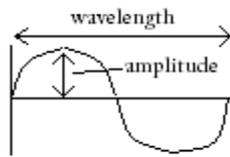
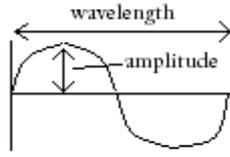


### Topic 4 waves - Core Questions

You must learn the answers to each of these questions. **Bold indicates higher tier only.**

What do waves transfer?	Energy and information but <b>not</b> matter.
What evidence is there that waves do not transfer matter?	For water waves, a float on the surface of the water will move only up and down not across the water. For sound waves, an air particle will vibrate back and forth not travel across the room.
Give examples of longitudinal waves	Sound waves (including ultrasound and infrasound) and seismic P (primary) waves.
Which type of wave has the direction of the vibration parallel to the direction of energy travel?	Longitudinal
Give examples of transverse waves	All of the electromagnetic waves including light, seismic S (secondary) waves, water waves and waves on a string.
Which type of waves has the direction of the vibration is perpendicular to the direction of energy travel?	Transverse
What is the wavelength and what is it measured in?	The length of 1 complete wave cycle. It is measured in meters (m). 
What is the amplitude and what is it measured in?	The distance from the centre of a wave to the top of the wave. It is measured in meters (m). 
What is the frequency of a wave and what is it measured in?	The number of waves in 1 second and the unit is Hertz (Hz)
What is wave velocity and how is it different to wave speed?	Wave velocity describes both how fast the wave is travelling (m/s) and in which direction. It is a vector quantity. Wave speed is only how fast the wave is going (still m/s). It is a scalar quantity.
What is the period of a wave and what is it measured in?	The time for 1 complete wave. It is measured in seconds (s).
What is the name given to describe the surface over which a wave has maximum and minimum values (peaks and troughs)?	Wavefront.
As the wavelength of a wave increases, how is its frequency changed? (Assuming that it is travelling at a constant speed).	The frequency would decrease.
As the speed of a wave increases, what happens to the wavelength of the wave? (Assuming that the frequency is constant).	The wavelength would get longer.
What 2 variables affect the speed of a wave?	The kind of wave it is and what the wave is moving through.

What happens to the speed of sound as you move from gas to liquid to solid?	It increases. This is because there are more particles to pass on the vibrations.
What is the speed of sound in a vacuum?	0 m/s. Sound cannot travel through a vacuum as there are no particles to pass on the vibrations.
Which two equations can be used to find the velocity of a wave?	Distance / time and frequency x wavelength.
In calculation questions what must you remember to do?	Substitute in values in standard units, show working out clearly and show the units on the answer. Triangles are a tool to help us re-arrange equations.
What are the standard units for speed?	Metres per second (m/s).
What are the standard units for distance?	Metres (m).
What are the standard units for time?	Seconds (s).
Describe how to measure the velocity of sound in a gas like air.	Use a signal generator to produce a sound of known frequency. Connect 2 microphones to an oscilloscope to detect the sound waves in front of the speaker. Move 1 microphone away until the waveforms are aligned. Measure the distance between the microphones as this is the wavelength of the sound wave. The speed (in m/s) will be frequency (Hz) x wavelength (m).
Describe how to measure the velocity of a wave in a liquid like water.	Use a ripple tank to create water waves. Measure the distance between 2 peaks, this is the wavelength. Find the frequency by counting the number of waves past a point in 10s and divide by 10. The speed (in m/s) will be frequency (Hz) x wavelength (m).  Alternatively, mark 2 points on the side of the ripple tank and time how long it takes 1 wave to travel between the 2 points. Measure the distance of the 2 points. The speed (in m/s) will be distance (m) divided by time (s).
Describe how to measure the velocity of sound in a solid like steel.	Suspend the steel rod and hit it with a hammer. Use a frequency app to record the peak frequency (or a microphone and oscilloscope). Measure the length of the steel rod. Wavelength = 2 x length and so divide the length by 2 to find wavelength. The speed (in m/s) will be frequency (Hz) x wavelength (m).
<b>What type of substances absorb waves?</b>	<b>Light waves are absorbed by black materials. Sound waves can be absorbed by soft furnishings.</b>
<b>What type of substances reflect waves?</b>	<b>Mirror and shiny materials reflect light waves. Hard flat surfaces reflect sound waves.</b>

What type of substances transmit waves?	Clear materials like glass and plastic transmit light waves. Sound can be transmitted through thin materials like walls, doors and windows.
What property of the wave is the behaviour (absorption, transmission, reflect or refract) dependent on?	The wavelength of the wave.
What happens to light as it passes from one material to another?	Some of it will be reflected (bounced off) and some will be refracted (bent through).
What is refraction and what causes it?	Refraction is the bending (change of direction) of a wave as it passes between different materials. <b>It is caused by the slowing down or speeding up of the wave as it travels from one density to a different density.</b>
As light travels from a more dense material to a less dense material, what direction will it bend in?	Away from the normal line.
If light is allowed the travel into a glass block and out of the other side again, what would you notice about the incident ray and the emergent ray?	They will be parallel to each other. You might also notice the incident ray is slightly brighter than the emergent ray as some energy may have been absorbed by the glass as the wave is transmitted through.
If a wave travels 90 °to the surface (along the normal line) of a material what will not change and what will change?	<b>Direction will not change but speed still will. This means that the wavelength will change for a constant frequency but the direction of the wave will continue in a straight line and not bend.</b>
What happens to a water wave as it travels from shallow water to deeper water?	<b>It will speed up in deeper water. This will cause the wavelength to increase (for a fixed frequency) and if the waves arrive at the deep water at any angle other than 90 °, they will change direction.</b>