PhET INTERACTIVE ACTIVITY - WAVE INTERFERENCE
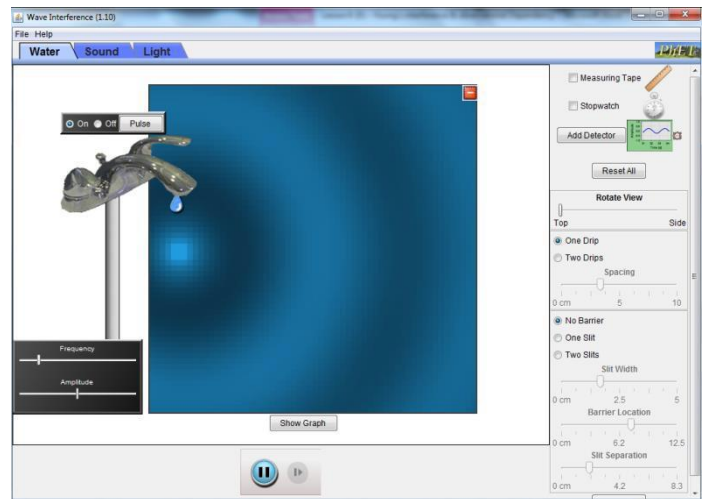
Download and run the PhET simulation "Wave Interference" using the following link: https://phet.colorado.edu/en/simulation/wave-interference

Familiarize yourself with the simulation by playing with the Water and Light modules and get to know the different tools you have available within these modules. Remember to reset everything before you begin each activity. You may also find it helpful to increase the size of the simulation's viewing window by clicking on the small box with a '+' in the upper right-hand corner.

ACTIVITY 1 - Water Waves (1 source)

1. Open the Wave Interference PhET simulation. Select "Show Graph." What is on each axis? How would you explain what it is showing in simple terms?

2. Start with **one drip** and change the frequency and amplitude first predict what you think will happen then record what happens below.

	Prediction	Observations	How does the graph change?
Changing frequency			
Changing amplitude			

3. Sketch the water waves from both the top and side views. Label the wavelength of the wave in each of your sketches.

Top	Side

4. Place a barrier with a narrow slit (aperture) in the path of the wave. As the waves pass through the aperture you should observe that they spread out (diffract). Predict what would happen if you increased the size of the aperture. Would the waves diffract more or less? Test your prediction and comment on your observations.

ACTIVITY 2 - Water Waves (2 sources)

5. Try **two drips** and repeat Question 2.

	Prediction	Observations	How does the graph change?
Changing frequency			
Changing amplitude			

6. Based on your observations, summarise what happens when you change the frequency and amplitude with one or two drips.

ACTIVITY 3 - Light Waves

7. In the previous activity waves diffracted when they interacted with an appropriately-sized aperture. Light, being a wave, is capable of doing the same thing. Using the space below, sketch what you predict the pattern would look like on a screen if:

Light hits the screen unobstructed without passing through aperture:	Light hits the screen after passing through a single narrow aperture (single slit):	Light hits the screen after passing through two, closely-spaced, narrow apertures (double slit):

Test your predictions and comment on how closely they matched your observations.

8. You just saw that the pattern of light after passing through a double-slit resembles a series of closely-separated bands of light, known as an interference pattern. In the space below, summarise what happens to the interference pattern when the following parameters are adjusted independently:

Wavelength of light (λ):

Distance between barrier and light source (L):

Distance between slits (d):

9. Using the relationship

$$x = \frac{\lambda D}{s}$$

where x = fringe spacing (m)

D = distance from slits to screen (m) s = distance

between the slits (m)

λ = wavelength (m)

Solve the following problem:

Light from a sodium lamp (λ = 589 nm) illuminates two narrow slits. The fringe spacing on a screen 150 cm behind the slits is 4.0 mm. What is the spacing (in mm) between the two slits?