There are two different types of waves, longitudinal and transverse.

Transverse:

Direction of travel

A transverse wave has **vibrations** at 90° to the direction of travel.

Longitudinal:

Direction of travel

A longitudinal wave has **vibrations** parallel to the direction of travel.

In this example there are **two** complete waves shown.

You must be able to describe a wave in terms of its wavelength, amplitude and frequency.

Wavelength = the length of one complete wave

Amplitude = maximum displacement

Frequency = the number of waves in 1 second

For the wave shown:

Wavelength = 4 units

Amplitude = 2 units

Wave speed can be calculated in two ways, both equations are given on the equation sheet so use the **units** to help decide which you need to use.

$$Speed\ (\mathbf{m/s}) = \frac{distance\ (\mathbf{m})}{time\ (\mathbf{s})}$$

*Wave speed = wavelength(**m**) × frequency(**Hz**)*

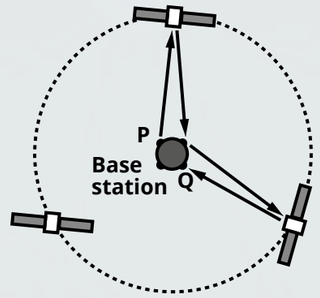
Satellite communication

There are two kinds of satellite used, both take 24 hours to orbit.

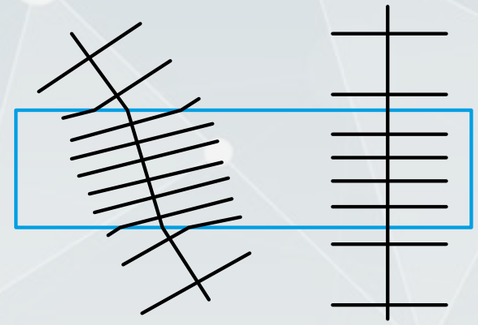
Geosynchronous returns to the same point **once** every 24 hours.

Geostationary stays **above** the same point at **all times**.

Using geostationary satellites to send messages requires at least 3 satellites. Remember the signal must travel up to the satellite and back and cannot travel straight from one satellite to another without returning to a station on the ground first.



Refraction

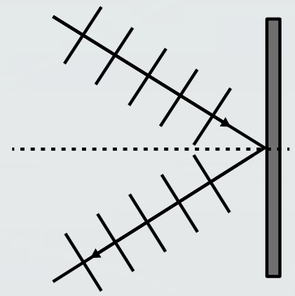


Notice the change in direction and the change in wavelength due to the change in speed.

Low optical density/ deep water	Higher speed Longer wavelength
High optical density/ shallow water	Slower Shorter wavelength
Low optical density/ deep water	Higher speed Longer wavelength

Reflection

Notice that the wavelength does not change this time and that the angle from the normal to the wave when it hits the object is the same as when it is reflected.



The Electromagnetic spectrum

All parts of the spectrum transfer energy, they are all transverse waves and all travel at the same speed in a vacuum (3×10^8m/s), but have different properties and uses.

Wave	**Radio waves**	**Microwaves**	**Infrared**	**Visible light**	**Ultraviolet**	**X rays**	**Gamma rays**
Wavelength	Long ←						→ Short
Frequency	Low →						High
Energy	Low →						High
Danger	Low danger	Heating water molecules in cells	Heat/burns	Damage retina	**Ionising**, causes cancer	**Ionising**, causes cancer	**Ionising**, causes cancer
Uses	Radio Television	Satellite television Mobile phones Cooking food	Optical fibres Remote controls Heat treatment	The only part that can be seen with the naked eye	Fraud detection	Looking at broken bones	Kills cancer cells