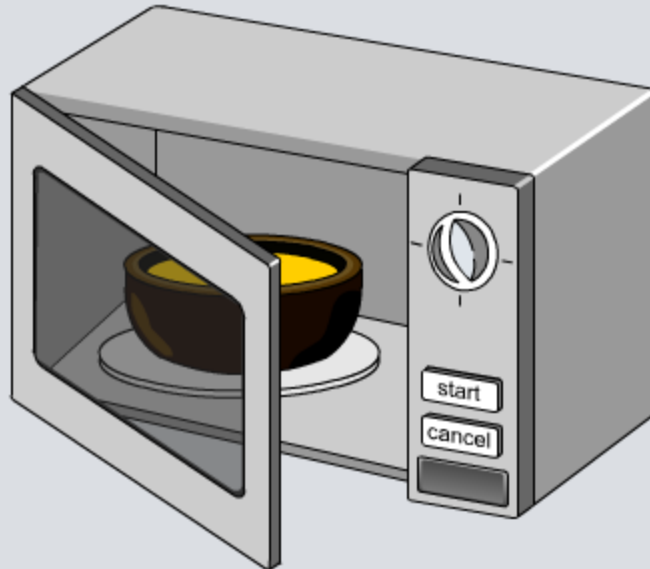


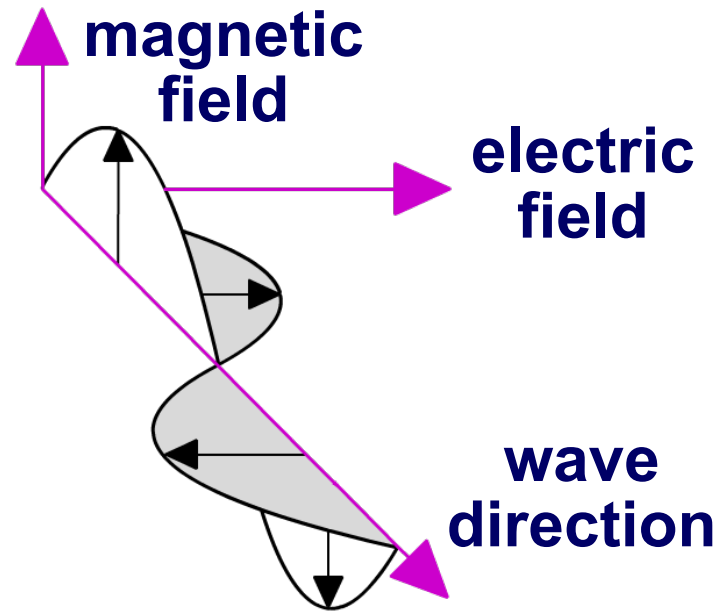
Electromagnetic Waves



What are electromagnetic waves?

What's the connection between light, microwaves and X-rays?

They are all different types of **electromagnetic radiation** that travel as **waves** and **transfer energy** from one place to another.



Electromagnetic waves are **transverse waves** made up of electric and magnetic fields.

All electromagnetic waves travel at the same speed.

In a vacuum (space), they travel at **300,000,000 m/s!**

How do electromagnetic waves differ?

Different electromagnetic waves carry different amounts of energy.

For example, microwaves carry less energy than X-rays.



- The amount of energy carried by an electromagnetic wave depends on the wavelength:
the shorter the wavelength, the higher its energy.
- Wavelength and frequency are linked properties of a wave:
the shorter the wavelength, the higher its frequency.
- So, frequency also tells you about the energy of a wave:
the higher its frequency, the higher the energy.

Do microwaves have a shorter wavelength than X-rays?



What happens when waves hit a surface?

When electromagnetic waves hit a surface, they can be **reflected**, **absorbed** or **transmitted**.

How the waves behave depends on their energy and the type of material.

For example, light waves are reflected by skin but X-rays pass straight through.

If electromagnetic waves are absorbed, some of their energy is absorbed by the material. This usually increases the temperature of the material.



Marco Michellini



Adam Ciesielski



What happens when waves are reflected?

Some surfaces can **reflect** electromagnetic waves. Shiny surfaces are good reflectors of light waves.

When waves are reflected, some of their energy may also be absorbed by the material.



A mirror reflects most of the light waves that hit it.

The curved satellite dish reflects microwaves from a satellite to the receiver.

How does reflection allow us to see?



Jupiterimages Corporation



Are these statements about
electromagnetic waves true or false?

Electromagnetic waves are
used by us every day.

How much do you know about
electromagnetic waves?

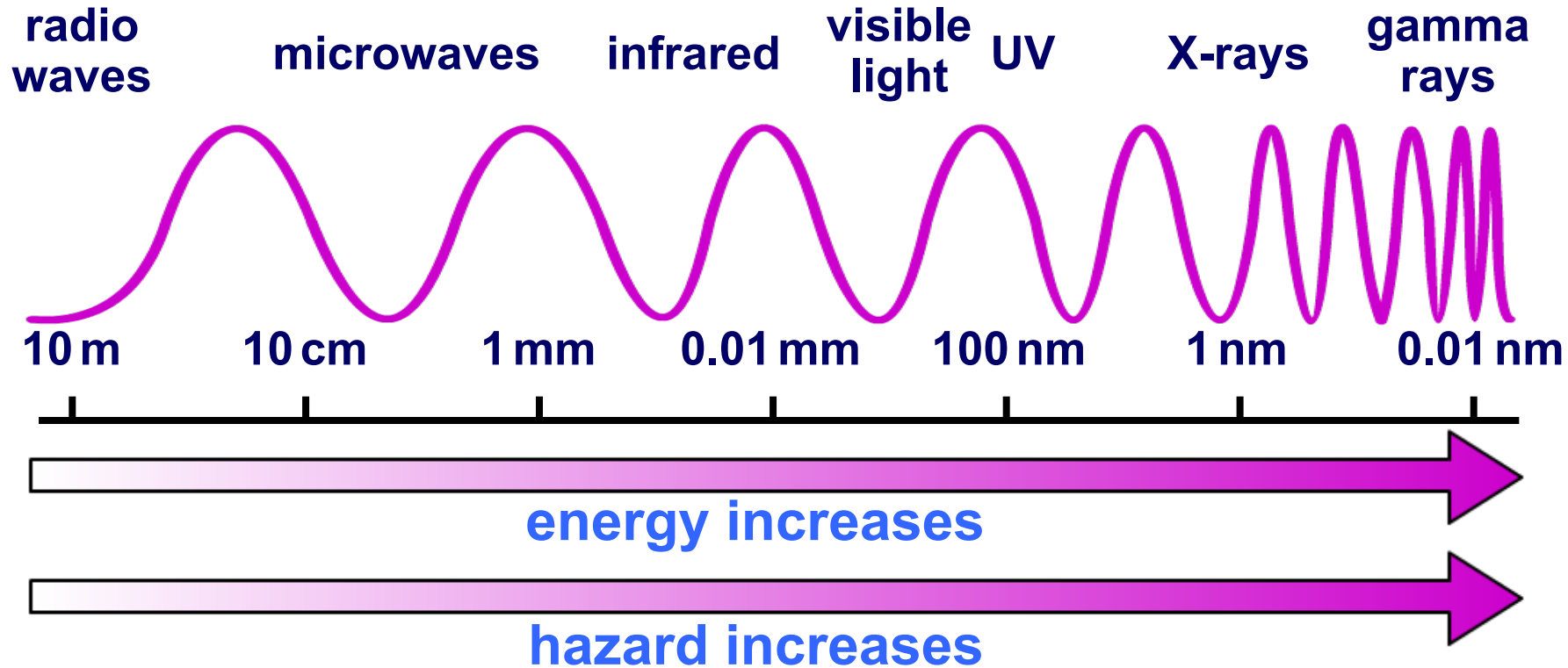
Click "**start**" to find out.

start



Are electromagnetic waves dangerous?

The shorter the wavelength (and higher the frequency) of electromagnetic waves, the more energy that they carry.



High-frequency electromagnetic waves, such as gamma rays, are potentially more harmful because they have more energy.

The electromagnetic spectrum



Arrange the electromagnetic waves in order of wavelength, starting with the longest wavelength.

- 1 gamma rays
- 2 radio waves
- 3 visible light
- 4 X-rays
- 5 microwaves
- 6 ultraviolet rays
- 7 infrared waves



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How do different types of electromagnetic waves affect living tissue?

radio waves

heats tissue slightly
but no adverse effects proved

microwaves

high intensity can cause skin burns

infrared waves

no effect on living tissue

visible light

can kill or damage DNA in cells

ionizing waves

high intensity can damage eyes
and cause blindness



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