

Year 10 Science Knowledge Booklet





Big Questions and Vocabulary

- What are waves and how do we describe them?
- How can we measure the speed of waves?
- What happens when waves reflect and refract?
- What is the electromagnetic spectrum?
- What do we use X-rays and gamma rays for?
- What are ultraviolet and infra-red radiations?
- How do we use microwaves and radio waves in communications networks?

Wave Ways of transferring energy and information through a medium without overall movement of the medium.	Wavelength The length of one complete wave. Measured in metres.	Amplitude The maximum displacement of a point on the wave. (measured form the undisturbed position)
Frequency The number of complete waves passing every second. Measured in hertz, Hz	Transverse wave A wave whose vibrations are at right angles to the wave direction. Light and all electromagnetic radiations are transverse waves.	Longitudinal wave A wave whose vibrations are along the direction of wave travel. Sound waves are longitudinal waves.
Wave speed The speed that wave crests travel. In metres per second.	Refraction The change of direction of a wave when it crosses a boundary. Caused by a change in wave speed.	Reflection When a wave bounces off a surface.

Waves may be longitudinal or transverse.

(a) Describe the differences between longitudinal waves and transverse waves.

(b) Radio waves are electromagnetic waves.

Describe how radio waves are different from sound waves.

(3)

(4) (Total 7 marks) Waves may be longitudinal or transverse.

(a) Describe the differences between longitudinal waves and transverse waves.

direction of wave travel	Descibe the difference so t about both
for longitudinal waves the oscillations	things.
are along	
the direction of wave travel	

(b) Radio waves are electromagnetic waves.

Describe how radio waves are different from sound waves.





- Both are waves.
- Both carry information. ٠
- Both can reflect and refract. ٠
- - Travel at different speeds ٠
 - Light can travel in space, sound ٠
 - needs a medium (air) to travel in.
 - ٠ Light is transverse wave, sound is longitudinal wave

Equation	Meaning of terms in the equation and units
$v = f\lambda$	v = wave speed (metre per second, m/s) f = frequency (hertz, Hz) λ = wavelength (metres, m)
$f = \frac{1}{T}$	f = frequency (hertz, Hz) T = period (seconds, s)

Supply

Wave can be shown by ripples on water in a ripple tank. The crests of the waves cast

Can measure the wavelength on water.

- Measure 10 waves and divide by 10
- Photograph the waves with a ruler in view and check the measurement with

Waves are **refracted** when they **change speed**.

- The wave <u>speed slows down</u> in the glass.
- The wavelength gets shorter in the glass.
- The wave refracts to keep wave-fronts together.



Illumination

Shallow tank of wate

Oscillating paddle

Nave patterns on a viewing screen or tab



Dangers of EM radiations

EM radiations are <u>ionising</u>. Ultra violet(UV), X-rays and gamma-rays are <u>most</u> <u>ionising</u>. They can <u>damage human cells</u> and cause <u>cancers</u>.

Humans can protect themselves from ionising radiations by:

- Monitoring and minimising their exposure.
- Shielding themselves behind lead or thick concrete.

Radio waves

Radio waves are <u>electromagnetic, transverse</u> waves produced by <u>oscillations in</u> <u>electrical circuits</u>.

- <u>Radio</u>, <u>television</u> and <u>wi-fi</u>, are carried by <u>radio waves</u>.
- <u>Bluetooth</u> and <u>mobile phone signals</u> are carried by **microwaves**. Microwaves are short wavelength radio waves.
- Radio waves <u>refract in the atmosphere (ionosphere)</u> and <u>can travel long</u> <u>distances</u>. <u>Longer wavelengths</u> are refracted most and <u>travel furthest</u>.
- Micro waves have <u>short wavelengths</u> and can be sent <u>through the</u> <u>atmosphere</u>. They can be passed around the Earth by satellites.

X-rays

X-rays:

<u>pass through soft tissue</u> like skin or muscle.
<u>Absorbed</u> by <u>hard tissue</u> like bone.
Leave a trace on X-ray film.

Balance of **risk** (of harm from X-rays) vs. **benefit** (of diagnose broken bones).

Can use **contrast medium (barium)** to <u>increase absorption</u> of X-rays in stomach



Useful Websites

https://www.bbc.com/education/topics/ztmttv4aA

https://www.bbc.com/education/guides/zc7q4qt/revision/1

Wider Reading





CGP