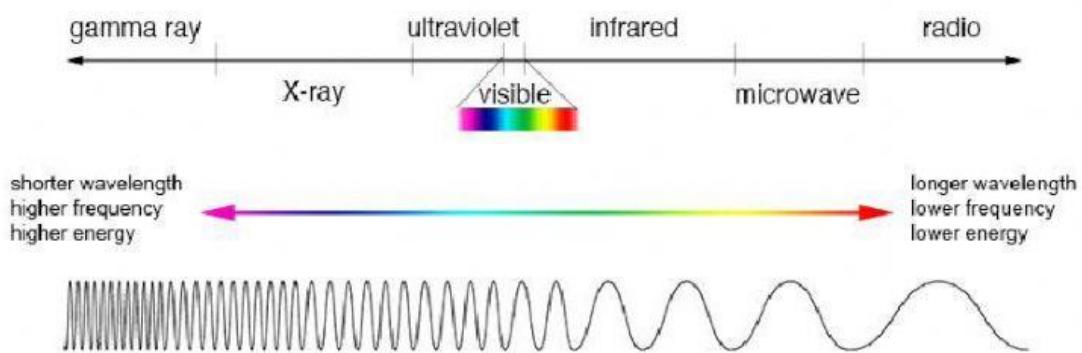


Name: \_\_\_\_\_ Date: \_\_\_\_\_

**PHYSICS: Light and Optics**  
**Activity: PHET Measuring Wavelength & Frequency of Visible Light**

Electromagnetic radiation (EMR) is light, and there are seven classes of electromagnetic radiation in the electromagnetic spectrum. Visible light is the most narrow band of electromagnetic radiation. The human eye can only detect light between wavelengths of 380 nm (limit of violet) to 760 nm (limit of red). nm is the unit nanometers.  $1 \text{ nm} = 1.00 \times 10^{-9}$  meters, or, there are 1 billion (1,000,000,000) nanometers in 1 meter.



**INSTRUCTIONS**

Open a web browser and go to: PHET Waves Intro  
[https://phet.colorado.edu/sims/html/waves-intro/latest/waves-intro\\_en.html](https://phet.colorado.edu/sims/html/waves-intro/latest/waves-intro_en.html)  
Choose the WAVES INTRO LIGHT

1. In the upper right gray menu, choose the options
  - Choose the laser source (device on the right). The visible spectrum should appear.
  - Move the yellow tape measure from the gray menu to the wave field.
2. In the lower left corner, choose continuous waves (button with many transverse waves).
3. Under the wave field, choose TOP VIEW.
4. Press the PLAY button. Press the round green button on the laser. Light waves should begin to come out of the laser.

5. Toggle the slide pointer to the far left side of the visible spectrum to the near infrared. The color of the laser light should change from its original color to a deep brownish red.
6. Allow for the near infrared light waves to fill the entire wave field, then press PAUSE.
7. Use the yellow tape measure to measure the distance covered by five consecutive light waves. Place the tape measure's tape box on the center of a wave, then drag the telescoping end across five waves, placing the tip of the telescoping end in the center of the fifth wave. Measure the length of five waves in nm.
8. Press PLAY.
9. Repeat steps 5-8 with the other color light of the visible spectrum.

**Data Table**

Color Light	5 wavelengths ( $5\lambda$ , nm)	1 Wavelength ( $\lambda$ , nm)	1 Wavelength ( $\lambda$ , m)	Frequency (Hz)
<b>Near Infrared</b>				
<b>Red</b>				
<b>Orange</b>				
<b>Yellow</b>				
<b>Green</b>				
<b>Blue</b>				
<b>Indigo</b>				
<b>Violet</b>				

- Determine 1 wavelength  $1\lambda$ , divide the distance of 5 wavelengths by 5.
- Calculate the wavelength in meters, divide the wavelength by  $1.00 \times 10^9$ .  
There are 1,000,000,000 nm in 1 meter.

$$m = nm \cdot \frac{1 \text{ m}}{1.00 \times 10^9 \text{ nm}}$$

- Calculate the frequency of the color light. Frequency is the speed of light divided by the wavelength. Wavelength is in meters. The speed of light =  $3.00 \times 10^8 \text{ m/s}$

$$f = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{\lambda}$$

