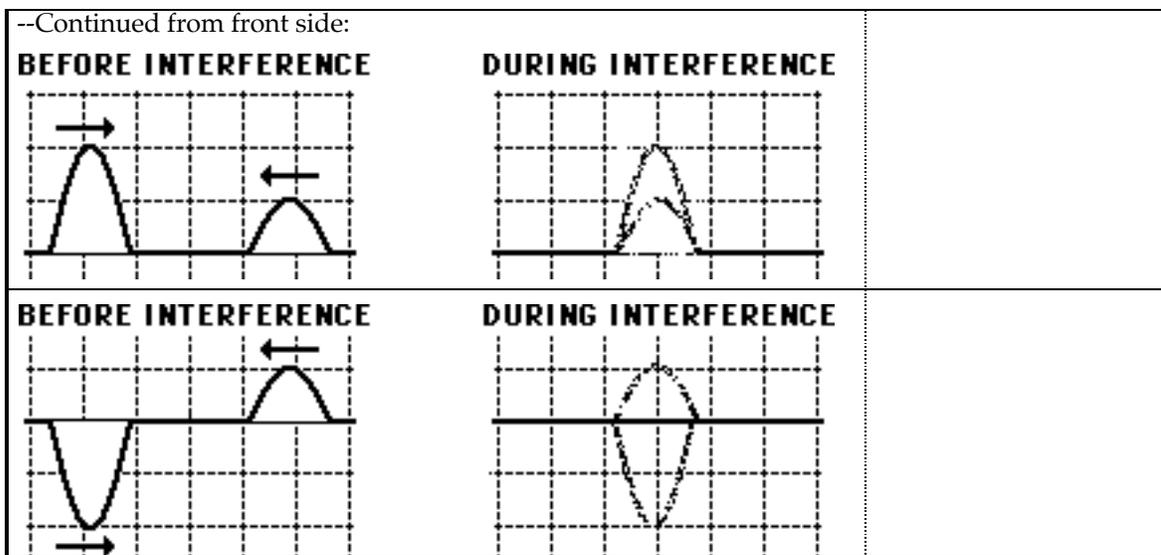
- | T or F? | |
|---------|---|
| _____ | 1. When two pulses meet up with each other while moving through the same medium, they have a tendency to bounce off each other and return back to their origin. |
| _____ | 2. Constructive interference occurs when a crest meets up with another crest at a given location along the medium. |
| _____ | 3. Destructive interference occurs when a pulse with an amplitude of +5 units interferes with a pulse with an amplitude of -5 units. |
| _____ | 4. Destructive interference occurs when a trough meets up with another trough at a given location along the medium. |
| _____ | 5. If a pulse with an amplitude of +5 units interferes with a pulse with an amplitude of +3 units, the resulting amplitude of the medium will be +4 units - the average of the two individual amplitudes. |
| _____ | 6. If a pulse with an amplitude of +5 units interferes with a pulse with an amplitude of -3 units, then neither constructive nor destructive interference occurs. |
| _____ | 7. Two sound waves could never interfere in such a manner as to cancel each other out and produce silence. |

Principle of Superposition: The effect of two interfering waves upon a medium is to produce a resulting shape and size that is the combination of the shapes and sizes of the individual waves. The amount of displacement of the medium at any given location is simply the vector sum of the displacement of the two individual waves at that location.

8. The diagrams below depict two pulses traveling towards each other and at the moment when they are completely superimposed on each other. For each diagram, sketch the resultant of the two pulses during the interference. Finally, indicate if the example represents a case of constructive or destructive interference.

| "Snapshot" of Two Pulses Before and During Interference | | Constructive or Destructive? |
|---|--|---------------------------------|
| BEFORE INTERFERENCE  | DURING INTERFERENCE  | |
| BEFORE INTERFERENCE  | DURING INTERFERENCE  | |

Wave Basics



9. Two waves are traveling along the same medium. The diagrams below show the waves on the medium at an instant in time. Utilize the principle of superposition in order to construct the shape of the medium at the instant shown in each diagram. To do so, begin by determining the resulting displacement of the medium at each of the marked locations (↑). Approximate the shape of the remainder of the medium by sketching *from dot to dot*.

Diagram A

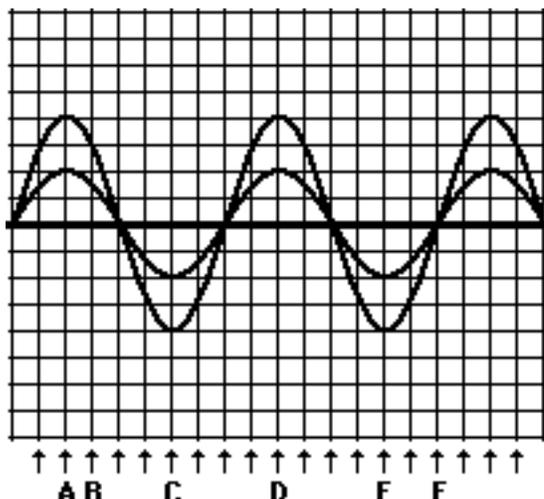
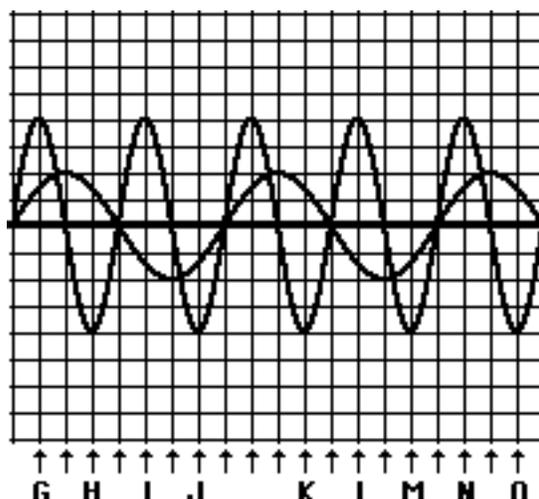


Diagram B



10. Several of the marked positions (↑) above are labeled with a letter. Categorize each labeled position along the medium as being a position where either constructive or destructive interference occurs.

| Constructive Interference | Destructive Interference |
|---------------------------|--------------------------|
| | |