

What Is the Electromagnetic Spectrum?

Have you ever gone outside after a rain shower and noticed a rainbow in the sky? Maybe you have had an x-ray to see if you had broken a bone. More than likely you have at least watched the television or used a cell phone. What do these all have in common? Well they all involve the electromagnetic spectrum.

The electromagnetic spectrum is a diagram that charts electromagnetic waves.

Electromagnetic waves are waves that can travel through the emptiness of space, at the speed of light.

Seven types of electromagnetic waves are:

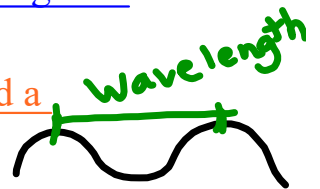
1) radio waves 2) microwaves 3) infrared waves, 4) visible light waves, 5) ultraviolet waves, 6) x-rays 7) gamma rays.

Wavelengths



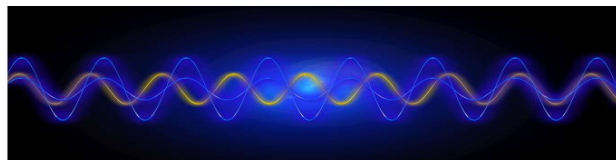
The electromagnetic spectrum takes all the electromagnetic waves and lines them up based on their wavelengths. So what is a wavelength? If you have ever been to the beach and watched the water move, you have seen a wavelength. Electromagnetic waves move similarly to the rising and falling of water waves.

From the top of one wave to the top of the next wave is called a wavelength.



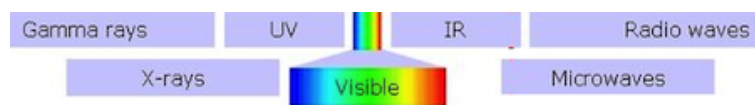
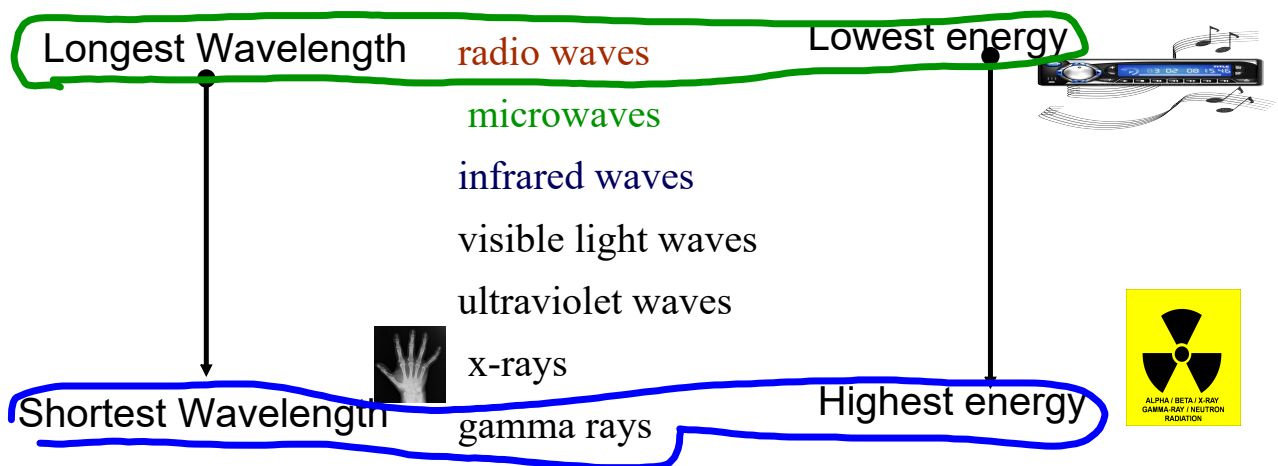
If the wavelength is long, you will experience less waves.

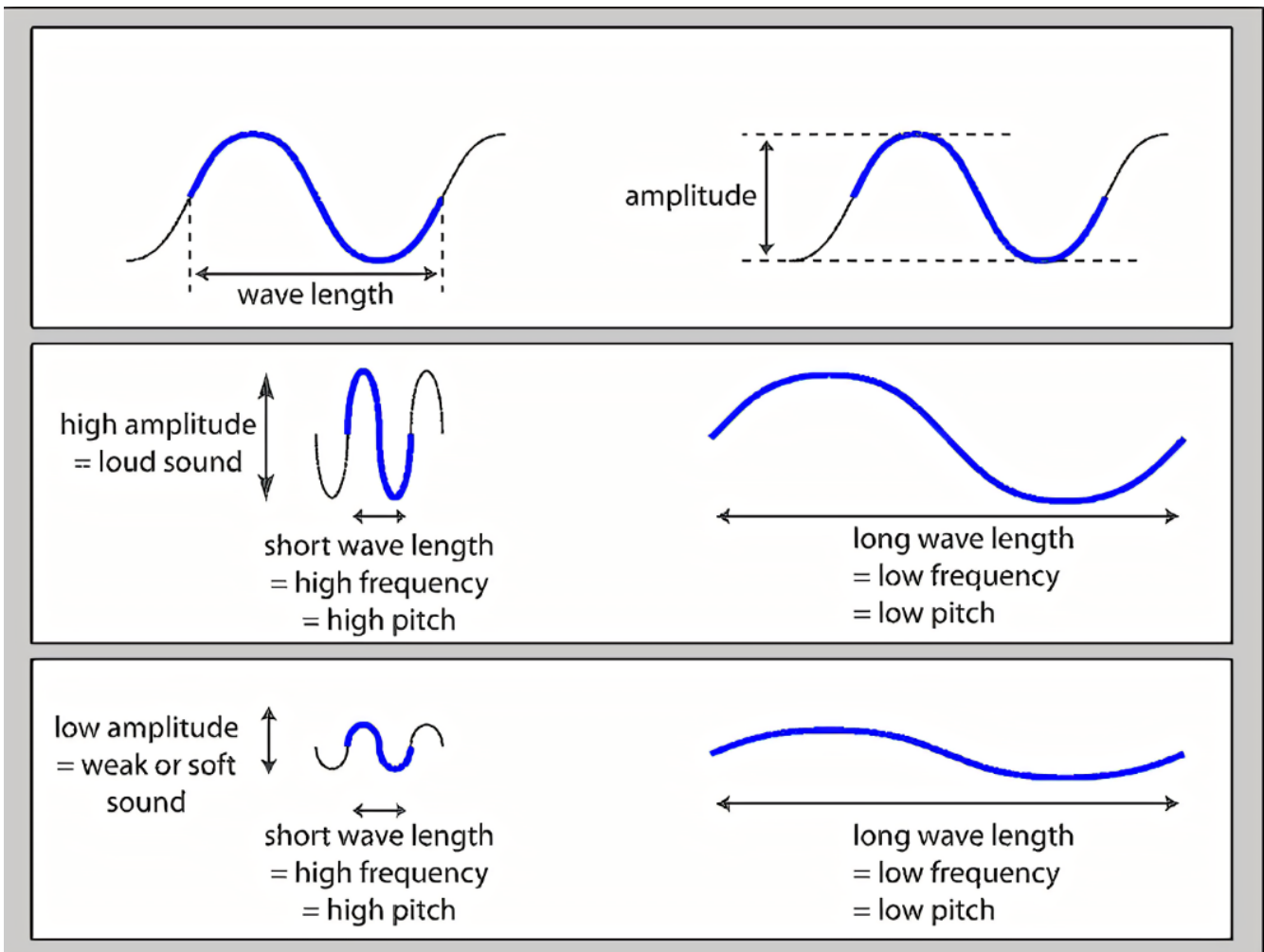
If the wavelength is short or closer together, you will experience more waves.

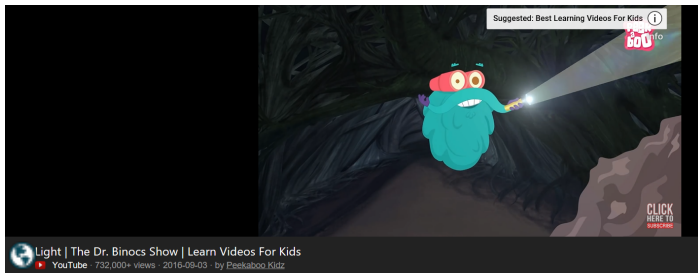


The electromagnetic spectrum is set up based on wavelengths.

The order is:







Light - is the form of energy that you can see and the reason why we can see objects around us. Light travel in straight lines.

Natural light sources are:

1) The Sun is a star with the most abundant and the least expensive in the world

2) Flames or Sparks from Fire

The sun and other stars emit light in all directions using waves or rays (similar to spokes on a bicycle). This is known as radiation. Energy such as light that travels by radiation, like the sun, is known as **radiant energy**.

Since we do not always have the light from the sun, we have developed artificial light sources Examples: light bulb, flashlight

Interesting fact - less than 0.0000001% of the suns energy actually reaches the earth

[Light: Crash Course Astronomy #24 - YouTube](#)



– Properties of Light

1) • Light travels in straight lines:



2) • Light travels VERY FAST – around 300,000 kilometres per second.

1. the speed of light = 299,792,458 meters / second

[How to measure the speed of light - with CHOCOLATE! | Do Try This At Home | We The Curious - YouTube](#)

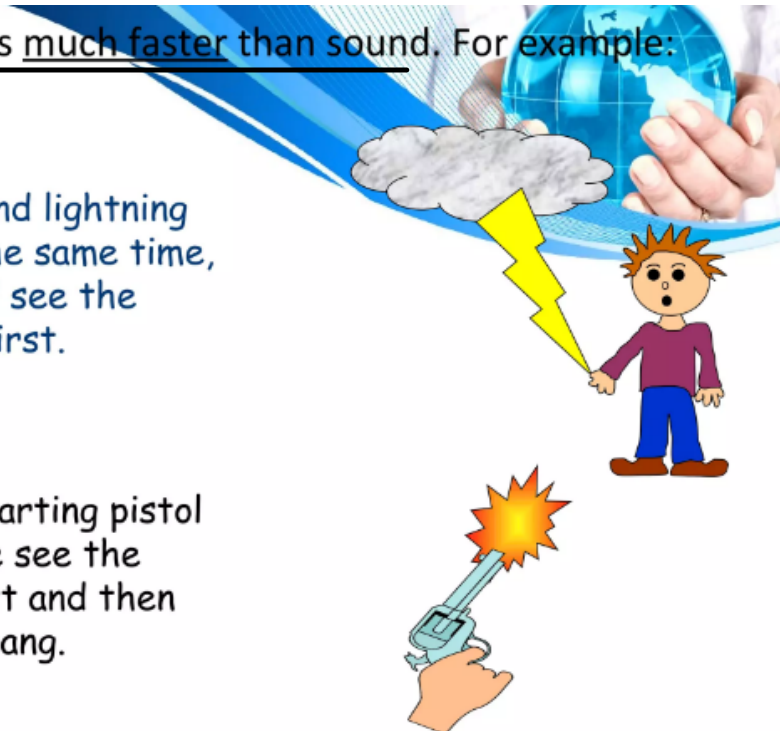
At this speed it can go around the world 7.5 times in one second.



- Light travels much faster than sound. For example:

Thunder and lightning start at the same time, but we will see the lightning first.

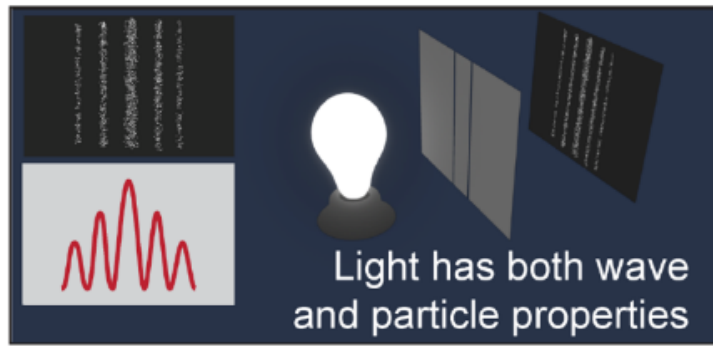
When a starting pistol is fired we see the smoke first and then hear the bang.



3. Light Has a Dual Nature

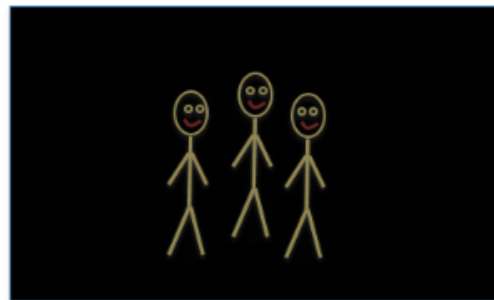
NOTES

Light can behave as waves, or as particles called photons.

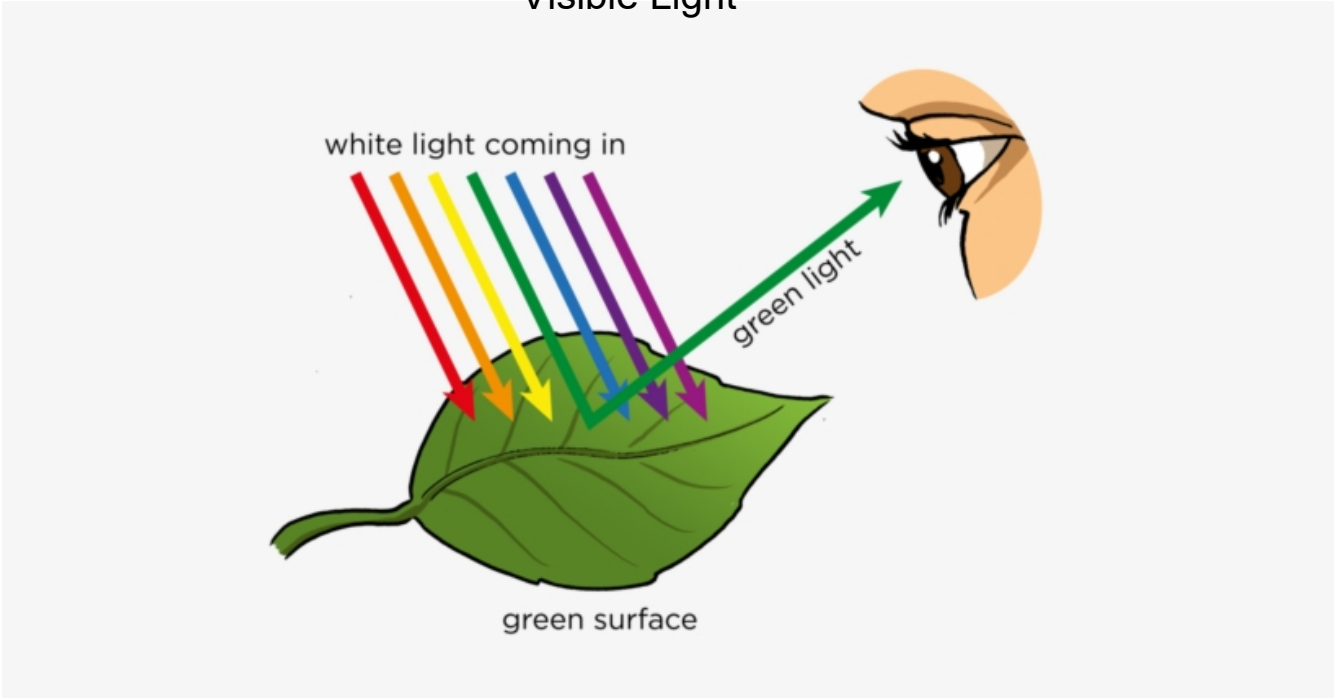


If you were in a *perfectly dark* room with your best friends, could you see them?

What if you stayed in there for a *really* long time?



Visible Light



All sources of light require energy. A light bulb uses electricity, flash light uses batteries and a match used chemicals. Light from the Sun is formed through a process called nuclear fusion.

[How Does Fusion Power the Sun? - YouTube](#)



The first basic property of light is that light is a form of energy.

When light is absorbed by a surface, it can be transformed into one of the following:

- 1) Thermal Energy- energy that comes from heat
ex) black sweater absorbing the sun

- 2) Chemical Energy - energy stored in the bonds of chemical compounds (atoms and molecules)
ex) trees absorbing sunlight to make sugars
ex) glow sticks

- 3) Electrical Energy - uses electrons and conductors to produce the electricity we use in our houses

- 4) Solar Energy - Solar cells change light to electricity