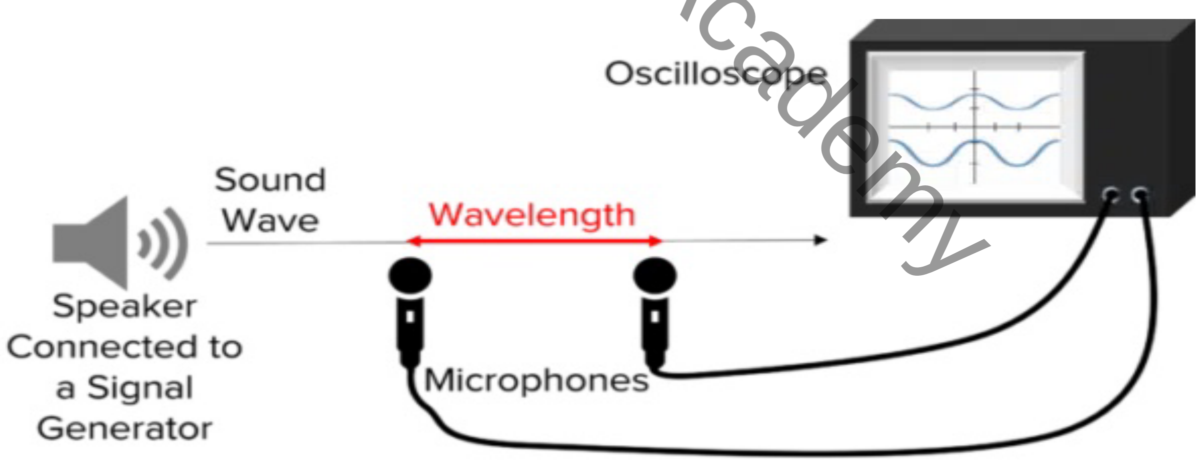
Experiments with Waves

Measuring Speed of Sound Waves using Oscilloscope

For this experiment, you'll need two microphones, an oscilloscope (to find Wavelength), a loudspeaker and a signal generator.

Method

1. Set up the **oscilloscope** so that each of the microphones are connected separately.
2. Turn on the signal generator and make a note of the **frequency, f** that you have chosen.
3. Begin with both microphones next to the speaker. The waves on the oscilloscope should line up, as shown in the diagram.
4. Move one microphone away from the other slowly. As it moves away, the waves on the oscilloscope will change.
5. When the waves on the oscilloscope line-up again, stop moving the microphone. The distance between the microphones is the **wavelength,** λ of the sound.
6. Measure the distance between the two microphones using a meter rule.
7. Calculate the speed of sound using $v=f\lambda$

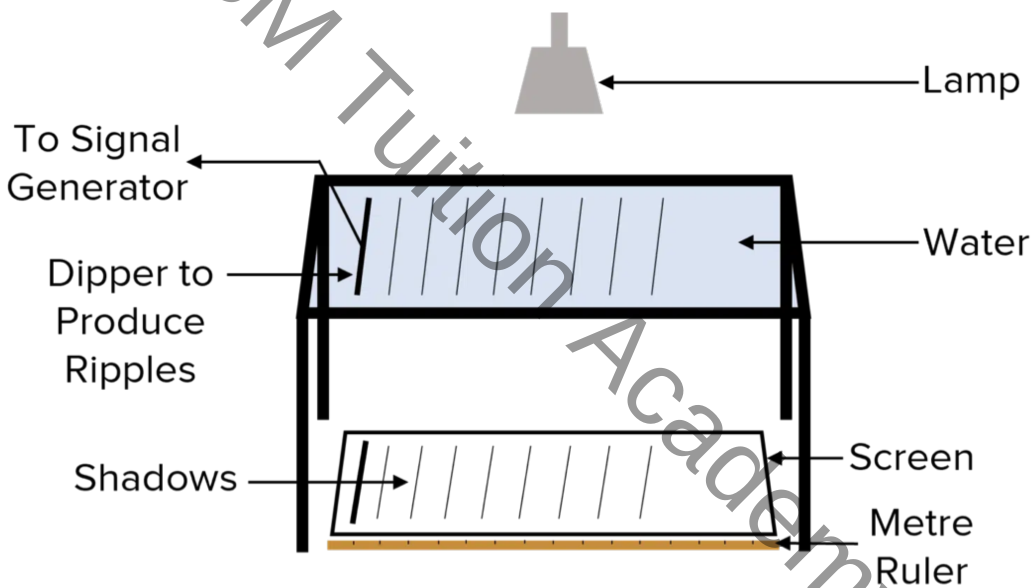


Measuring the Speed of Water Ripples Using a Lamp

This is a simple method for measuring the **wavelength** and **speed** of water waves. From this, you can calculate the frequency and period of the waves.

Method:

1. In a **darkened room**, set up the experiment as shown in the diagram.
2. Switch on the **signal generator** so that the dipper produces waves.
3. Using the **meter ruler**, measure the distance between the shadows of the waves on the screen.
4. Choose two points on the screen and measure the distance between them.
5. Using a **stopwatch**, measure the time taken for a wave to travel between the two points.
6. Calculate the speed of the wave using speed=distance/ time



Use the Wave Equation for wave on string or wire

This method involves using a signal generator is connected to a vibration transducer.

Method:

1. A longish piece of wire or string is fixed to the vibration transducer and passed over a pulley wheel at the end of the bench.
2. The other end of the wire/string is connected to a hook system on which you can add 'weights' to increase the tension on the wire/string as shown in diagram A.
3. You switch on the signal generator and vibration transducer to set the wire/string vibrating - the waves should oscillate up and down.
4. Adjust the frequency until you can get a **clear transverse standing wave** (as in diagram B) and measure its wavelength using the meter rule sighted behind the vibrating wire/string.
5. Its easiest to measure the length of as many half wavelengths as you can, calculate the average and then double the average to get the full wavelength.
6. We can also find the speed of wave using **$v=f\lambda$**