

OCR (B) Physics GCSE

1.3 - How do Waves Behave?

Flashcards

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



What is a wave?



What is a wave?

A regular disturbance that transfers energy in the direction the wave is travelling without transferring matter.



What is a transverse wave?



What is a transverse wave?

A wave in with oscillations that are at right angles (perpendicular) to the direction of motion.



Give examples of transverse waves



Give examples of transverse waves

Waves on a string, all electromagnetic waves (eg. visible light), ripples on water, vibrations on guitar strings.



What is a longitudinal wave?



What is a longitudinal wave?

A wave in which the disturbances are parallel to (in the same direction as) the direction of motion.



Give examples of longitudinal waves



Give examples of longitudinal waves

Pulses along a spring, sound waves,
ultrasound.



Transverse waveforms have...



Transverse waveforms have...

Peaks and troughs



Longitudinal waveforms have...



Longitudinal waveforms have...

Compressions and rarefactions



Wavelength is...



Wavelength is...

The shortest distance between the same point on two consecutive waves (e.g. the distance between two consecutive peaks/troughs/compressions/rarefactions).



Displacement is...



Displacement is...

The distance from equilibrium position.

When displacement is at a maximum (peaks/troughs), this is the **amplitude**.



Frequency is...



Frequency is...

The number of complete waves passing a point per second (or the number of waves produced by the source per second).



Period is...



Period is...

The time taken for a whole wave to pass through a single point.



State the wave equation



State the wave equation

$$v = \lambda \times f$$

- v = velocity (m/s)
- λ = wavelength (m)
- f = frequency (Hz)



Give an equation relating time period
and frequency.



Give an equation relating time period and frequency

$$T = 1/f$$

$$f = 1/T$$

- T = time period (s)
- f = frequency (Hz)

The two quantities are **reciprocals** of each other.



What is a ripple tank?



What is a ripple tank?

A shallow glass tank with an oscillating paddle/needle to create waves. It is illuminated from above so the waves can be seen on the surface below the tank.



Describe how to measure the speed of water waves using a ripple tank



Describe how to measure the speed of water waves using a ripple tank

- Set up ripple tank with a motor, power supply, meter ruler and approx. 5cm deep water.
- Adjust the frequency of the motor so low frequency waves can be observed.
- Measure the length of 5 waves using a ruler (the more waves measured the better) and divide by the number of waves to calculate the wavelength of one wave.
- Count the number of waves passing a point in 10 seconds and divide by 10 to get the frequency.
- Use $v = \lambda f$ to calculate speed.



Describe a procedure to measure the speed of sound waves in air



Describe a procedure to calculate the speed of sound in air

- Place 2 people 100m apart, person 1 with a starting pistol and 2 with a stopwatch.
- Person 1 will fire a starting pistol and raise their hand at the same time.
- Person 2 should start the stopwatch when they see the hand raised and stop it when they hear the gun fired.
- Speed = distance (100m) \div time.



What is refraction?



What is refraction?

Refraction is the change in **speed** of a wave as it reaches a boundary between two media, usually resulting in a change in direction (if it enters at an angle).



What property of a wave is **not** changed by refraction?



Which property of a wave is **not** changed by refraction?

The frequency



Why is frequency not altered by
refraction? (Higher)



Why is frequency not altered by refraction? (Higher)

Energy must be conserved
(**conservation of energy**) so frequency
remains constant.



What happens when waves are incident
on a flat surface?



What happens when waves are incident on a flat surface?

Reflection.



A stronger reflected wave is produced
when...



A stronger reflected wave is produced when...

The surface is smoother.



Why do rough surfaces appear matt when illuminated?



Why do rough surfaces appear matt when illuminated?

The reflected light is scattered in all directions.



When entering a denser material, light waves...



When entering a denser material, light waves...

...slow down and bend towards the
normal.



When entering a less dense material,
light waves...



When entering a less dense material, light waves...

...speed up and bend away from the
normal.



How does wavelength affect refraction?
(Higher)



How does wavelength affect refraction? (**Higher**)

Shorter wavelength waves refract **more**.



What happens when white light is shone through a prism?



What happens when white light is shone through a prism?

It separates into a spectrum of all its coloured light components.



Why is white light separated by a prism?
(Higher)



Why is white light separated by a prism? (Higher)

Each different coloured light wave has a different wavelength. The shortest wavelength light (blue) refracts the most while longer wavelengths (red) refract more, producing a spectrum.



How can refraction be measured?



How can refraction be measured?

The angle of incidence, i , and angle of refraction, r , can be measured and compared. All angles are measured relative to the normal.



When light is reflected, how do angles i and r compare?



When light is reflected how do angles i and r compare?

angle of incidence = angle of reflection

