

PRE-PLANNING	PRIOR KNOWLEDGE	
	<ul style="list-style-type: none"> A wave is any disturbance that carries energy through matter or space. 	
	LEARNING GOALS	
	<ul style="list-style-type: none"> Investigate the properties of a transverse wave. Observe how waves behave when they have a loose, fixed or no end. 	
	Common Core Standards	Texas Essential Knowledge and Skills (TEKS)
	<u>NGSS Science Content HS-PS4-1</u> Use mathematical representations to support a claim regarding relationships among the frequency, wavelength and speed of waves traveling in various media. <u>Crosscutting Concept</u> Cause and Effect: empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. <u>Science and Engineering Practices</u> Using Mathematics and Computational Thinking: use mathematical representations of phenomena to describe explanations	P.7B investigate and analyze characteristics of waves, including velocity, frequency, amplitude, and wavelength, and calculate the relationship between wavespeed, frequency, and wavelength
MATERIALS		
<ul style="list-style-type: none"> PhET <i>Wave on a String</i> https://phet.colorado.edu/en/simulation/wave-on-a-string PreAP Wave Investigation Handout – 1 per student Waves on a String Exit Quiz – 1 per student Slinky – 1 per pair 		
LESSON CYCLE	ENGAGE <i>10 minutes</i>	
	Pass out 1 slinky per group of 2 students. Ask students to make the slinky have 3 different shapes while having one student hold each end. Have each pair demonstrate the shape they were able to make. Discuss similarities and differences between shapes created.	
	Part 1 – Beginning Observations <i>10 minutes</i>	
	<i>Teacher will...</i> Pass out Wave Investigation handout. Select 2-3 students that will share out their observations with the class. If possible, have students show their findings using the teacher computer in front of the room.	<i>Students will...</i> Explore the simulation and make beginning observations (Part 1 of lab).
	Part 2 -3 – Manual and Oscillate <i>30 minutes</i>	
<i>Teacher will...</i> Introduce lab expectations. Circulate while students are completing the investigation and ask guiding questions. The following guiding questions could be asked to individual/groups of students as the teacher circulates. Guiding Questions 1. What are the characteristics of waves? 2. What is amplitude? Tension? Damping? 3. How does the amplitude affect the speed of the wave? 4. Are the waves in the simulation transverse or longitudinal?	<i>Students will...</i> Complete investigations using manual and oscillate functions in simulation.	

	5. How do waves behave differently with free and fixed ends?	
	Exit Ticket <i>10 minutes</i>	
	<i>Teacher will...</i> Distribute Exit Ticket to students. Collect lab investigations	<i>Students will...</i> Complete their Exit Ticket individually.