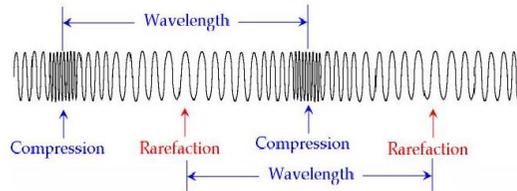


Draw and label a longitudinal wave.



Sound; ultrasound;

In which direction is the vibration for a longitudinal wave?

Parallel to the direction of the energy transfer.

List the electromagnetic waves in order from the longest wavelength to the shortest.

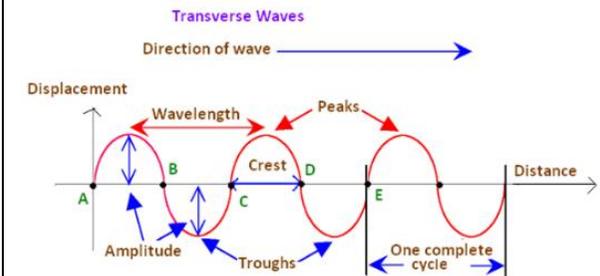
Radio - Microwaves
- Infrared - Visible -
Ultraviolet - X-rays -
Gamma waves

Answer these in your book

- 1 What do waves carry from one place to another?
- 2 Draw a transverse wave and add 3 labels
- 3 How would you explain how to measure the wavelength of a wave?
- 4 What is the symbol used for wavelength?
- 5 What is wavelength measured in?
- 6 Draw a longitudinal wave and label the wavelength, compression and rarefaction.
- 7 What is a rarefaction in a longitudinal wave?
- 8 Name a type of longitudinal wave.
- 9 Name 5 transverse waves.
- 10 What happens when a water wave reaches a duck?
- 11 "The particles move parallel to the direction of travel of the wave energy" describes the properties of what type of wave?
- 12 "The particles move at right angles to the direction of travel of the wave energy" describes the properties of what type of wave?
- 13 The time period, T of a wave can be found by using $1/f$. What does f stand for?
- 14 What is frequency measured in?
- 15 What is the equation for wave speed?
- 16 Draw a diagram to explain what amplitude is.
- 17 What piece of equipment can be set up in a school laboratory to work out the speed of water waves?
- 18 Which member of the electromagnetic spectrum has the longest wavelength?
- 19 Which member of the electromagnetic spectrum can be used in thermal imaging cameras?
- 20 Which member of the electromagnetic spectrum could cause premature aging?
- 21 Put the members of the electromagnetic spectrum in order from highest frequency to lowest frequency. (Be careful to start from the right end!)
- 22 What do all electromagnetic waves have in common?
- 23 Which colour has the longest wavelength?
- 24 Draw the path of a ray passing from air at an angle into a glass block and out again.
- 25 The amount of infrared radiation absorbed by a surface depends on the nature of the surface. Which type of surface is the best absorber and emitter of infrared radiation?
- 26 Why is silver foil sometimes placed behind radiators?
- 27 Where do gamma waves come from?
- 28 X-rays and gamma rays are ionising radiation. What effect can this have on the body?
- 29 Radiation dose is measured in sieverts (Sv). Who is more at risk, someone exposed to 2000 mSv or someone exposed to 3 Sv?
- 30 Name 4 members of the electromagnetic spectrum and give a practical application for each one.

Module 6 Waves

Knowledge Organiser



KEY WORDS/IDEAS TO REMEMBER

amplitude	emitter
wavelength	absorber
crests	absorption
normal	electromagnetic
longitudinal	gamma
ultrasound	X-rays
frequency	ultraviolet
hertz, Hz	visible
incidence	infrared
transverse	microwaves
refraction	radio
compression	half-life
rarefaction	tracer
reflection	communication

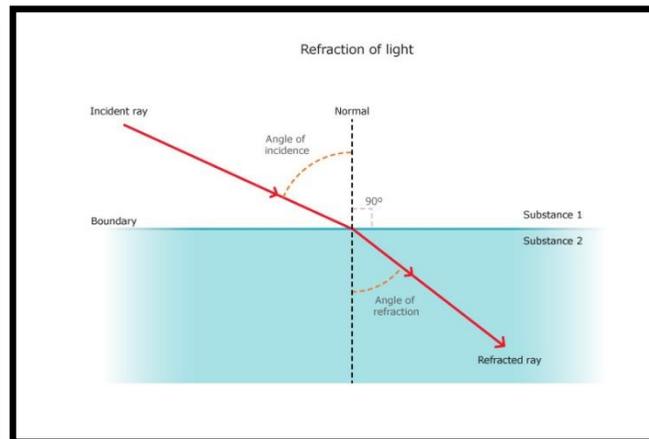
Calculate the frequency of a wave with a wavelength 1m and speed of 300m/s.

frequency = wave speed / wavelength

$$f = 300\text{m/s} \div 1\text{m} = 300 \text{ Hz (hertz)}$$

The angle of reflection is 45° what is the angle of incidence? How do you know?

It is 45° because the law of reflection states that the angle of incidence and the angle of reflection are the same.



How can ultraviolet radiation be useful?

Small doses produce vitamin D in our skin and most people like a sun tan!

What are the hazards of UV radiation?

Premature aging;

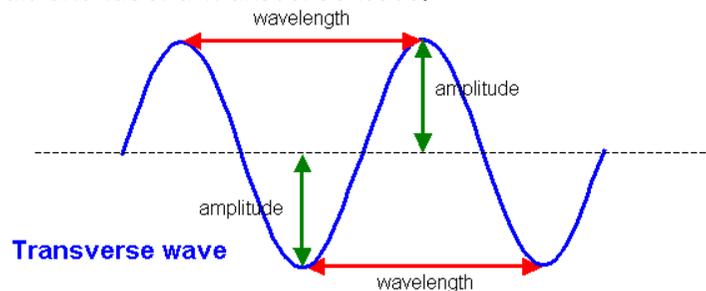
Damage to the eyes;

Skin cancer

Which direction is the vibration in a transverse wave?

At right angles to the direction of the energy transfer.

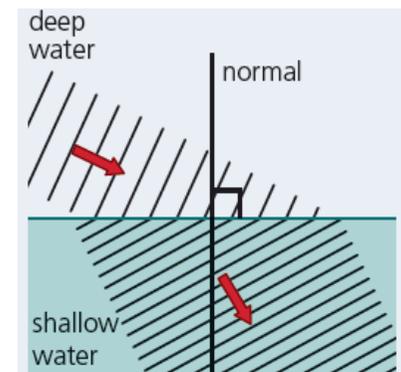
Draw and label a transverse wave.



Calculate the frequency of a wave with a wavelength $1 \times 10^{-4}\text{m}$ and speed of $3 \times 10^8\text{m/s}$. Where would you find this in the EM spectrum?

$$f = \text{wave speed} / \text{wavelength}$$

$= 3 \times 10^8\text{m/s} / 1 \times 10^{-4}\text{m} = 3 \times 10^{12}\text{Hz}$ which is in the infrared part of the em spectrum (see p 213 in the yellow book)



What is the difference between reflection and refraction?

Reflection is when the surface does not absorb any energy.

Refraction is when a wave crosses a boundary into a different medium and changes speed.

How can electromagnetic waves be useful?

Radio - communication

Microwaves - satellite communication (mobile phones); cooking

Infrared - cooking; thermal imaging; security lights and alarms

Visible - seeing things!

Ultraviolet - sun tan; security marking

X-rays - medical diagnosis

Gamma - tracers for diagnosis; treatment of cancer; sterilising surgical instruments; irradiating food (controversial).

Which are the most dangerous to humans, gamma rays or X-rays? Gamma because they are more ionising. They have more energy. Also, we can control the x-rays.

Why does satellite communication depend on microwaves and not radio waves?

Microwaves pass through the charged ionosphere layer of the atmosphere without being refracted. (Check out p225 in the yellow book for more on this. Higher tier but interesting)

Write down the wave equation that you need to help you find the speed of a wave.

$$\text{Wave speed} = \text{frequency} \times \text{wavelength}$$

Which colour is the best emitter of infrared radiation? Which is the worst?

Dull, black is the best emitter. Shiny, white is the worst.