

Edexcel Physics GCSE

Topic 4.17: Waves

Practical notes



Core Practical 2: Investigate the suitability of equipment to measure speed, frequency and wavelength of a wave in a solid and fluid

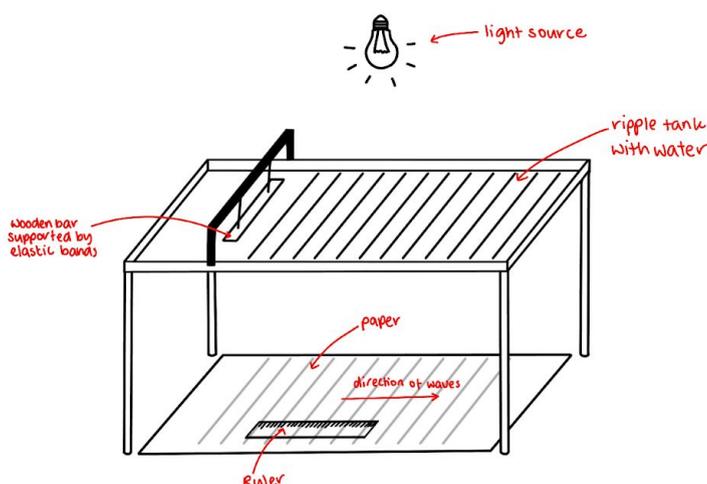
Waves in a liquid

Equipment:

- Ripple tank
- Ruler
- Camera (or phone)
- Stopwatch

Diagram

Method



1. Set up the ripple tank and place a piece of paper and a ruler underneath the tank where the light and shadows of the waves are visible.
 - The ruler must be perpendicular to the wavefronts – you can ensure this by using a set square or anything with a 90° corner.
2. Make the waves as slow as they can be whilst still being clearly visible by adjusting the settings of the ripple tank.
3. Use the ruler to measure the wavelength of the waves.
 - It may be helpful to take a photo of the waves with the ruler in the picture so that you can take your measurements without the waves moving.
 - Remember the value for the wavelength must be in metres, not centimetres.
4. Use the stopwatch to time 10 seconds and count the number of wavefronts that pass a fixed point in that time (mark the point on the paper to make this easier). Divide this number by 10 to obtain the frequency of the waves.
5. Mark two points beneath the tank that are a set distance apart (e.g. the length of the ruler, 0.3m) and use the stopwatch to determine the time it takes for one wave to travel between the two points
6. Using the formula $v = f\lambda$, you can calculate the value for the speed of the wave obtained through the wavelength and frequency of the wave



- Using the formula $v = \frac{d}{t}$, you can calculate another value for the speed of the wave obtained through the time it took to travel the distance you marked on the paper.
- Compare these two values for v – if they are close together, it would suggest that the suitability of the equipment is good (remember to refer back to the main aim of the investigation when coming to a conclusion).

Tips

- All values for length and distance must be measured in metres, not centimetres.

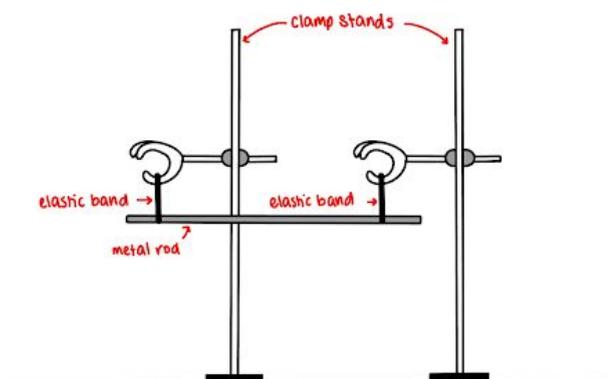


Waves in a solid

Equipment

- Metal rod(s)
 - using multiple rods of different types of metal may help to make the results more reliable
- Clamp stands
- Elastic bands
- Something to measure the peak frequency (such as a phone application)
- Ruler
- Something metal to strike the rods with

Diagram



Method

1. Measure the length of each rod using the ruler.
 - The wavelength of the wave at peak frequency will be twice this length
 - Ensure this is measured in metres
2. Suspend the rod from the clamp stands using the elastic bands as shown in the diagram.
3. Strike the rod at one end and use the frequency recorder to measure the peak frequency. Record this value.
4. Repeat this, striking the rod up to five times and taking an average of the frequency values
5. Repeat the process with different types of metal rods.
6. Using the formula $v = f\lambda$, calculate the velocity of the waves in each rod using the mean peak frequency and the wavelength (2 x the length of the rod).
7. Compare these values with researched values for each type of metal – if they are close, the equipment is suitable.

