Please grab your computer

PRACTICE	LABS	TESTS
Practice Problems (1-5)	• Exploring Waves Interactive • Wave Addition Interactive	Unit 14 Test Thursday (5/2/19)

Wave Behavior

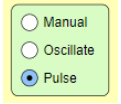
14.2	I can describe, interpret, and solve problems involving wave behavior.

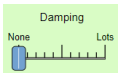
Path to Interactive

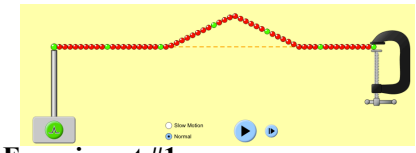
1. https://phet.colorado.edu
2. Play with Simulations
3. Physics
4. Wave on a String

Waves at Boundaries

Settings





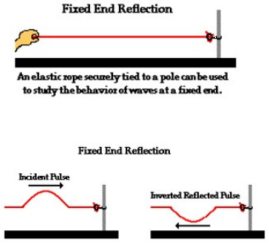


Experiment #1

Send one pulse down the string and make observations when you manipulate the

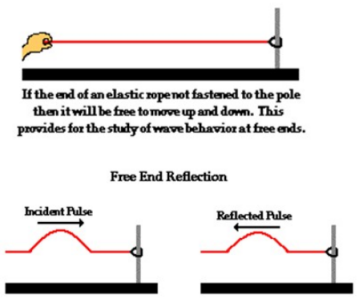
nction.

Fixed end wave reflection



- Notable characteristics of the reflected pulse include:
- The speed of the reflected pulse is the same as the speed of the incident pulse.
- The wavelength of the reflected pulse is the same as the wavelength of the incident pulse.
- The amplitude of the reflected pulse is less than the amplitude of the incident pulse.

Free end Reflection

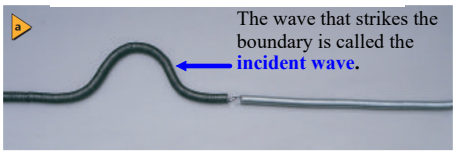


- The reflected pulse is not inverted.

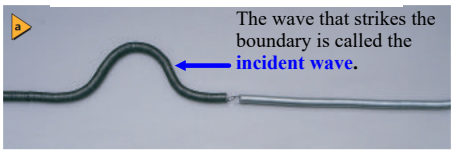
Waves at Boundaries

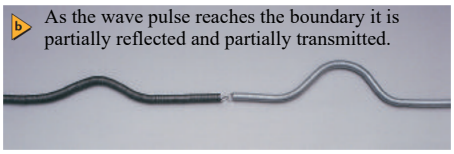
What happens when a wave moves across a boundary from one medium into another?

Waves at Boundaries

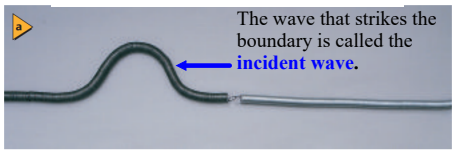


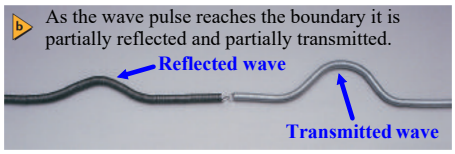
Waves at Boundaries





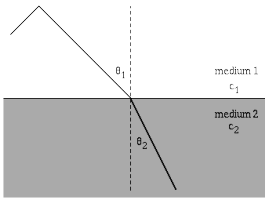
Waves at Boundaries





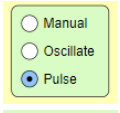
Refraction

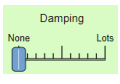
Waves can bend when parts of the wave fronts travel at different speeds. This bending of waves is called **refraction**.

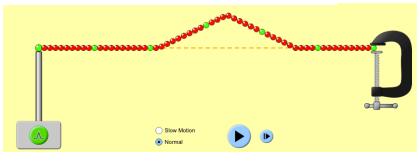


Superposition of Waves

Settings





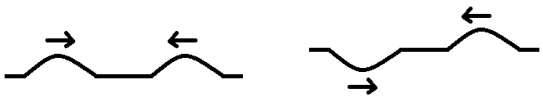


Experiment #2

Send one pulse down the string, and then send a second pulse when the first pules reaches the end. Observe how the waves interact with each other.

Superposition of Waves

The **principle of superposition** states that the displacement of a medium caused by two or more waves is the algebraic sum of the displacements caused by the individual waves.



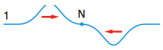
The result of the superposition of two or more waves is called **interference.**

Superposition of Waves

Constructive interference occurs when wave displacements are in the same direction. The result is a wave that has an amplitude greater than those of any of the individual waves. A larger pulse appears at point A when the two waves meet. Point A has the largest displacement and is called the **antinode** .

Superposition of Waves

The superposition of waves with equal but opposite amplitudes causes **destructive interference** . When the pulses meet and are in the same location, the displacement is zero. Point N, which does not move at all, is called a **node** .

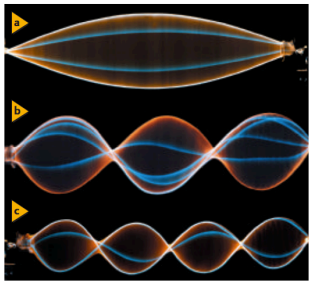


Wave Interference Application

Superposition of Waves

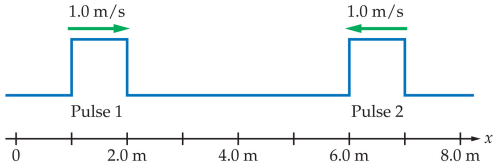
Interference can cause a wave to reflect upon itself and produce a **standing wave** .

As the frequency is increased, as shown from top to bottom, the number of nodes and antinodes increases.

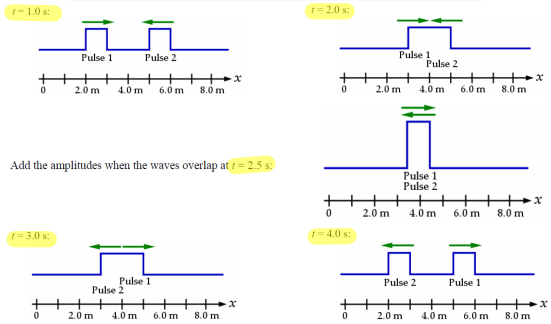


UNIT 14: IN-CLASS PROBLEMS

2. Two wave pulses on a string approach one another at the time t = 0 as shown in the figure below. Each pulse moves with a speed of 1.0 m/s. Make a careful sketch of the resultant wave at the times t = 1.0 s, 2.0 s, 2.5 s, 3.0 s, and 4.0 s, assuming that the superposition principle holds for these waves.

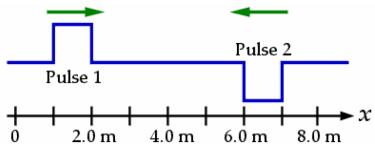


UNIT 14: IN-CLASS PROBLEMS

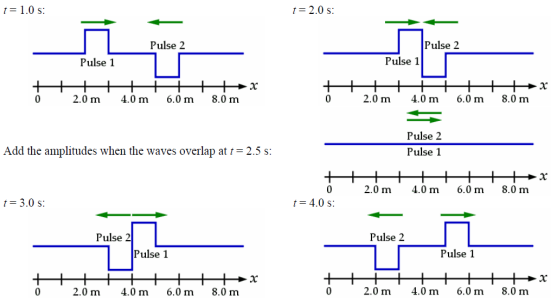


UNIT 14: IN-CLASS PROBLEMS

Suppose pulse 2 in Problem 2 is inverted, so that it is a downward deflection of the string rather than an upward deflection.

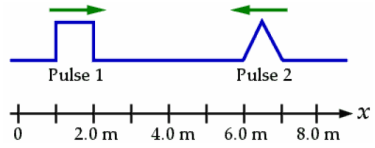


UNIT 14: IN-CLASS PROBLEMS

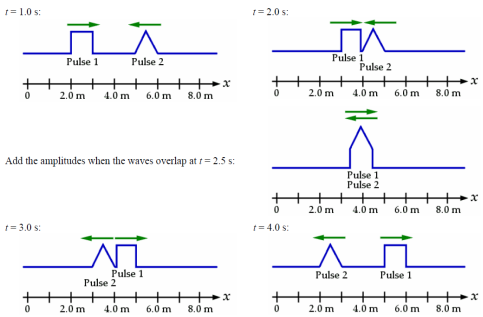


UNIT 14: IN-CLASS PROBLEMS

What if the wave pulses looked like this?



UNIT 14: IN-CLASS PROBLEMS



Constructive Interference: Double Up

Destructive Interference: Muffler