Physics topic 6: Waves

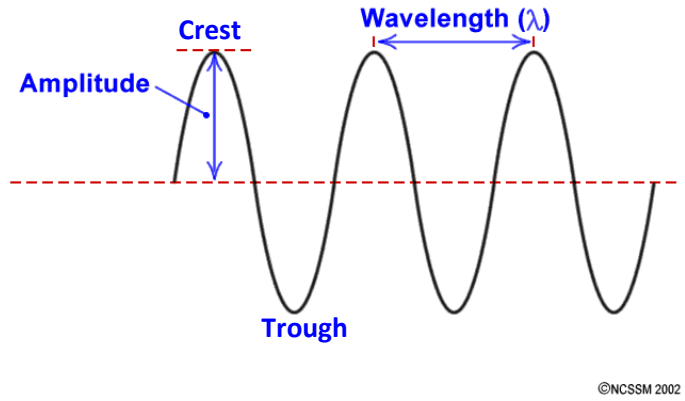
1. Keywords	
Transverse wave	A wave where the vibration is perpendicular to the direction of travel
Longitudinal wave	A wave where the vibrations are parallel to the direction of travel
Mechanical wave	A vibration that travels through a substance (e.g. sound)
Frequency	The number of wave fronts passing a fixed point every second (measured in Hz)
Period	The time for one complete wave
Ultrasound	Sound above 20,000Hz
Superposition	When two waves meet and affect each other
Reflection	When waves bounce off a surface
Echo	Reflection of sound that can be heard

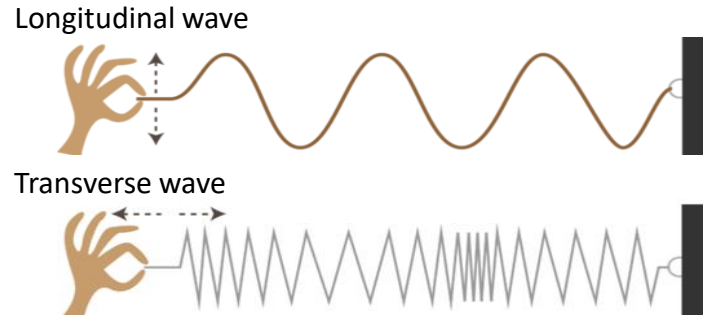
2. Period and frequency

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

T	Period (s)
f	Frequency (Hz)

3. Comparing types of wave





Comparing waves:	Light wave	Mechanical wave
Type of wave	Transverse	Longitudinal
Can they travel through a vacuum?	Yes	No. Mechanical waves can only pass through a solid, liquid or gas
Can they be reflected?	Yes. By smooth shiny surfaces	Yes. By smooth surfaces
Can they be absorbed?	Yes. By dark surfaces	Yes. Rough surfaces absorb sound
Can superposition occur?	Yes	Yes

4. Wave equation

$$v = f\lambda$$

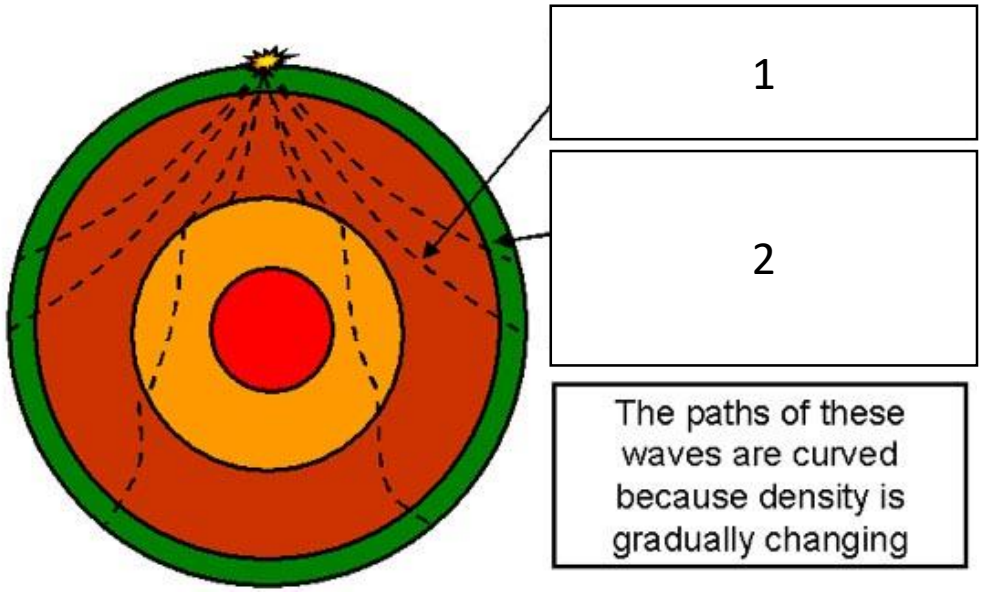
v	Wave speed (m/s)
f	Frequency (Hz)
λ	Wave length (m)

5. Uses of ultrasound (HT PHYSICS ONLY)

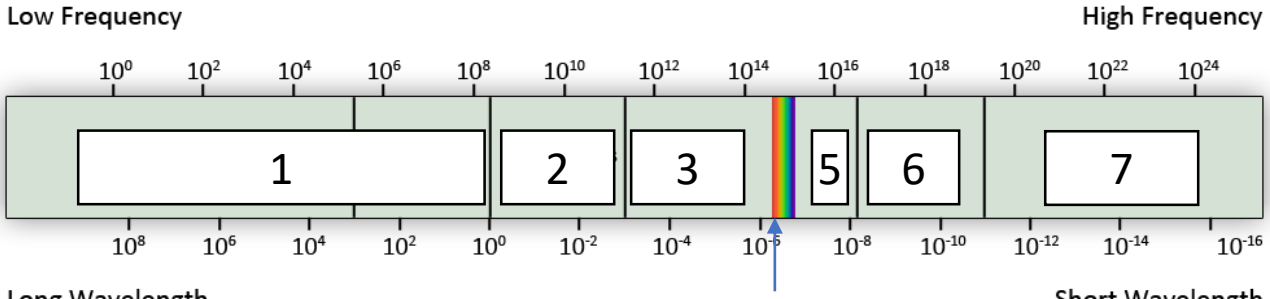
Use	How it works
Cleaning jewellery	The vibrations of the wave shake the dirt lose
Scanning the human body	The waves are partially reflected at different tissue boundaries
Industrial imaging	The waves can detect flaws in metal castings as they are partially reflected by cracks
Physiotherapy	Energy from the wave is absorbed by body tissue and relieves pain

6. Seismic waves produced by earthquakes (HT PHYSICS ONLY)

1	S waves	Transverse	Only travel through solid
2	P waves	Longitudinal	Travel through the earth and are refracted when they pass through different density medium



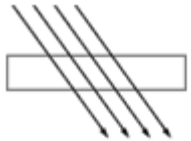
7. The electromagnetic spectrum



	Name	Notes
1	Radio	Produced by oscillations in circuits (HT)
2	Microwaves	Used for heating water
3	Infrared	Thermal energy
4	Visible	Only one you cansee
5	Ultra violet	Skin damage
6	X rays	Cause cancer
7	Gamma rays	Cause cancer

8. The properties of EM waves on materials (HT ONLY)

1	Transmit
2	Specular Reflection
3	Diffuse Reflection
4	Absorb
5	Refract



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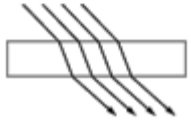

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9. Uses of EM waves

Name	Use
Radio	Radio and TV
Microwaves	Satellite communication, cooking food
Infrared	Electric heaters, cooking food, infra-red cameras
Visible	Fibre optic communication
Ultra violet	Energy efficient lamps, sun tanning
X rays	Imaging bones
Gamma rays	Radiotherapy, medical imaging

10. Black body radiation (physics only)

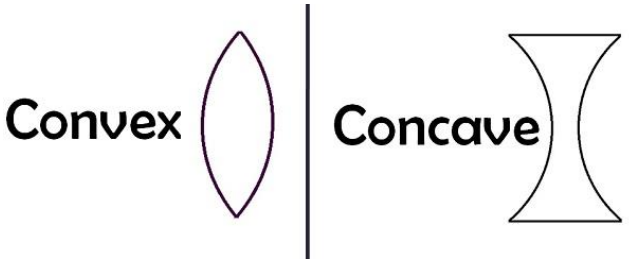
emit	give out
absorb	Take in
Black body	An object that absorbs all the radiation shone on it. It is the best possible emitter

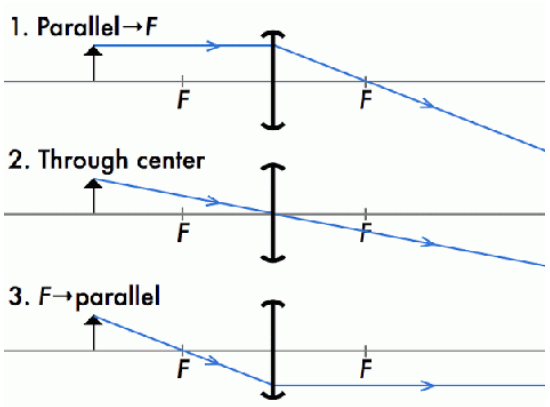
11. Perfect black bodies and radiation

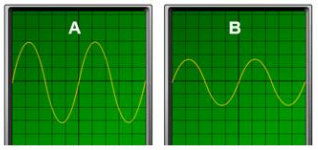
1	The intensity of black body radiation depends on temperature
2	The hotter the object the more radiation is emitted
3	The hotter the object the greater the increase in the proportion of shorter wavelengths
	White hot is hotter than red hot

12.. Lenses (physics only)

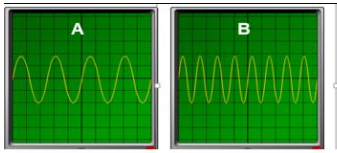
$$magnification = \frac{image\ height}{object\ height}$$







Sound A has the largest **amplitude** (i.e. the tallest waves), so it is the loudest of these two sounds.



Sound B has the greater number of waves across the **oscilloscope** – it has the highest **frequency** and so has the highest **pitch**.