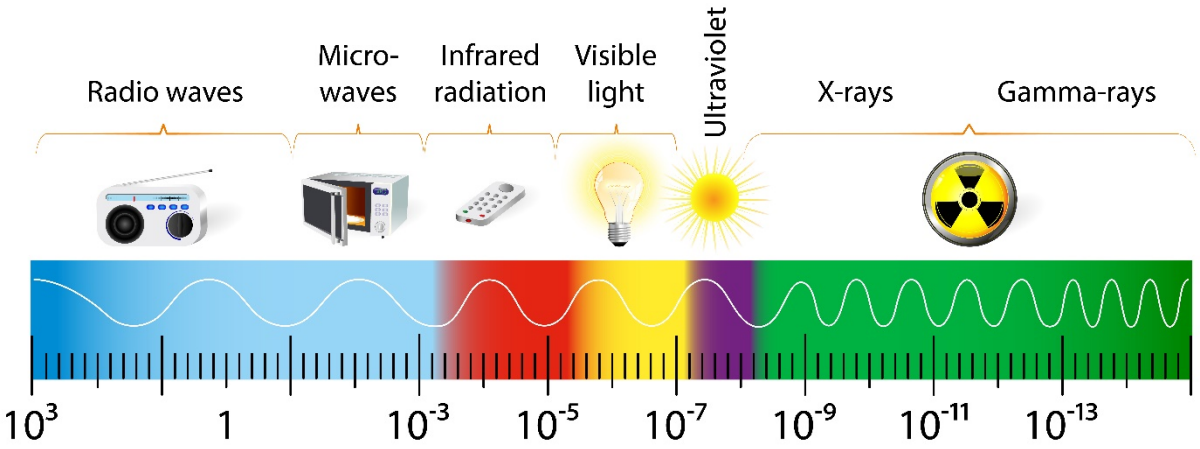
S6 Electromagnetic Waves



Electromagnetic waves are waves that contain an electric field and a magnetic field and carry energy. They travel at the speed of light.

There are seven types of electromagnetic waves. They are classified according to their frequency. Waves in the electromagnetic spectrum vary in size from very long radio waves the size of buildings, to very short gamma-rays smaller than the size of the nucleus of an atom.

The electromagnetic spectrum includes, from longest wavelength to shortest: radio waves, microwaves, infrared, optical, ultraviolet, X-rays, and gamma-rays.

Radio waves have the longest wavelength of all electromagnetic waves. They range in size from the size of a football to longer than a football field. They are used to transmit data and can be found in radios, televisions, and cellular devices.

Microwaves are measured in centimetres. Longer microwaves are used to heat food. They are also useful for transmitting information from one place to another as microwave energy can penetrate haze, light rain, snow, clouds, and smoke. Shorter microwaves are also used in radars such as radars used in weather forecasts.

Infrared light has a range of wavelengths, just like visible light has wavelengths that range from red light to violet. "Near infrared" light is closest in wavelength to visible light and "far infrared" is closer to the microwave region of the electromagnetic spectrum. The longer, far infrared wavelengths are about the size of a pin head and the shorter, near infrared ones are the size of cells, or are microscopic. Far infrared waves are thermal, and we can feel them in the heat from the sun, a fire or a radiator. Near infrared lights are not hot at all and can be found in your TV remote control.

Visible light waves are the only electromagnetic waves we can see. We see these waves as the colors of the rainbow. Each color has a different wavelength. Red has the longest wavelength and violet has the shortest wavelength. When all the waves are seen together, they make white light.

Ultraviolet light has wavelengths that are invisible to the human eye, but some insects such as bees can see them. It is ultraviolet rays from the Sun that cause sunburns. We are protected from the Sun's ultraviolet rays by the ozone layer. Ultraviolet light is used by powerful telescopes like the Hubble Space Telescope to see far away stars.

X-rays have even shorter wavelengths than ultraviolet rays, but they have higher energy as energy increases as wavelengths of light decrease. X-rays were discovered by German scientist Wilhelm Roentgen. X-rays can penetrate soft tissue such as skin and are therefore often used to take X-ray photos of bones.

Gamma rays have the shortest wavelengths, which means they have the highest energy. These waves are generated by radioactive atoms and in nuclear explosions. Gamma-rays can kill living cells, a fact which medicine uses to its advantage, using gamma-rays to kill cancerous cells.