

Year 11 Science Knowledge Booklet

Term 2

Name:

Class:

**Year 11 Knowledge quiz timetable and Workbook
deadlines.**

8 th November	B6
22 rd November	C6
6 th December	P6





Science Homework 1

Complete the section of the homework workbook identified on the front of this Knowledge organiser and learn the key knowledge questions and answers ready for the knowledge quiz.

Big questions: Waves

What are waves and how do we describe them?

How are the speed, frequency and wavelength of a wave related?

How are the speed, frequency and wavelength of a wave measured?

How can we measure the speed of sound?

What is the electromagnetic spectrum of waves?

What happens to waves when they cross a boundary that changes their speed?

Which surfaces are best at absorbing or emitting electromagnetic waves?

How are radio waves and other electromagnetic waves produced?

What are the harmful effects of electromagnetic waves?

Key vocabulary

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 from 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.

Normal	A line drawn at right angles to a boundary where the wave crosses the boundary. All angles of waves are measured from the normal.
Specular reflection	Reflection from a smooth surface like a mirror. All waves coming from the same direction are reflected at the same angle.
Electromagnetic spectrum	The range of radiations in the same family as visible light. All electromagnetic radiations are transverse waves and travel at the speed of light.

What are waves and how do we describe them?

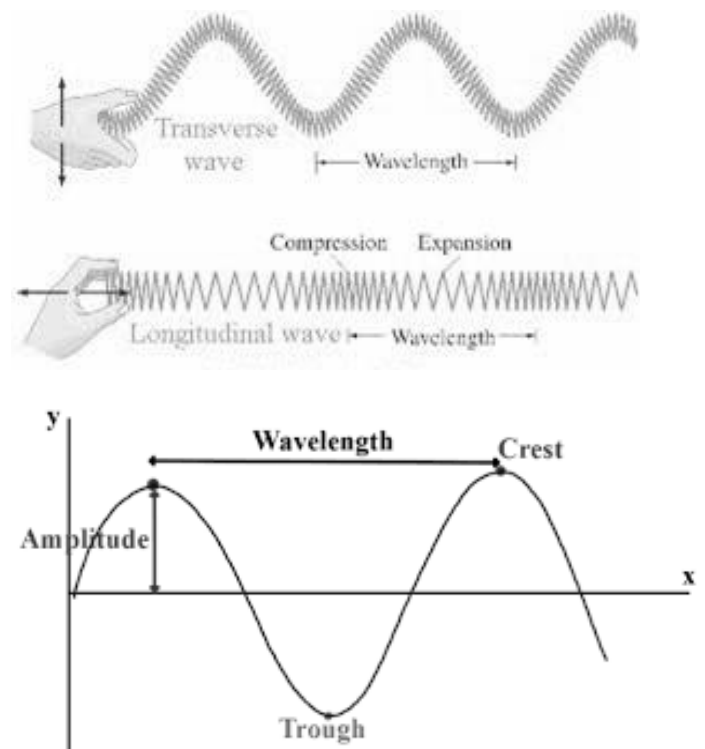
Waves **transfer energy** and information without the transfer of matter

Transverse waves – have vibrations at right angles to the wave direction.

-eg. Light is transverse wave.

Longitudinal waves – have vibrations along the wave direction.

- eg. Sound is longitudinal wave.



- **Wavelength (m)** – length of one complete wave.
- **Amplitude (m)** – height of one crest measured from the centre (rest position).
- **Frequency (Hz)** – number of complete

How are the speed, frequency and wavelength of a wave related?

$$v = f\lambda$$

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

v = wave speed (metre per second, m/s)
 f = frequency (hertz, Hz)
 λ = wavelength (metres, m)

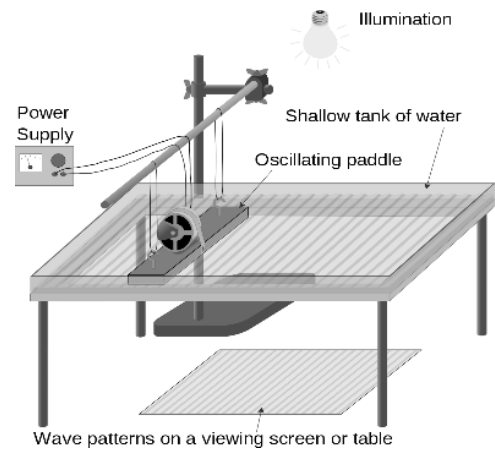
f = frequency (hertz, Hz)
 T = period (seconds, s)

How are the speed, frequency and wavelength of a wave measured?

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

Can measure the wavelength on water. Accuracy is improved by:

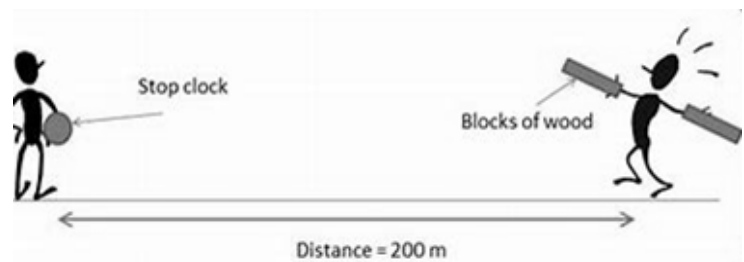
- Measure 10 waves and divide by 10
- Photograph the waves with a ruler in view and check the measurement with a still picture



How can we measure the speed of sound?

The speed of sound can be measured by making a loud sound a large distance away:

- Measure the distance
- Start the clock when you see the clap.
- Stop the clock when you hear the sound.



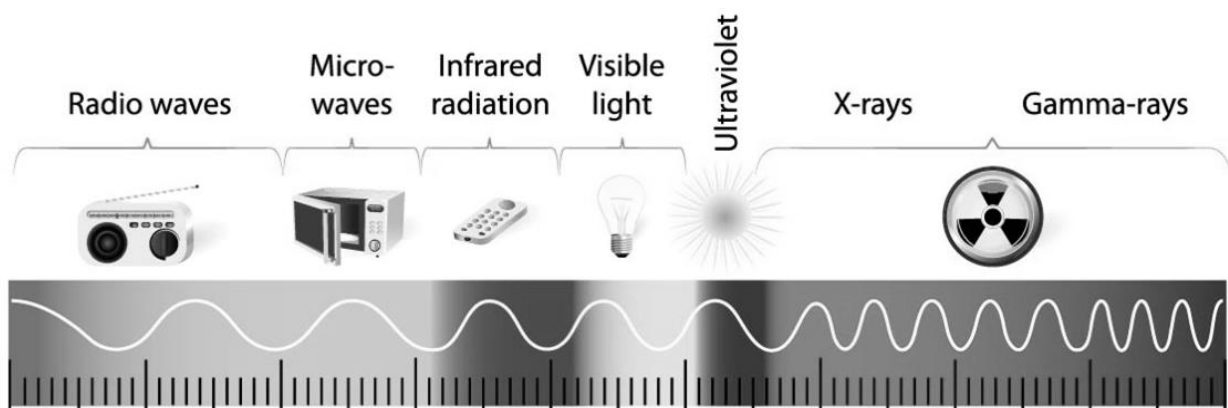
Use: $\text{speed} = \text{distance} / \text{time}$ to find the speed.

What is the electromagnetic spectrum of waves?

Visible light is an electromagnetic wave.

It is a small part of the electromagnetic(EM) spectrum of waves.

All EM waves travel at the speed of light.



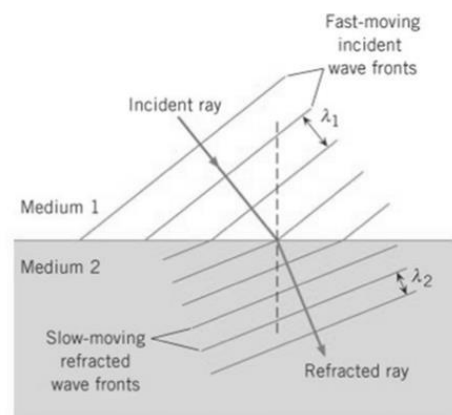
EM radiation	Source	Example of Use
Radio wave	Radio transmitter	Carry radio and tv signals.
Micro-wave	Mobile phone	Carry mobile phone calls, messages and data.
Infra-red radiation (IR)	Hot objects	Carry heat energy away from hot things. Used to toast bread in a toaster.
Visible light	Lights	Allow us to see things.
Ultra violet (UV)	Sun and UV lamps	Tan our skin.
X-rays	X-ray machines	Take X-ray photograph or scan bags at airports.
Gamma rays	Nuclear reactors	Used in gamma cameras to scan patients in hospitals.

What happens to waves when they cross a boundary that changes their speed?

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

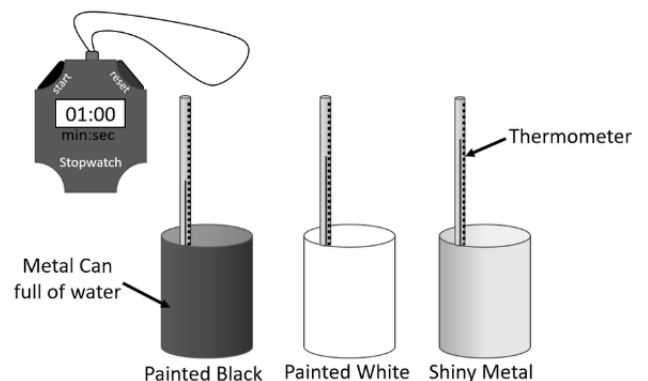
When light enters glass:

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



Which surfaces are best at absorbing or emitting electromagnetic waves?

- Matt and black surfaces are the best emitters and absorbers of radiation.
- Shiny and white surfaces are the worst absorbers and emitters of radiation.
- The wave refracts to keep wave-fronts together.



How are radio waves and other electromagnetic waves produced?

Radio waves are electromagnetic, transverse waves produced by oscillations in electrical circuits .

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

What are the harmful effects of electromagnetic waves?

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

Humans can protect themselves from ionising radiations by:

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



Science Homework 2

Complete the second section of the Exam Practice workbook identified on the front of this Knowledge Organiser ready for the Knowledge Quiz.



Science Homework 3

Complete the final section of the homework workbook identified on the front and learn the key knowledge questions and answers for all of the areas covered in this knowledge organiser ready for the end of term Pillars test.

How to get the most out of your knowledge organiser:

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.
- There are several different things you can do
 - Look, cover, write, check, correct
 - Read through the organisers
 - Mind maps
 - Key spellings
 - Make a glossary
 - Missing out key words
 - Questions/answers answers/questions
 - Flash cards
 - Revision clock learning
 - Mnemonics

Science Learning Tools and wider study:

The Oak Academy – Online Science lessons

BBC Bitesize science

You tube channels:

Fuse school

Ted talks

Free science lessons

Primrose Kitten

Shows on Netfilx

Our planet

Tiny creatures

A life on our planet

Key knowledge question	Answer
What is meant by a transverse wave	The vibrations are perpendicular to the direction of energy transfer
What is meant by a longitudinal wave	The vibrations are parallel to the direction of energy transfer
Give an example of a transverse wave	Radio waves, Microwaves, Infra-red, Light, Ultraviolet, X-rays, Gamma Rays
Give an example of a longitudinal wave	Sound, ultrasound
Give the equation that links wave speed, frequency and wavelength for a wave	Wave speed = frequency x wavelength
Define wavelength of a wave and give the units	The distance from one point on a wave to the same point on the next wave, metres, m
Define amplitude of a wave	The maximum displacement of a wave from its undisturbed position
Define frequency of a wave and give the units	The number of waves passing a point each second, hertz, Hz
Define period of a wave and give the units	The time taken for one complete wave to pass, seconds, s
Define wave speed and give the units	The speed at which energy is transferred through the medium
Name the seven regions of the electromagnetic spectrum	Radio waves, Microwaves, Infra-red, Visible light, Ultraviolet, X-rays, Gamma Rays
Name the part of the EM spectrum with longest wavelength	Longest wavelength = Radio waves
The part of the EM spectrum with the highest frequency	Highest frequency = Gamma Rays
Give two properties of all waves in the electromagnetic spectrum	Travel at the speed of light, are transverse waves, reflect, refract
Give two electromagnetic waves that can increase the risk of cancer in humans	UV, X-ray, gamma