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Physics Paper 2 Topic 6: Waves

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Section 1: Key Terms and Definitions

1.	Amplitude	The **maximum displacement** of a point on a wave away from its **undisturbed position**
2.	Wavelength	The distance from one point on one wave to the equivalence position on the next wave.
3.	Frequency	The number of waves passing a point each second.
4.	Oscillation	A motion that repeats itself – i.e. vibrations
5.	Longitudinal	Oscillations are along the same direction as the direction of travel e.g. sound waves
6.	Transverse	Oscillations are at right angles to the direction of travel e.g. water waves, all electromagnetic waves
7.	Period	The time needed for one wave to pass a given point.
8.	Compression	Region in a longitudinal wave where the particles are closest together.
9.	Rarefaction	Region in longitudinal wave where the particles are furthest apart.
10.	Absorb	When the energy of an electromagnetic wave is taken up by an object.

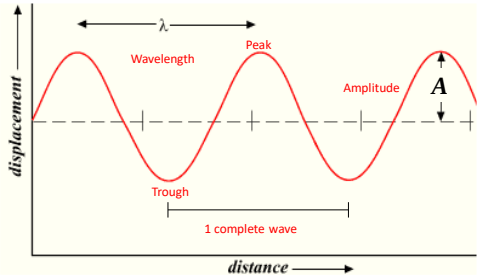
Section 1 continued: Key Terms and Definitions

11.	Transmit	When a wave is able to pass through a material.
12.	Reflection	The wave bounces off a surface; the angle of incidence is equal to the angle of reflection
13.	Refraction	The wave changes direction when it enters a medium of different density where it has a different speed.
14.	Diffraction	The slight bending of waves as they pass around the edge of an object or through an opening
15.	Medium	The **substance that carries a wave** (or disturbance) from one location to another
16.	Vacuum	A space entirely devoid of matter (completely empty)
17	Decibel (dB)	A unit used to measure the intensity of a sound
18	Ultrasound	Frequencies of sound above 20kHz (20,000 Hz)
19	Sonar	A system for the detection of objects under water by emitting sound pulses and detecting or measuring their return after being reflected.
20	Seismic Waves	Produced by earthquakes. P waves are longitudinal and S waves are transverse (cannot travel through a liquid)

Section 2: Transverse and Longitudinal Waves

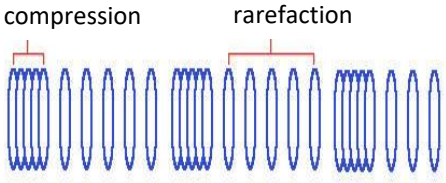
TRANSVERSE WAVES

The wave moves at right angles to the disturbance or vibration.



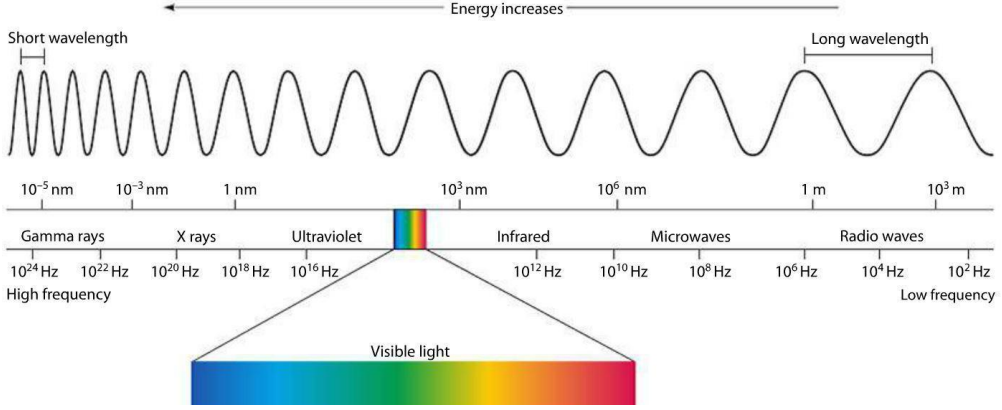
LONGITUDINAL WAVES

The wave moves along in the same direction as the disturbance or vibration.



Section 3: The Electromagnetic Spectrum

1.	Electromagnetic Spectrum	The collective name for all types of Electromagnetic Radiation. They are all transverse waves that travel at 300,000,000 m/s.
2.	Ionising	High energy radiation which can remove electrons leaving ions. If this happens in DNA it can cause a mutation that could lead to cancer.
3.	Production	Gamma Rays are produced from the decay of an unstable nucleus. Radio waves are produced by oscillations in electrical circuits.



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Section 4: Uses and Risks of Electromagnetic Waves

Electromagnetic Wave	Uses	Why is it suitable?	Risks
32. Radio Waves	Television and Radio	Reflected by ionosphere so can broadcast over long distances	
33. Microwaves	Satellite communications, cooking food	Able to pass through the atmosphere to satellites. Has a heating effect.	
34. Infrared	Electrical Heaters, Cooking Food, Infrared Cameras	Has a heating effect. Emitted by objects so cab be detected	
35. Visible Light	Fibre-optic Communications	Able to pass along a cable by total internal reflection	
36. Ultraviolet	Energy efficient lamps, sun tanning	Increases amount of melanin (brown pigment) in skin.	Premature skin aging. Increase risk of skin cancer (some can ionize)
37. X-Rays	Medical imaging and treatments	Absorbed by bone but transmitted through soft tissue.	Ionizing – can cause mutation of genes and cancer
38. Gamma Rays	Medical imaging and treatments	Able to pass out of body and be detected by gamma cameras	Ionizing – can cause mutation of genes and cancer

Section 5: Properties of Electromagnetic Waves and Sound Waves

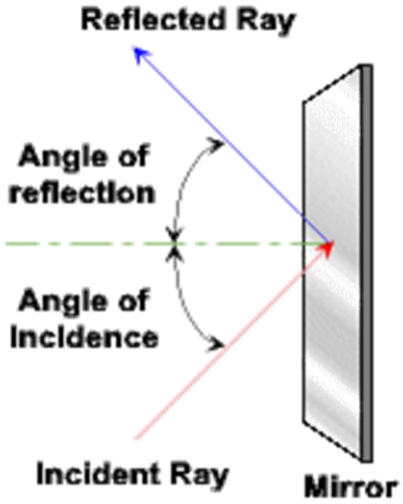
Property	Electromagnetic Wave	Sound Wave
1. Speed	300,000,000 m/s	Much slower (330 m/s in air)
2. Media it can travel through	Can travel through anything, even a vacuum	Solids, liquids or gases
3. Type of Wave	Transverse	Longitudinal
4. Wavelength	Very short	Longer

Section 6: Measuring the Speed of Sound

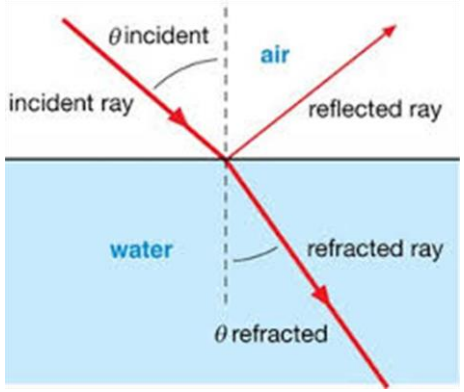
a. Measure the distance to a building.
b. Fire a starting pistol (or make other loud noise) and start timing.
c. Stop the timer when the echo is heard.
d. Half your value for time.
e. Work out the speed using distance divided by time.

Section 7: Reflection, Refraction and Diffraction Diagrams (Physics)

Reflection



Refraction



Diffraction