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** x **λ**
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 λ** with a ruler then **÷ 10** to get **1 λ**. Count waves in **1 min** then **÷ 60** to get **f**. Use **v** = **f** x **λ**.
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** x **λ**.
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 λ, 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