

Edexcel Physics IAL

Core Practical 5: Investigate Factors Affecting the Frequency of a Vibrating String

Practical Notes



Core Practical 5: Investigate the Effects of Length, Tension and Mass per Unit Length on the Frequency of a Vibrating String or Wire

Equipment

- String or wire
- Bench pulley
- Slotted masses and hanger
- Metre ruler
- Vibration generator linked to a signal generator
- Bridge

Method

1. Attach one end of the string to the vibration generator, and pass the other end over the bench pulley.
2. Add the mass hanger to the pulley end of the string, and add 100g to ensure the string is taught.
3. Move the bridge so that the length of the oscillating section of string is 1m, turn on the vibration generator and then adjust the frequency until a stationary wave in its fundamental frequency forms - record the frequency.
4. Repeat, moving the bridge by 10cm each time to produce frequency values for lengths of 100cm, 90cm, 80cm, 70cm, 60cm and 50cm.
5. Repeat the entire experiment, and find a mean frequency for each length.

Calculations

- Plot a graph of $1/f$ against length and draw a line of best fit.
- $v=2fl$ and the gradient= $1/fl$ and so multiply the gradient of the line by 2 to produce the speed of the travelling waves.
- As well as this, $v = \sqrt{T/\mu}$ and so the value of tension (mass on mass hanger in kg x 9.81) and the mass per unit length (measure the mass of the string and divide by its length) can be substituted in and this value for the speed of the waves can be compared to the value produced by the graph.

Notes

- You can carry out the same experiment to investigate the effect of tension and mass per unit length by keeping the length the same each time, but varying the chosen factor:
 - Tension is altered by adding masses to the mass hanger.
 - Mass per unit length is altered by using different thicknesses of string.



Safety Precautions

- If a metal wire is used in place of string, safety glasses must be worn in case the wire snaps.
- Don't stand under the hanging masses since if they fall they can cause injury.

