

# Navigate



## Turn and Talk

What does it mean when we say “electromagnetic radiation” or “microwave radiation”?

Discuss what you know about the meaning of each of the following words:

- electromagnetic
- microwave
- radiation

# Case of the Unknown Wave

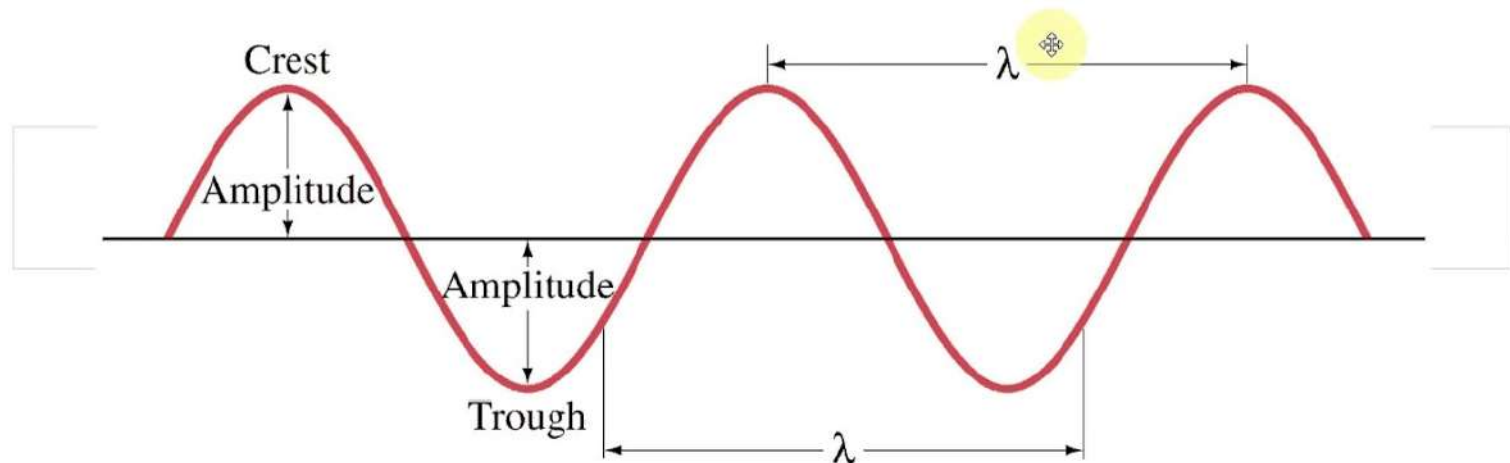
# Wave Definitions

Frequency- number of waves over one second

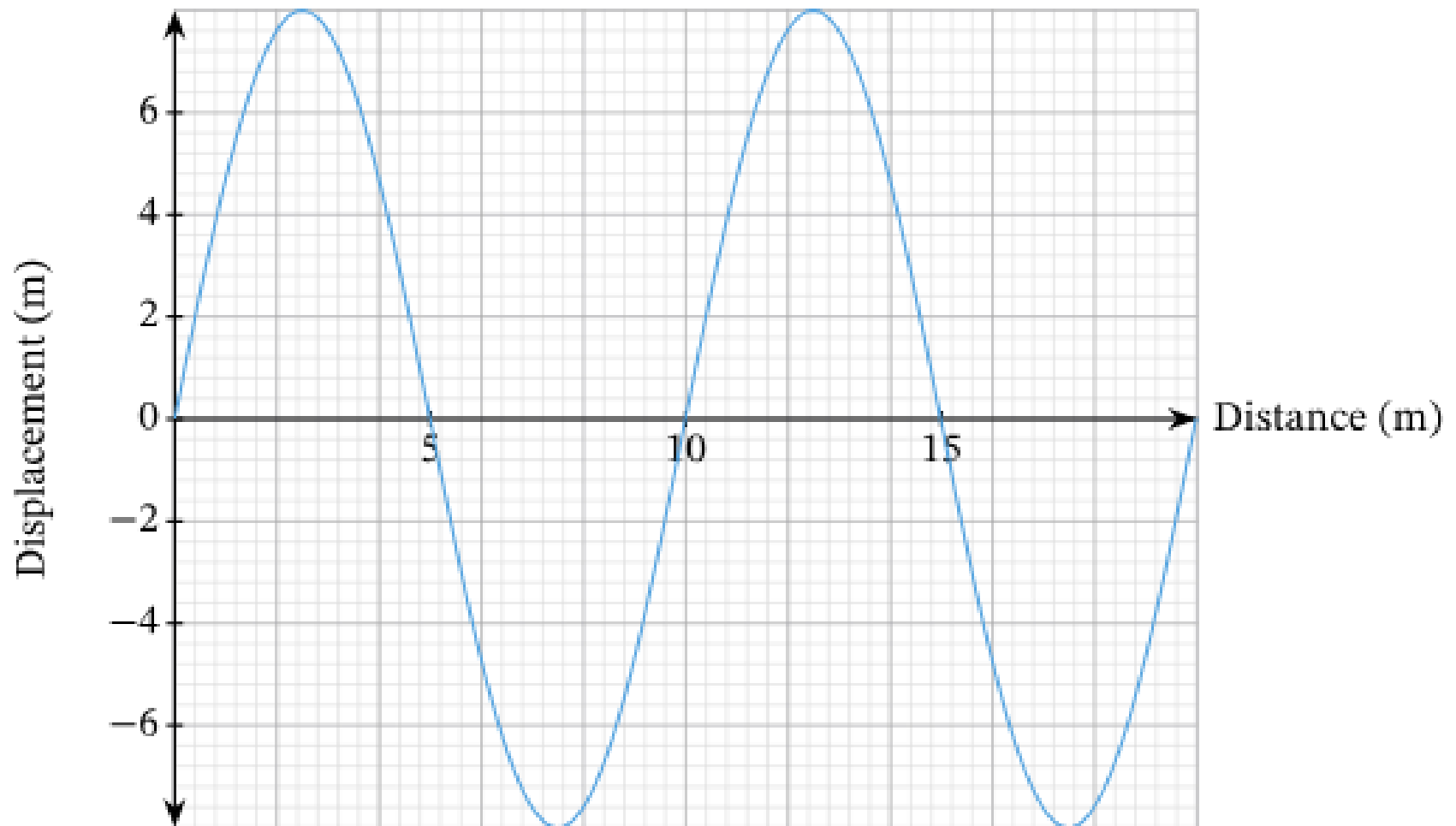
## Parts of a wave

Crest: "Top" of wave  
Trough: "Bottom" of wave

Amplitude: "Height" of wave (from centerline)  
Wavelength: How long wave is - symbol  $\lambda$



Determine the amplitude, frequency and wavelength.



Work Time (15 minutes)

- Wave Investigation on Google Classroom
- Wave Practice Packet (you need a ruler!)

# Slinky Fun!

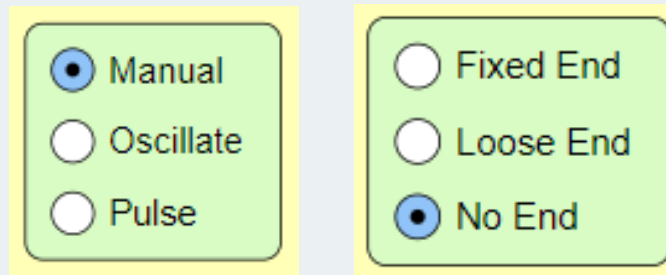
- Fixed End
- Loose End

# Explore the Simulation



## With your class

- Open the simulation and set it to “*Manual*” and “*No End*”:



PhET Interactive Simulations

- Drag the wrench up and down.

How does the behavior of this simulated system compare to the physical manipulatives we just used?

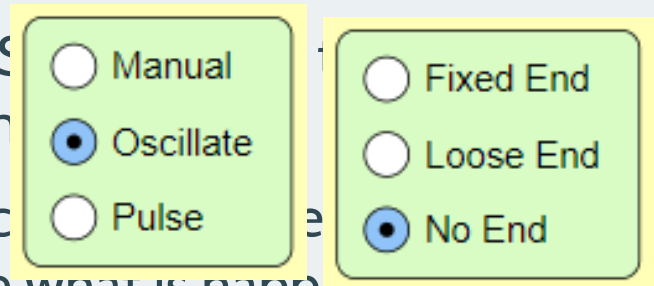
# Explore the Simulation



## On your own

We want to use this simulation to investigate what affects the amount of energy transferred by a wave.

- Launch the simulation. Set the controls on “**Oscillate**” and “**No End**”.
- Explore the rest of the controls and see how they change what is happening.
- Record your observations about what you can control and observe/measure in this simulation on your handout.



PhET Interactive Simulations



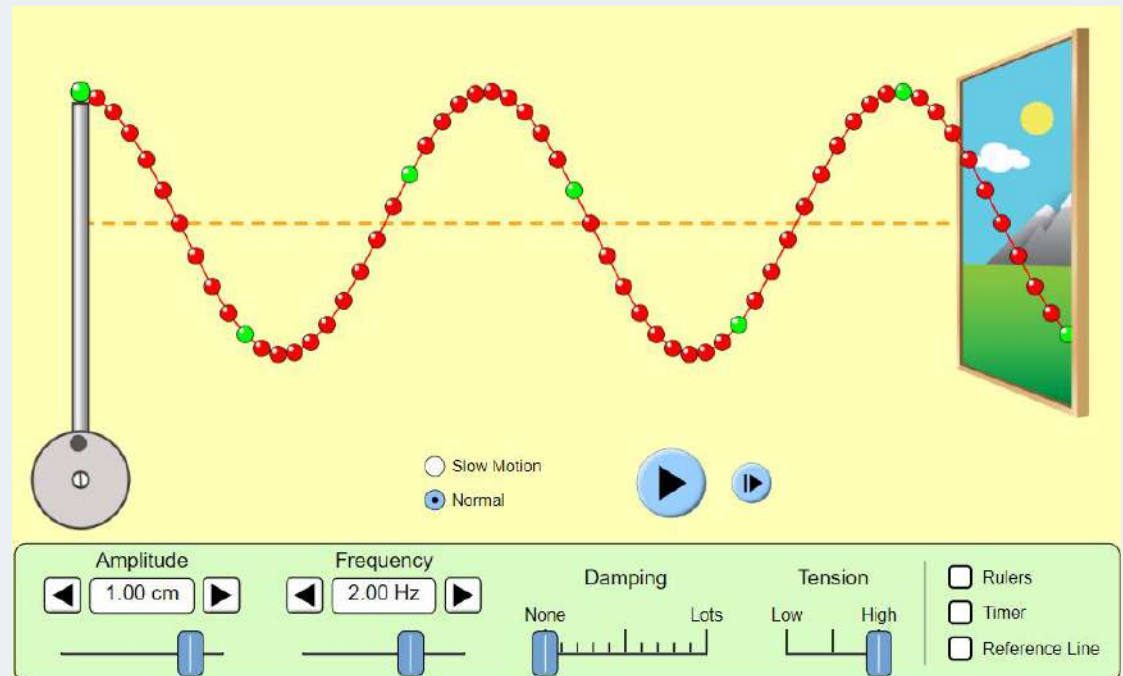
# Identify Variables



## Scientists Circle

- What can we control?
- What can we measure?

Meet in a Scientists Circle to co-construct a poster of these variables in words and pictures.



# Carry Out Investigation of Amplitude

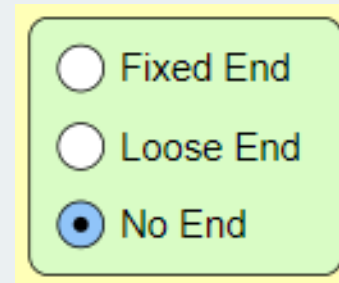
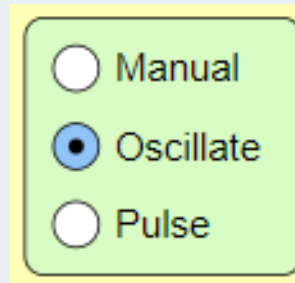


## With a partner

Open the simulation:

<https://www.openscienced.org/general/waveonastring/>

Use these settings for each investigation you carry out:



PhET Interactive Simulations

Carry out your investigation for **amplitude** and record your results in column D of the table on your handout.

# Construct an Explanation for Amplitude



## With a partner

Write a conclusion statement for **amplitude** that describes how changes in it affected the other variables.

*E.g., “When \_\_\_\_\_ (decreases/increases),  
then \_\_\_\_\_.”*

Also note how **amplitude** affects or does not affect the amount of energy transferred by the wave.

# Compare Explanations for Amplitude



## With your class

- How does changing **amplitude** affect the other variables?
- How can we visually represent this?
- Does changing **amplitude** affect how much energy is transferred by the wave?
  - If so, does increasing amplitude increase or decrease the energy transferred?

# Carry Out Investigation of Frequency



## With a partner

Open the simulation:

<https://www.openscienced.org/general/waveonastring/>

Use these settings for each investigation you carry out:

☐ Manual  
☒ Oscillate  
☐ Pulse

☐ Fixed End  
☐ Loose End  
☒ No End

PhET Interactive Simulations

Carry out your investigation for **frequency** and record your results in column D of the table on your handout.

## Construct an Explanation for Frequency



### On your own

Write a conclusion statement for **frequency** that describes how changes in it affected the other variables.

*E.g., “When \_\_\_\_\_ (decreases/increases),  
then \_\_\_\_\_.”*

Also note how **frequency** affects or does not affect the amount of energy transferred by the wave.

# Compare Explanations for Frequency



## With your class

- How does changing **frequency** affect the other variables?
- How can we visually represent this?
- Does changing **frequency** affect how much energy is transferred by the wave?
  - If so, does increasing frequency increase or decrease the energy transferred?

# Carry Out Damping & Tension Investigations



## With a partner

Open the simulation:

<https://www.openscienced.org/general/waveonastring/>

Use these settings for each investigation you carry out:

|                                            |                                         |
|--------------------------------------------|-----------------------------------------|
| <input type="radio"/> Manual               | <input type="radio"/> Fixed End         |
| <input checked="" type="radio"/> Oscillate | <input type="radio"/> Loose End         |
| <input type="radio"/> Pulse                | <input checked="" type="radio"/> No End |

PhET Interactive Simulations

Carry out your investigations for both **damping** and **tension** and record your results in column D of the table on your handout.



## Construct an Explanation: Damping & Tension



### On your own

Write conclusion statements for both **damping** and **tension**. Each should describe how changes affected the other variables.

*E.g., “When \_\_\_\_\_ (decreases/increases),  
then \_\_\_\_\_.”*

Also note how **damping** and **tension** affect or do not affect the amount of energy transferred by the wave.

# Compare Explanations for Damping & Tension



## With your class

- How does changing **damping** or **tension** affect the other variables?
- How can we visually represent this?
- Does changing **damping** or **tension** affect how much energy is transferred by the wave? If so, how?
  - If so, does increasing damping and/or tension increase or decrease the energy transferred?

# Use Mathematical Thinking

*Scientists sometimes create mathematical models to quantitatively describe the relationships between variables.*



## With your class

Review what relationships between variables our data show us.

- Can we use our results plus our definitions of the variables to create any equations to relate our variables?
  - Is this equation supported by our data and conclusions?

# Use the Wave Speed Formula



## Warm Up

If the frequency of the wave is 20 Hz, what is the wavelength of each of the speeds?

Low tension speed = 1.3 cm/s

Medium tension speed = 3.8 cm/s

High tension speed = 6.3 cm/s

Wave Speed = wavelength \* frequency

# Review Friday/Monday Assignment

# Navigate



## **Exit Ticket**

Complete the Electronic Exit Ticket.

# Licensing Information



Physics Unit P.5 Lesson 3 Slides. OpenSciEd. CC-BY-NC 4.0

[Visit this page](#) for information about the license and [this document](#) for information about the proper attribution of OpenSciEd materials.