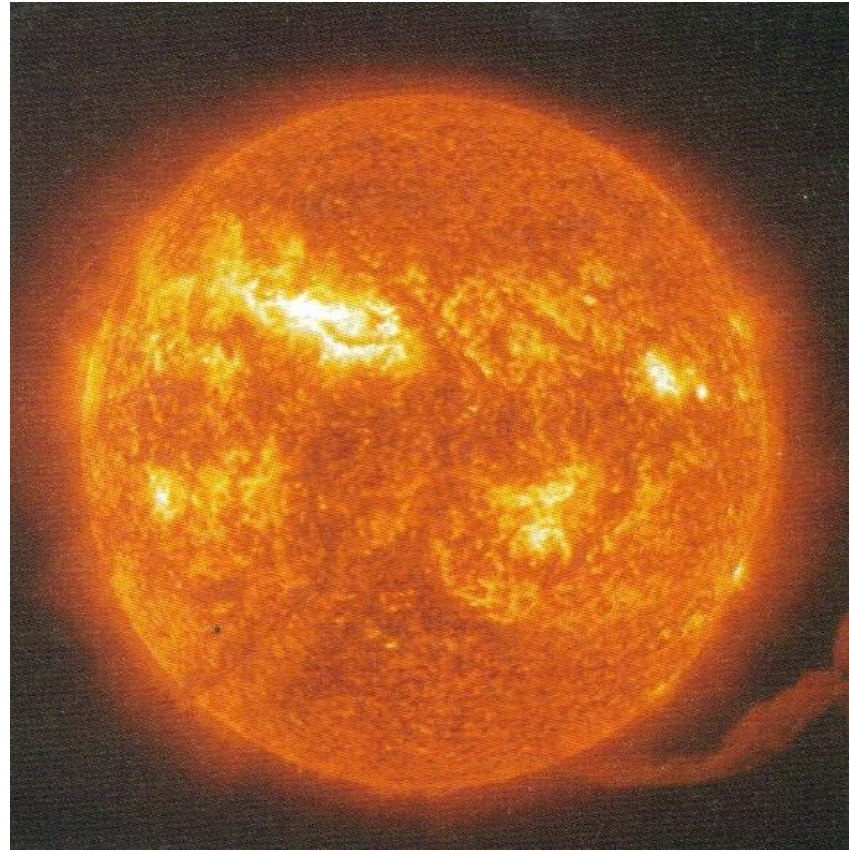




**What is
Light?**

Energy!

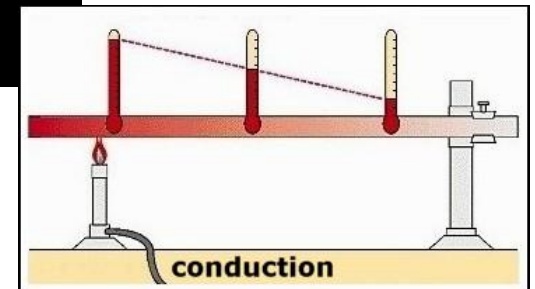
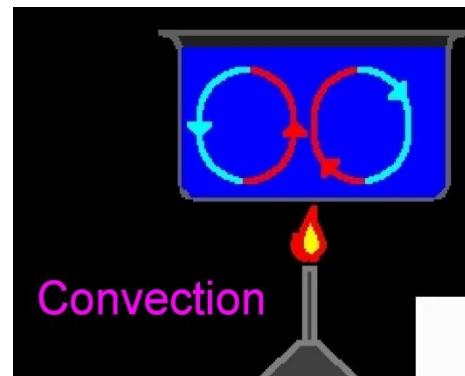
- Travels like a wave
- A small packet of light energy is called a Photon



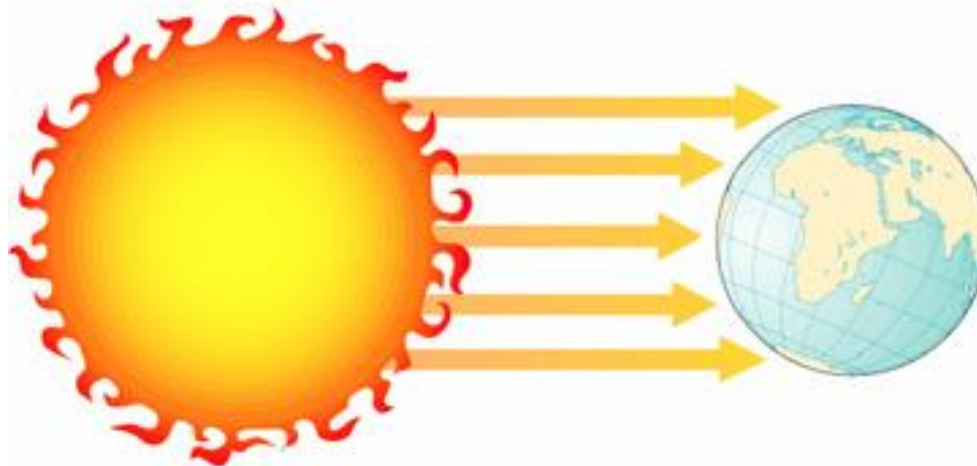
Energy....

- ✓ Usually needs a *medium* for transmission.
- ✓ Ex. Heat transfers by

convection
or
conduction.



- ✓ Travels through the vacuum of outer space.....
- ✓ Transferred by *radiation* in the form of an electromagnetic wave



Properties of Light

✓ Travels in straight lines.

✓ Travels *VERY* fast.

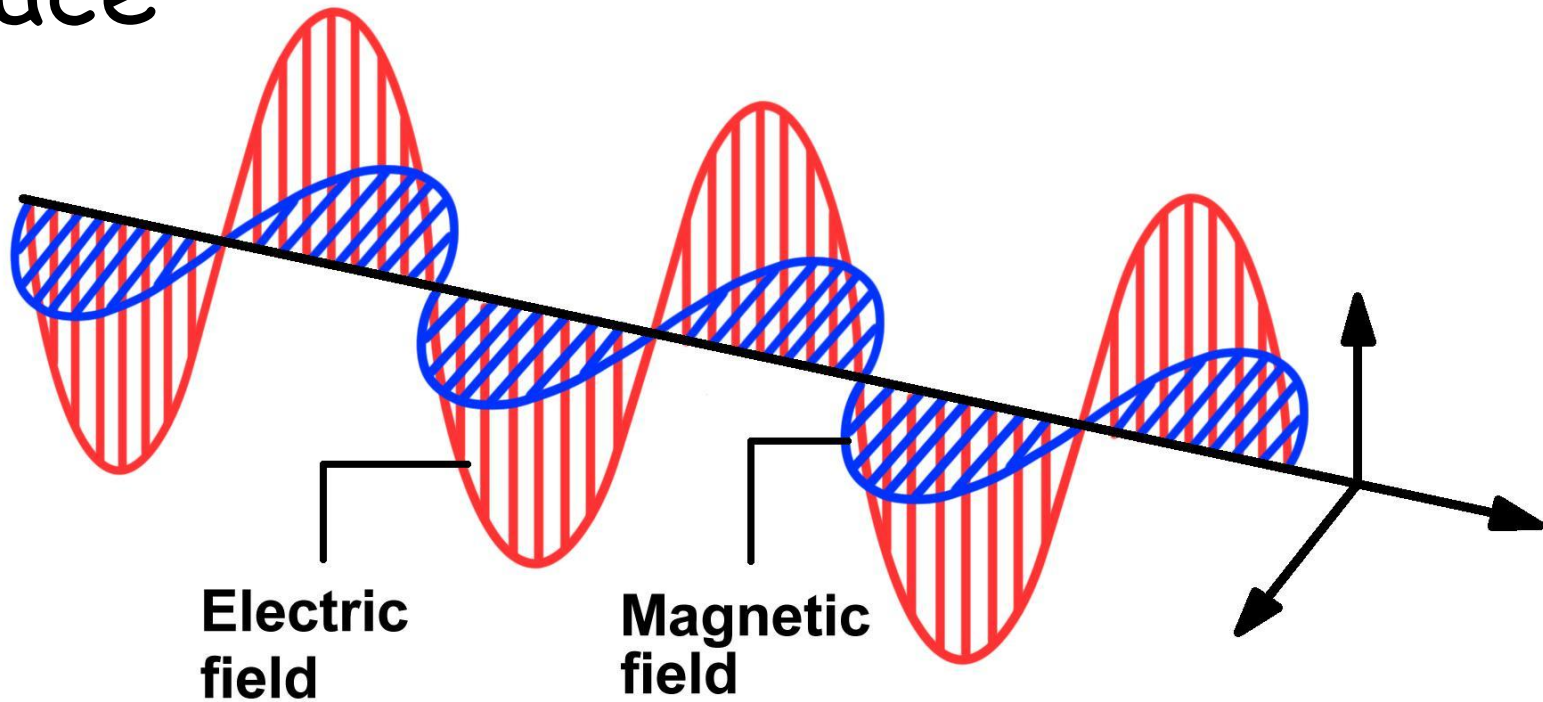
- travel at a speed of

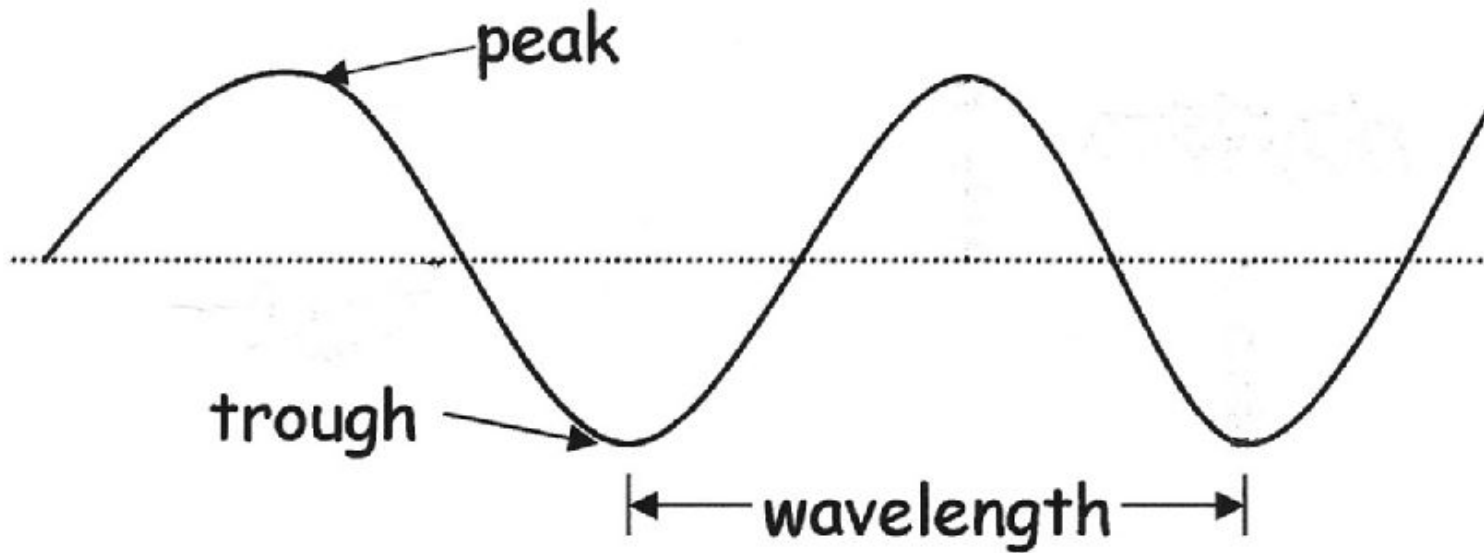
$$3.00 \times 10^8 \text{ m/s}$$



Electromagnetic Waves

An electromagnetic wave is a wave of energy that moves through space





- ✓ Waves have high points called **"crests."**
- ✓ Waves also have low points called **"troughs."**
- ✓ The distance from one crest (or trough) to the next crest (trough) is called a **"wavelength"**

□ Arranged by wavelength and frequency on EM Spectrum

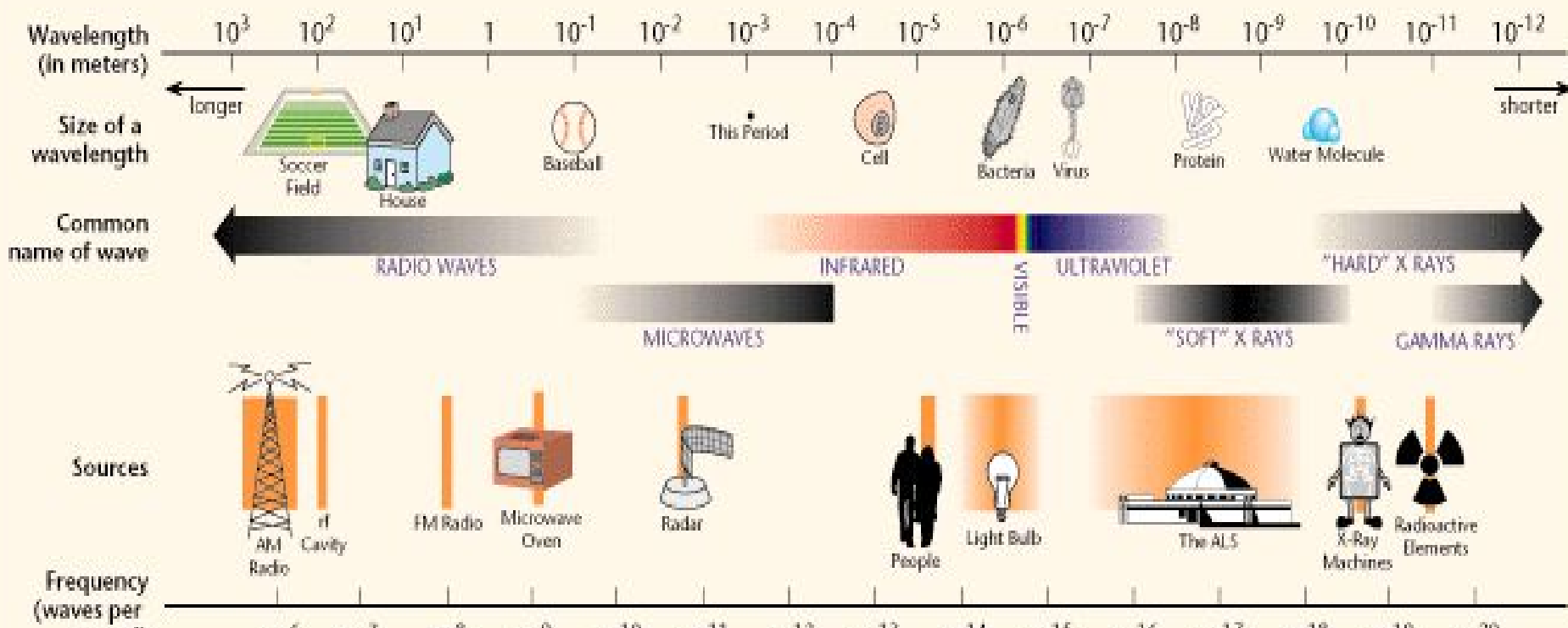
✓ **Wavelength:** distance from peak to peak or trough to trough

✓ **Frequency:** the number of peaks that pass a point in a certain time span

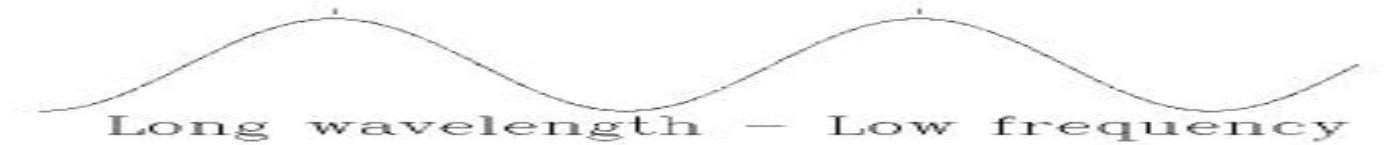
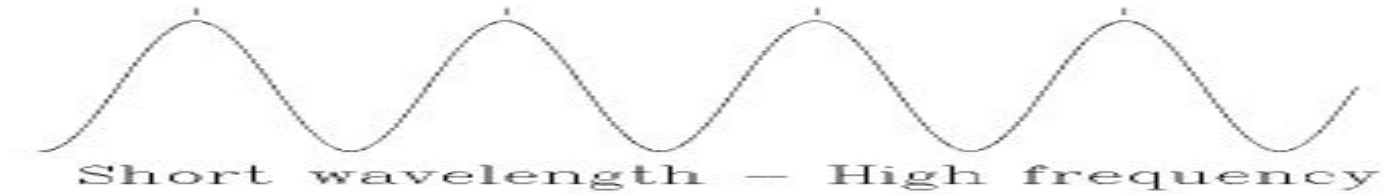
✓ Also means cycles per second (measured in Hertz, Hz)

Different electromagnetic waves have different lengths which give them different amounts of energy

THE ELECTROMAGNETIC SPECTRUM



Key facts



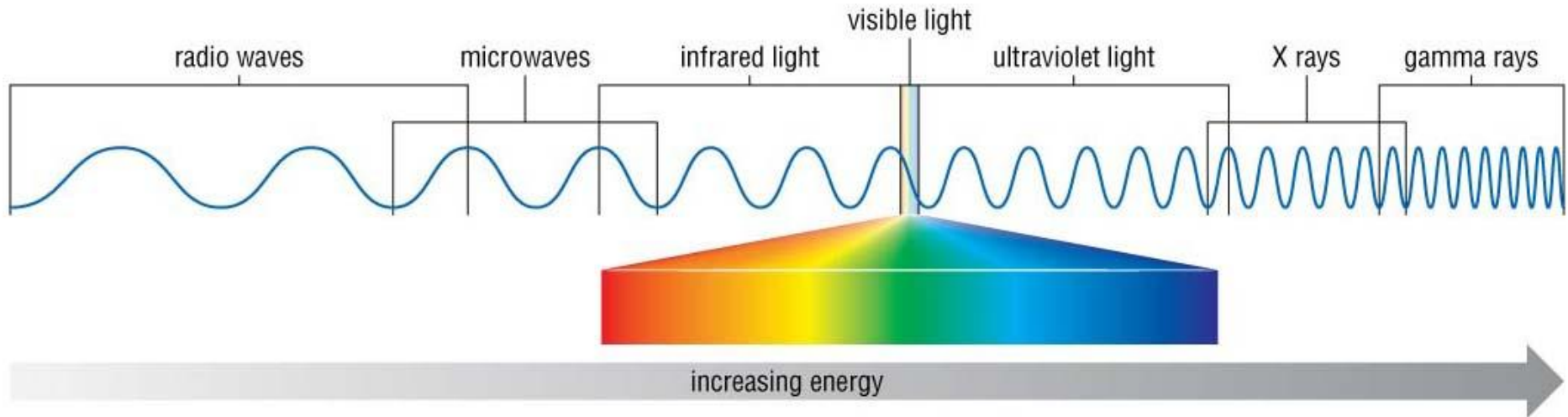
High frequency and short wavelength =
HIGH ENERGY

Key facts about “Invisible Light”

- ❑ All waves shorter than visible light can cause cancer.
 - ✓ UV - light - sun burn and skin cancer
 - ✓ X-rays can cause cancer (that is why the dentist leaves the room when she X-rays your teeth)

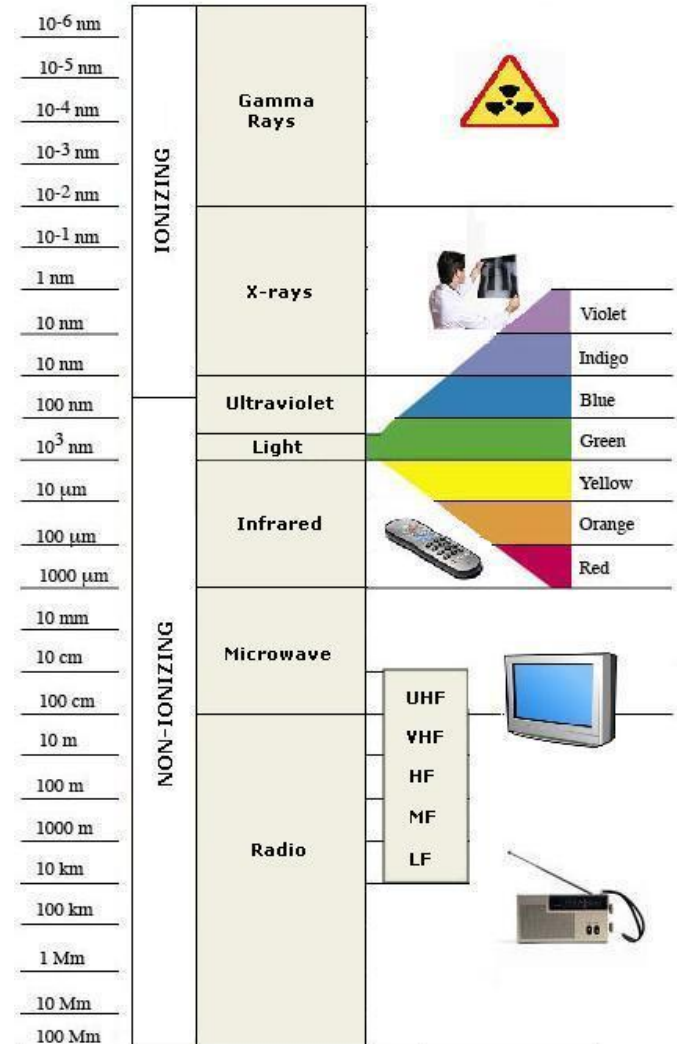
- ❑ Gamma rays are the most dangerous
 - ✓ they can kill ALL living things and cause cancer
 - ✓ BUT also used to treat cancer because they destroy cancer cells

Electromagnetic Spectrum

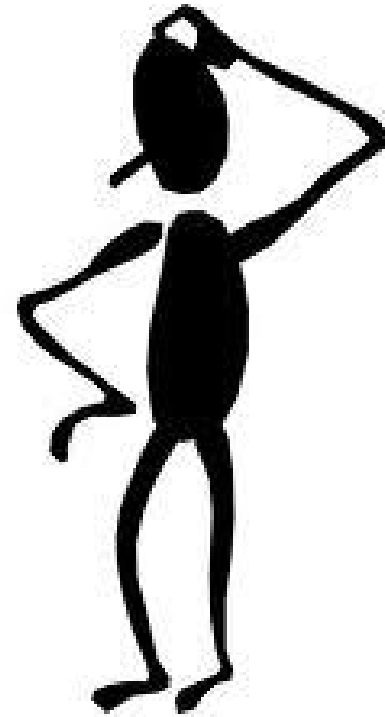


Electromagnetic Spectrum

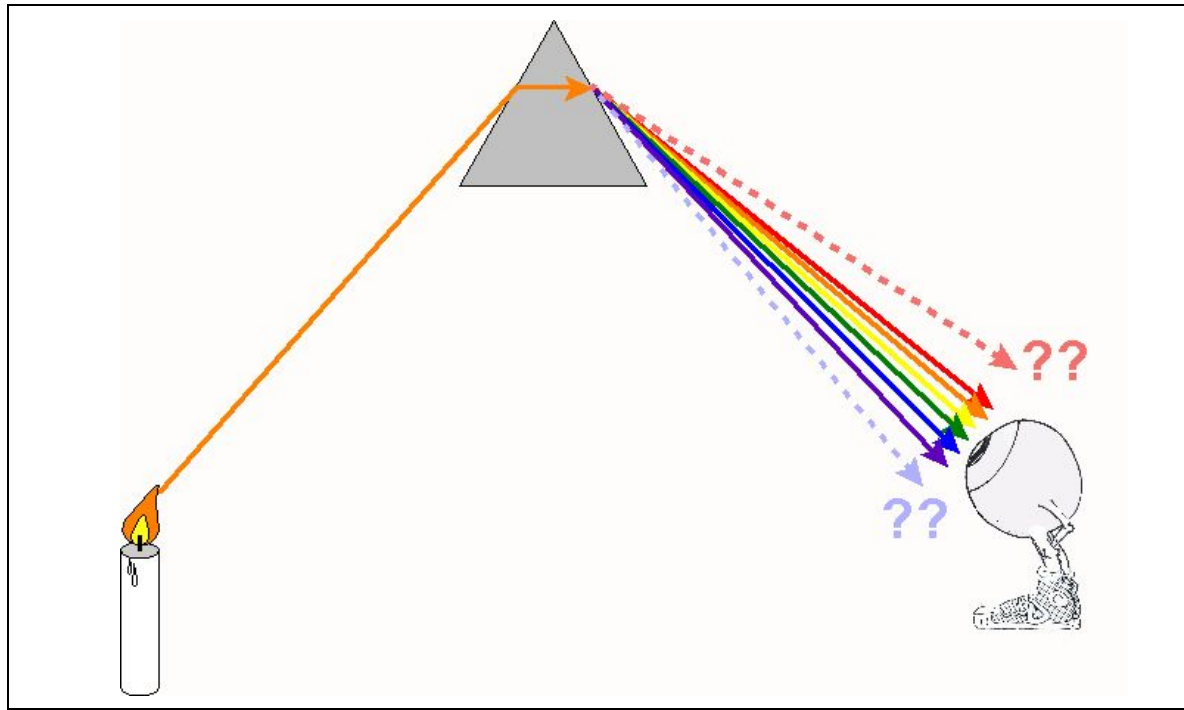
- ✓ Gamma rays
- ✓ X-rays
- ✓ Ultraviolet light
- ✓ Visible light
- ✓ Infrared light
- ✓ Microwaves
- ✓ Radio waves



But we don't see
radio
waves and x-rays.....



Our ears cannot hear some high sound frequencies that dogs can.



Similarly our eyes can not “see” some of the wavelengths of light.



Visible Light!

- ✓ Any electromagnetic wave that the human eye can detect.
- ✓ Called the *Visible Spectrum*.



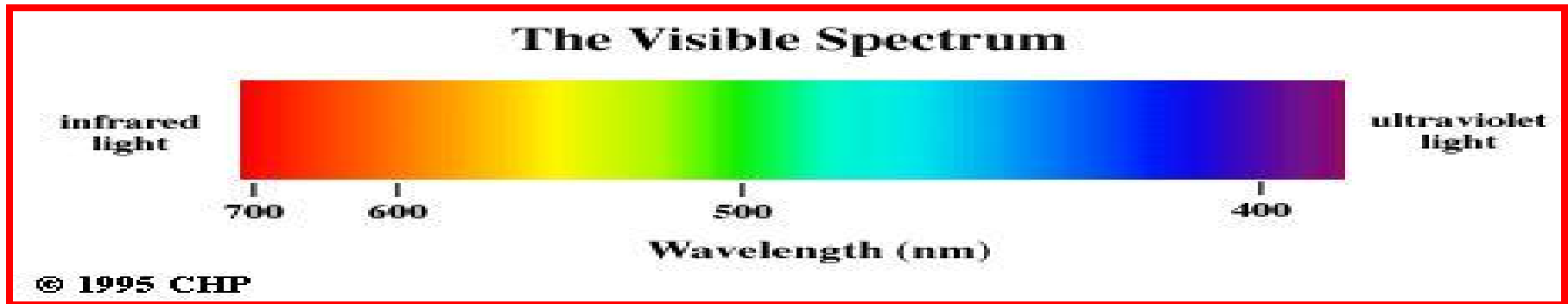
Visible Region of the Electromagnetic Spectrum

☐ Light we can see

☐ ROYGBIV - Acronym for:

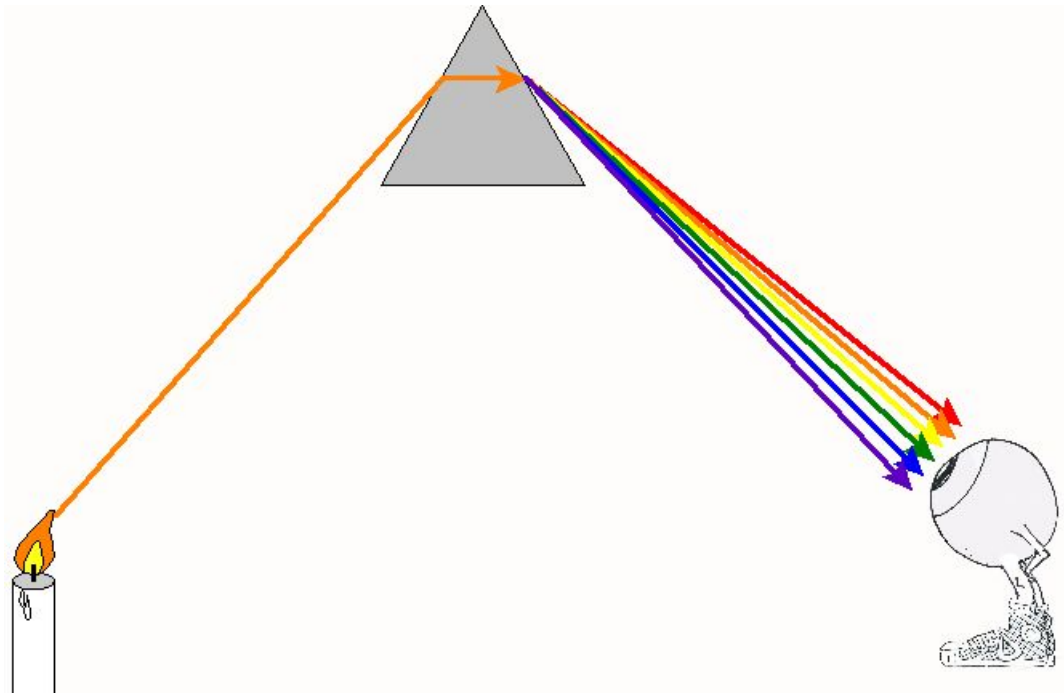
Red, Orange, Yellow, Green, Blue, Indigo, & Violet.

→ Largest to Smallest Wavelength.



[Click here to see a prism separating white light](#)

- white light breaks into the colours of a **rainbow** when it passes through a prism.
- white light is made of all the colours of the visible spectrum

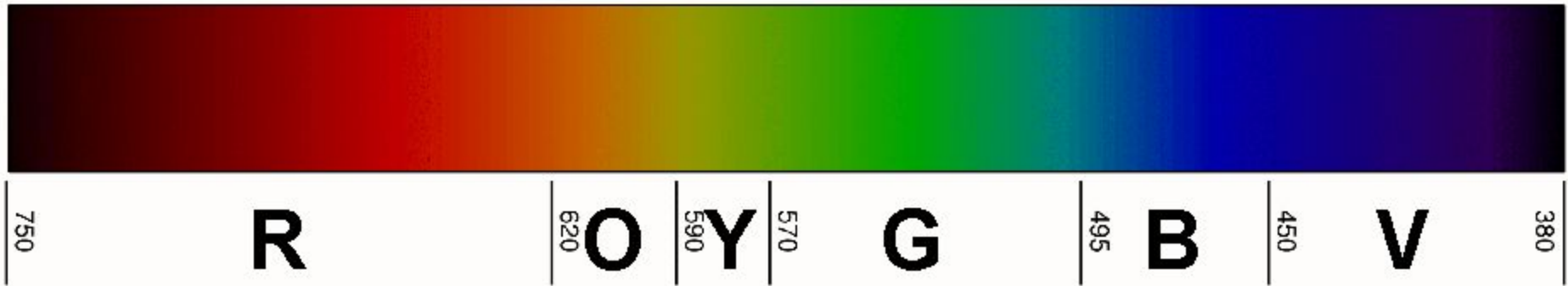


Similarly....

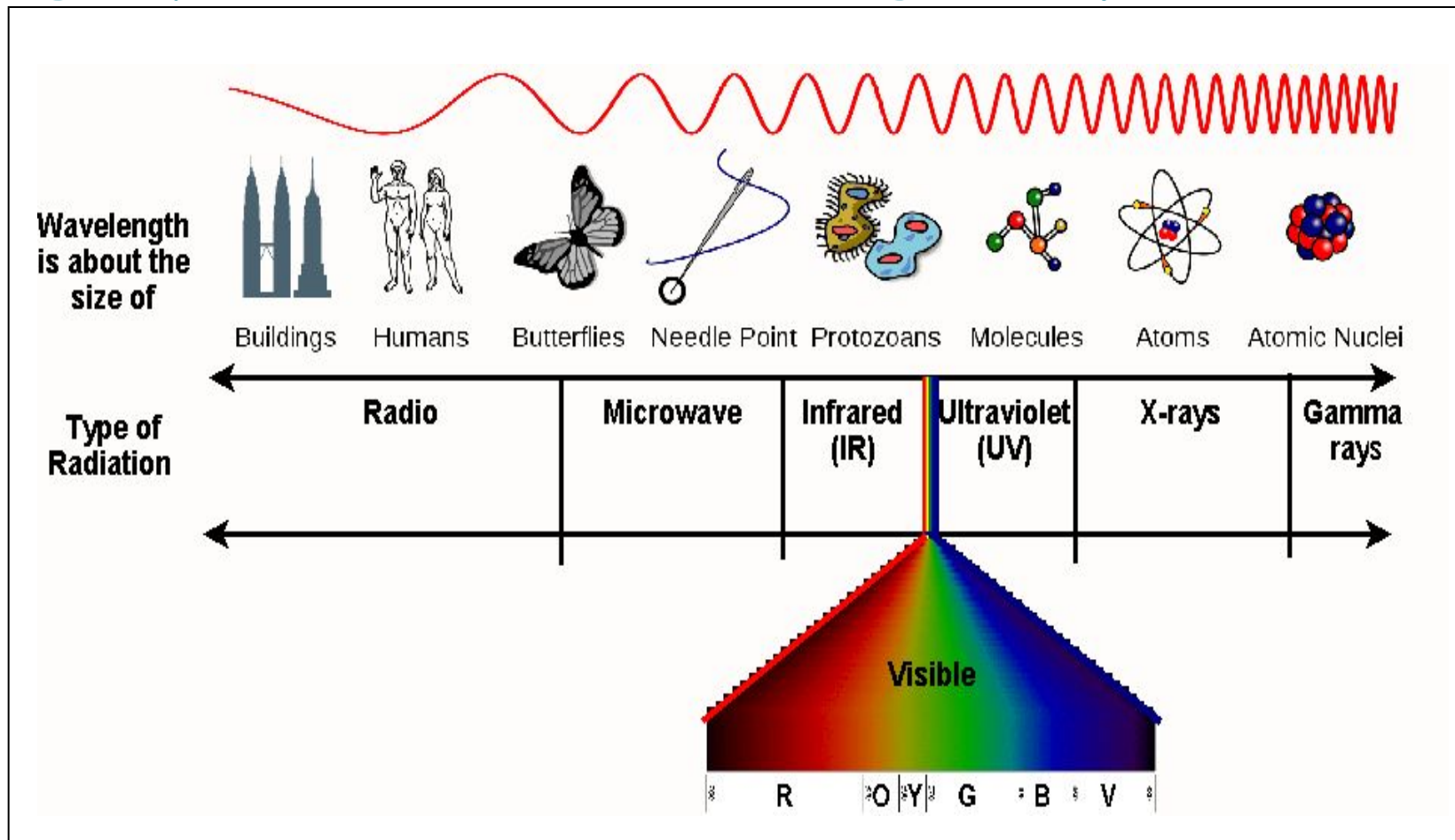
- A rainbow appears in the sky from the sun's rays.



So...when light from the sun is broken down, its' spectrum looks like



The Visible Light Spectrum is a very small part of a much larger spectrum called the Electromagnetic Spectrum



How Do You Remember the Colours?

- **All the colours spell the name**

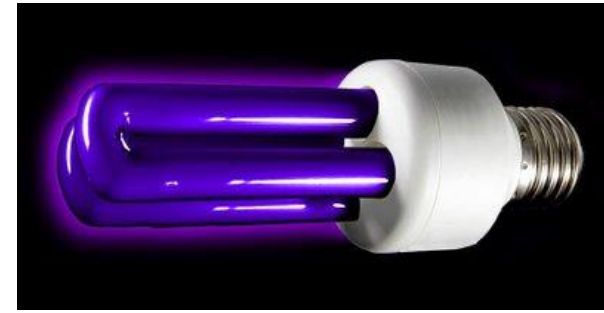
Roy G Biv

(but that's boring!)

Words to remember the Electromagnetic Spectrum from Long to Short Wavelength

Radio Waves	Microwaves	Infra Red	Visible Spectrum	Ultra Violet	X-Rays	Gamma Rays
Raul's	Mother	Is	Visiting	Uncle	Xavier's	Garden
Rabbits	Mate	In	Very	Unusual	eXpensive	Gardens
Raging	Martians	Invade	Roy G. Biv.	Using	X-rays	& Gamma Rays

Las Vegas Light Show



- A lamp that emits *electromagnetic radiation* almost exclusively in the soft **near ultraviolet range**.
- Only a very small fraction of visible radiation is emitted, and it is seen as **violet/blue light!**

Medium, Convection, Conduction

Radiation

Electromagnetic Wave

Electromagnetic Spectrum

Visible Light

Prism

Try these:

1. Draw 3 complete cycles of a wave that has a wavelength of 2.0 cm.
2. Count the number of crests and troughs in the wave you drew from Q#1. Label each crest and trough.
3. What characteristic(s) of a wave is used to arrange the waves in the electromagnetic spectrum?
4. What is the visible spectrum?
5. What does the acronym ROYGBIV stand for?
6. How are you going to remember the order of the EM spectrum?
7. TRUE or FALSE: Ultraviolet light has higher energy than microwaves?
8. TRUE or FALSE: RED light has a shorter wavelength than BLUE light?
9. Although gamma rays are very dangerous, they have a very important use. What are gamma rays used for?