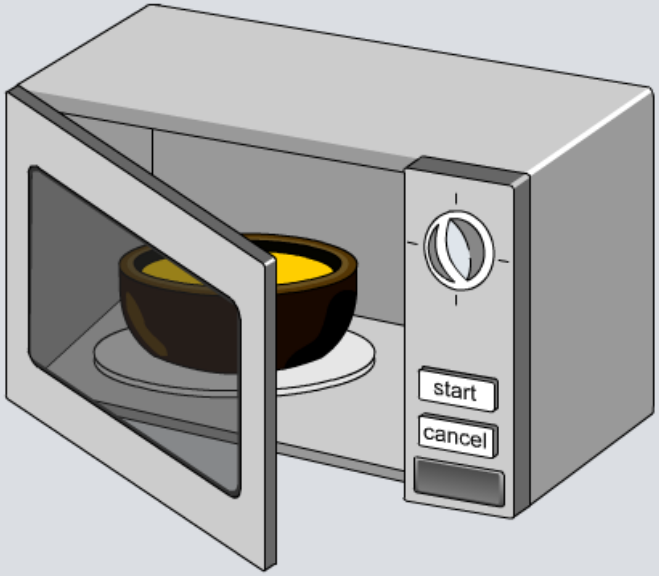
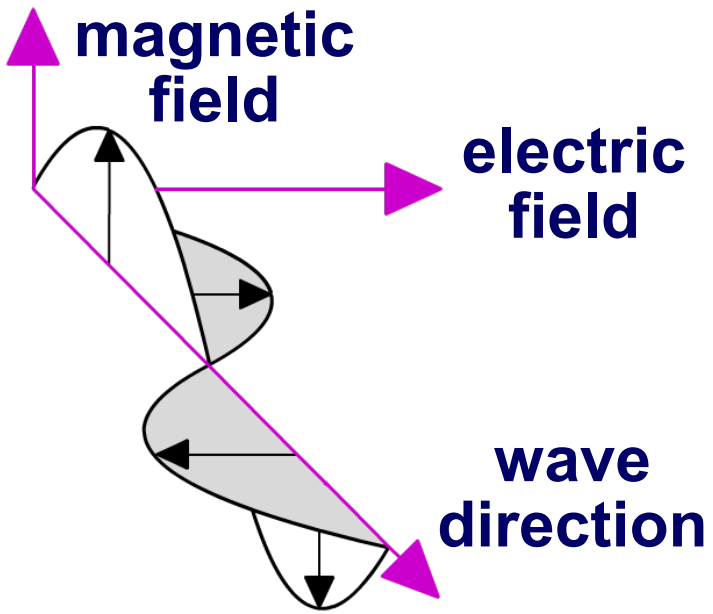
Electromagnetic Waves



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?

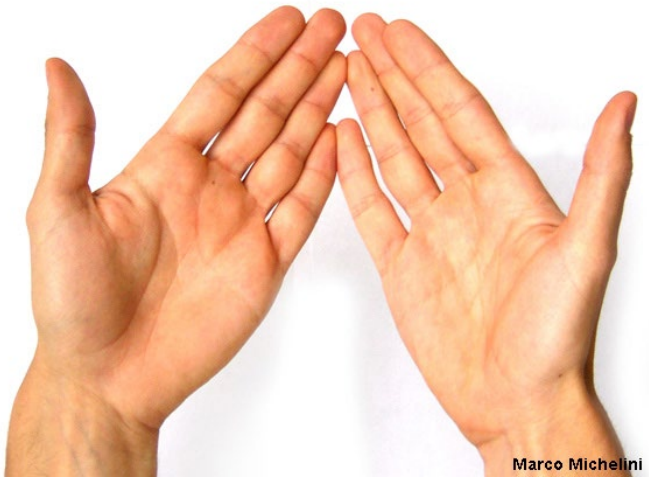
What happens when waves hit a surface?

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.



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?

Characteristics of electromagnetic waves

Are these statements about electromagnetic waves true or false?

Electromagnetic waves are used by us every day.

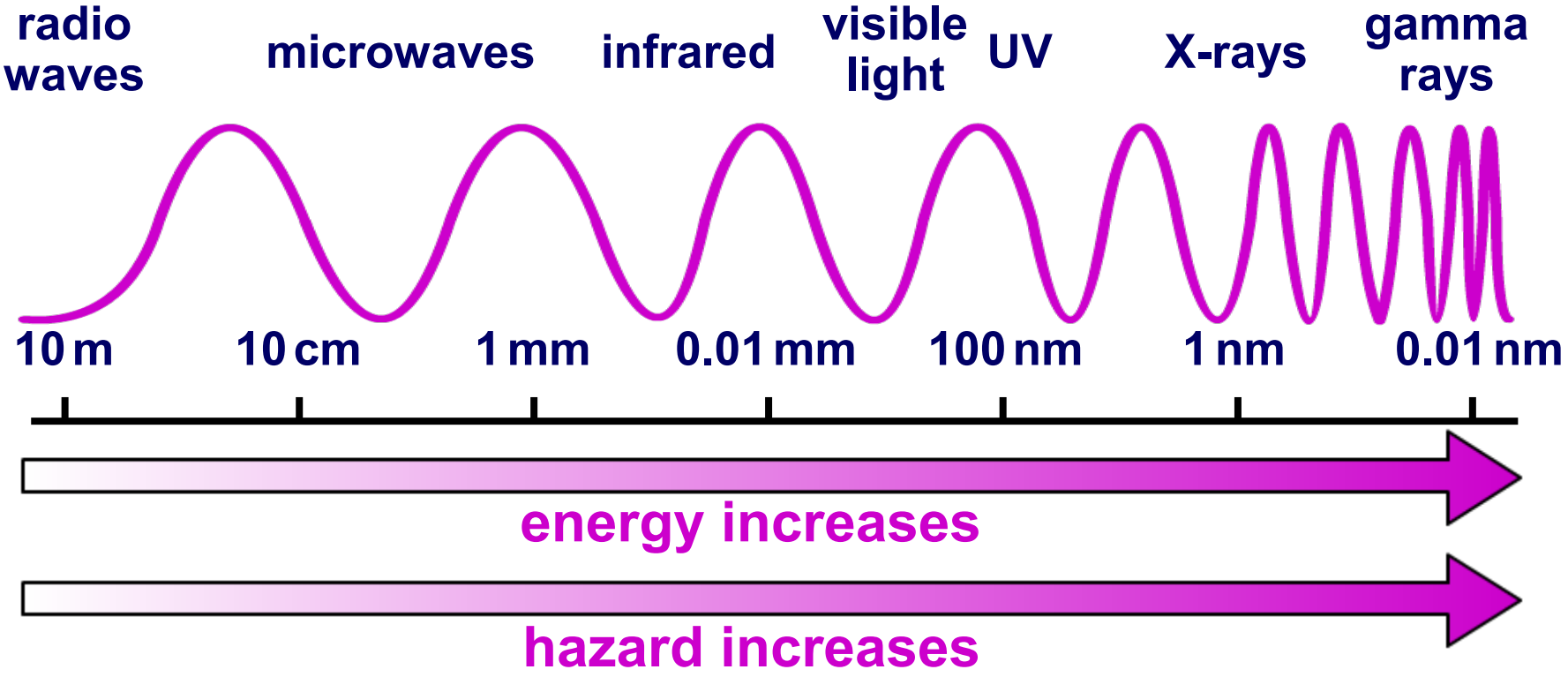
How much do you know about electromagnetic waves?

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

start

Are electromagnetic waves dangerous?

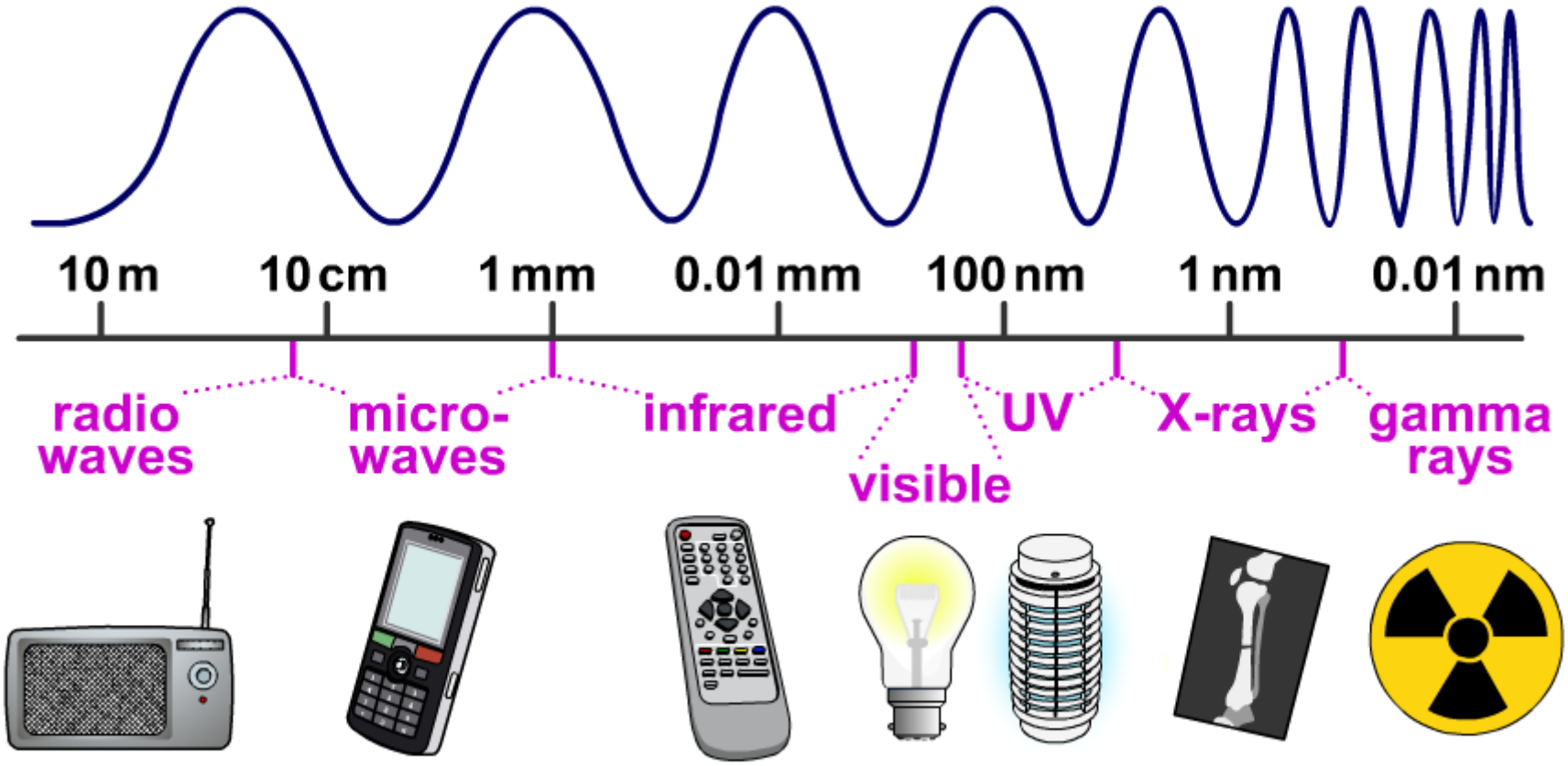
The shorter the wavelength (and higher the frequency) of electromagnetic waves, the more energy that they carry.



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

The electromagnetic spectrum

What are the properties of the electromagnetic spectrum?



Wavelength of electromagnetic waves

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

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

?

solve

Effect of electromagnetic waves

How do different types of electromagnetic waves affect living tissue?

radio waves	heats tissue slightly but no adverse effects proved
microwaves	high intensity can damage eyes and cause blindness
infrared waves	can kill or damage DNA in cells
visible light	high intensity can cause skin burns
ionizing waves	no effect on living tissue

?

solve