

1 – Waves Key Terms	
Waves	Oscillations that transfer energy away from a source. Do not transfer matter.
Transverse Waves	Oscillations are perpendicular to wave travel. E.g., EM waves.
Longitudinal Waves	Oscillations are parallel to wave travel. E.g., sound waves. Have areas of compression and rarefaction.
Frequency (f)	Number of waves that pass a point each second. Units = Hertz (Hz).
Peak / Crest	Highest point of oscillation on a wave.
Trough	Lowest point of oscillation on a wave.
Amplitude	Maximum displacement of oscillation from rest position.
Wavelength	Distance between a point on one wave and the same point on the next wave. E.g. peak to peak distance.
Time Period (T)	Time taken for a complete wave to pass a point. Units = seconds (s).
2 – Wave Equations	
T and F	Time period = 1 / frequency $T = 1 / f$
Wave Speed 1	Wave speed = distance / time $v = d / t$
Wave Speed 2	Wave speed = frequency x wavelength $v = f \times \lambda$
3 – RP: Measuring the Speed of Waves	
Measuring Speed in Air	Time a sound wave travelling between two microphones. Measure distance between microphones. Use $v = d / t$ .
Measuring Speed in Water	Use a ripple tank. Lamp projects shadow of waves onto a screen. Measure $10 \lambda$ with a ruler then $\div 10$ to get $1 \lambda$ . Count waves in 1 min then $\div 60$ to get f. Use $v = f \times \lambda$ .
Measuring Speed in Solids	Use a vibration generator to set up a wave on a string. Read frequency from signal generator and measure wavelength with a metre ruler. Use $v = f \times \lambda$ .
4 – Refraction (HT only)	
Refraction	Wave crosses boundary between materials, changes direction.
Optical density	Measure of how quickly light travels through a material.
F.A.S.T.	Glass to air -> waves get faster -> refracted away from normal. Air to glass -> waves get slower -> refracted towards normal.

5- Electromagnetic Spectrum	
Type of Waves	Transverse waves. Oscillating electric and magnetic field.
Speed	All travel at 300,000,000 m/s. Can travel in a vacuum (e.g. space).
6 – Uses and Properties of EM Waves (long to short $\lambda$ , low to high f )	
Radio waves	Produced by oscillations in electrical circuits. Used for television and radio broadcasting -> transmit easily through air.
Microwaves	Satellite communications -> can pass through atmosphere. Cooking food -> energy absorbed by water molecules.
Infrared	All objects emit IR -> hotter objects emit more IR. Detected by IR thermal imaging cameras. Used for cooking food and heating.
Visible Light (ROYGBIV)	Can be detected by human eyes. Used in fibre optic cables to transmit data -> reflected off inside of fibre.
Ultraviolet	Energy efficient lighting -> bulbs generate UV -> absorbed by a surface and remitted as visible light. Sun tanning -> produced by the Sun and by sun beds.
X-rays	Medical imaging -> absorbed by bones, pass through soft tissue. Radiotherapy -> kill cancer cells.
Gamma rays	Emitted from unstable atomic nuclei. Medical tracers -> source injected into body -> detected outside. Radiotherapy -> kill cancer cells. Sterilisation of food and medical equipment -> kills bacteria.
7 – Dangers of EM Waves	
Relationship	Higher frequency -> higher energy -> increased danger.
Ultraviolet	Can cause premature ageing of skin and skin cancer.
X-rays and Gamma rays	Ionising radiation -> high enough energy to remove electrons from atoms -> can cause mutation of genes -> lead to cancer.
Dose	Measure of the risk of harm resulting from an exposure of the body of the radiation.
8 – RP: Emission and Absorption of Surfaces	
Black matt	Best emitters and best absorbers.
Shiny silver	Poor emitters and poor absorbers (i.e. good reflectors).

## GCSE Science

### Physics P6 – Waves

