AQA Physics GCSE

Required Practical 8

Waves

Method taken from AQA Required Practical Handbook

Aim:

Measure the frequency, wavelength and speed of waves by observing water waves in a ripple tank and waves on a stretched string or elastic cord.

Equipment List:

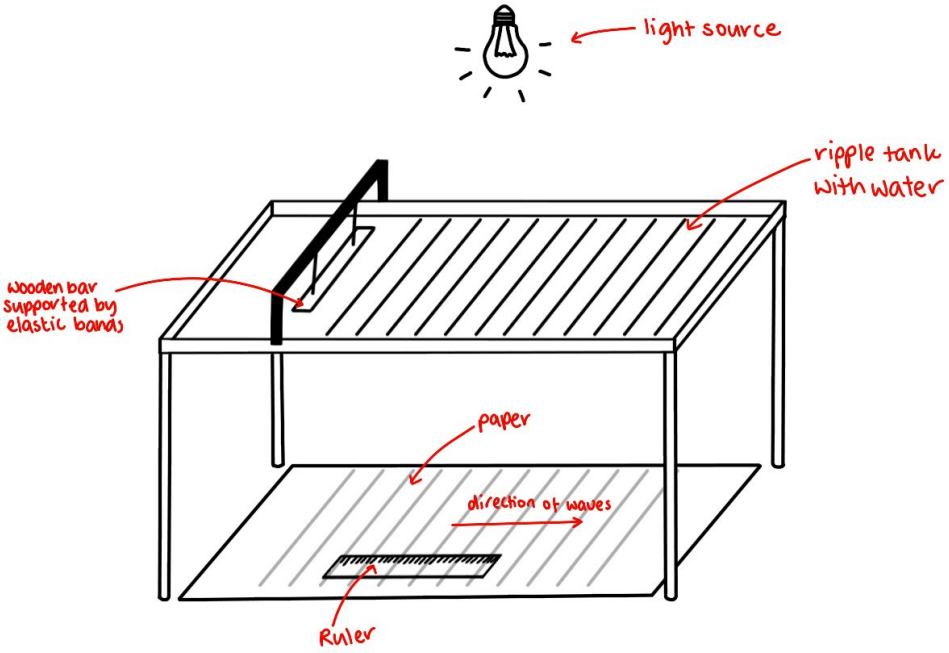
- Ripple tank
- Piece of white paper or card
- Suitable low voltage supply
- Motor (for moving a wooden rod in the ripple tank)
- Lamp
- Stopwatch
- Metre ruler
- Vibration generator
- 5W power signal generator
- Set of 100g masses and hanger
- Set of 10g masses and hanger
- Wooden bridge
- Pulley on a clamp

Method:

Water Waves in a Ripple Tank:

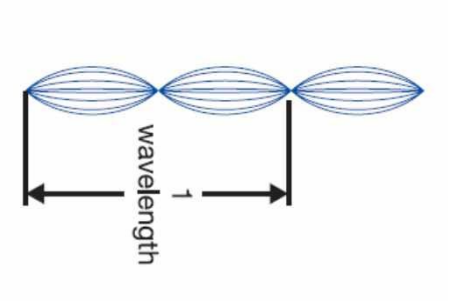
1. Fill the ripple tank so the water has a depth of approximately 5mm. Place the ripple tank on top of a piece of white paper or card.
2. Place a wooden rod on the surface of the water and attach it to the low-voltage power supply and motor. Add a lamp to the circuit and hold the lamp above the ripple tank.
3. View the wave pattern from the side of the tank, looking through the water.
4. To measure the wavelength, place the metre ruler perpendicular to the wavefronts on the page. Measure across as many wavefronts as possible and divide by the number of waves.
5. To measure the frequency, count the number of waves passing a particular point in the wave tank over a given time (measure 10 or 20 seconds using a stop clock).
6. To calculate the wave speed, multiply the wavelength by the frequency.

Diagram 1:



Standing Wave on a Vibrating String:

1. Produce a standing wave on the vibrating string by adjusting the frequency or the generator, the position of the wooden bridge and the tension in the string (by adding or removing masses). A standing wave is created when the wave doesn't appear to move horizontally, instead the string appears to oscillate only vertically.
2. To measure the wavelength, use a metre ruler to measure across multiple standing waves and divide by the number of total waves.



The wavelengths of a standing wave is measured across two halves, as shown in the diagram to the left.

Source: slideplayer.org

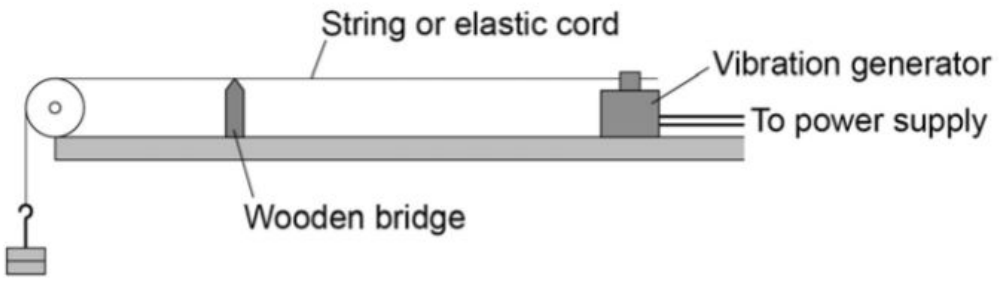
3. To measure the frequency, use a stopwatch to time wave oscillations over ten complete cycles. If the wave is slow enough, time the point at the centre of the half-wavelength, starting at equilibrium and counting every other time the string passes the equilibrium as a complete cycle. Divide this value by 10 to find the time period. Then use the equation,

$$f = \frac{1}{T}$$

to find the frequency.

4. To calculate the wave speed, multiply the wavelength by the frequency.

Diagram 2:



Source: AQA Required Practical Handbook

Safety Precautions:

- Take care working with water and electricity in close proximity. Mop up any spillages immediately.
- Don't stand beneath the weight stack, incase weights fall off or the string snaps.
- Wear safety goggles when using the oscillating string. Be cautious that the string may snap if at a high frequency and under too much tension. Avoid operating the vibration generator at high frequencies.