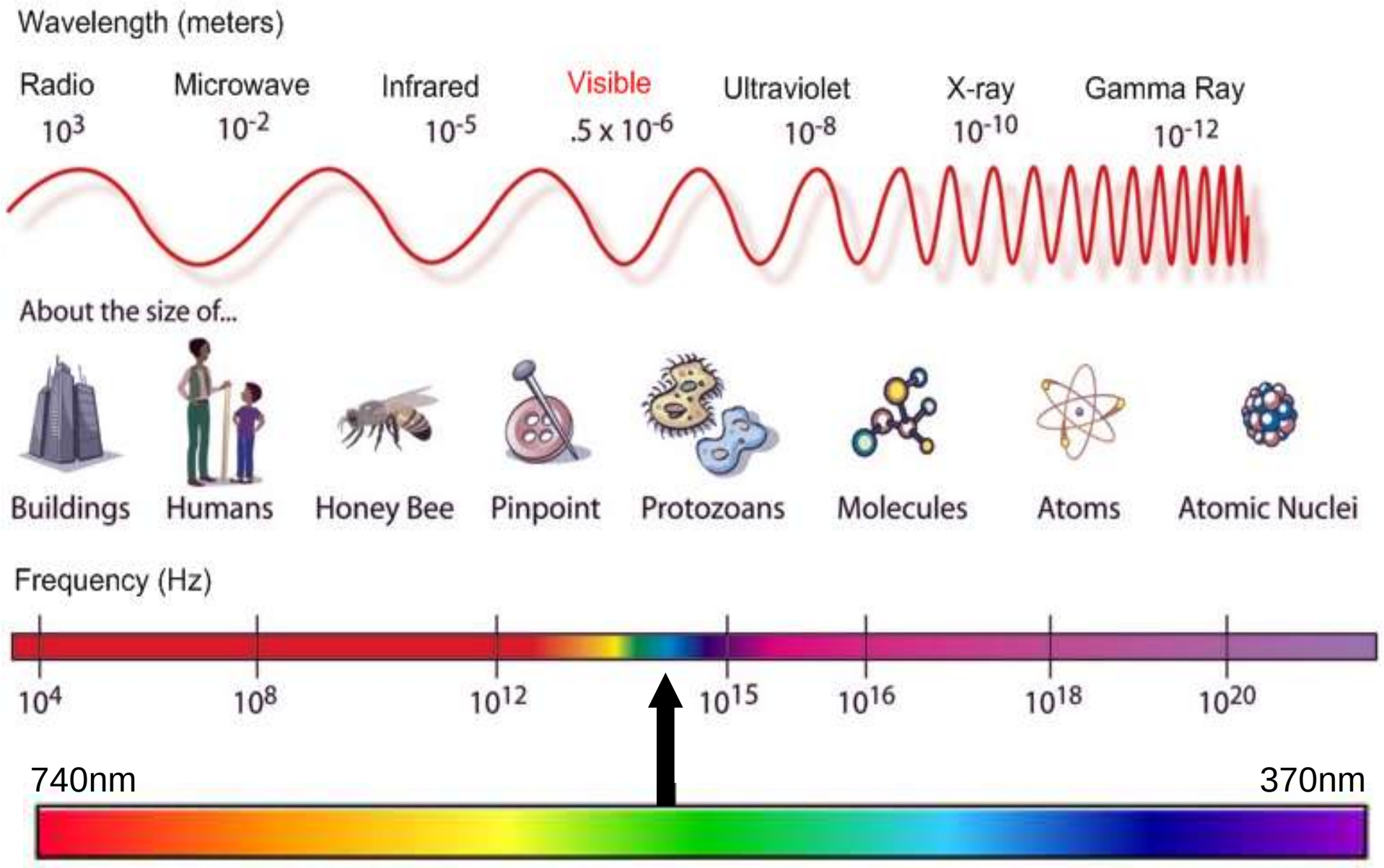
WAVES

Electromagnetic Spectrum

THE MISBOURNE

ELECTROMAGNETIC SPECTRUM



RADIOWAVES

- Wavelength: 1m to 100000m
- Frequency: 3 x 10^9 to 3 x 10^4 Hz
- Uses: Telecommunications, TV, Radio
- Dangers: none

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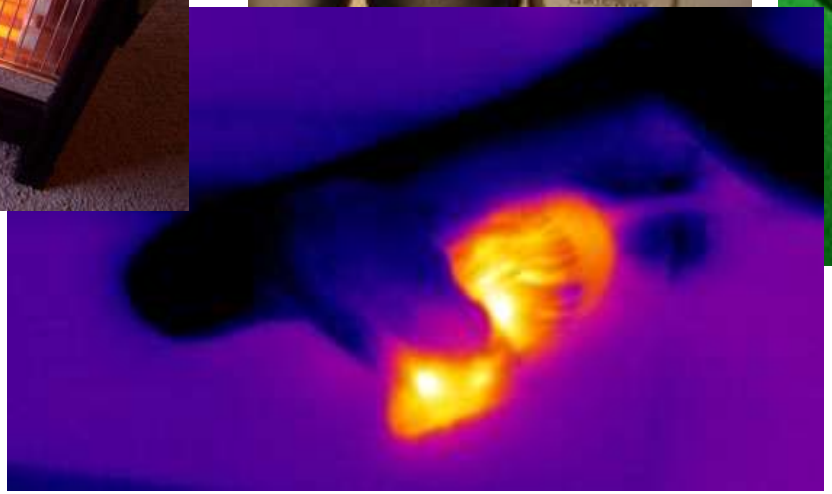
MICROWAVES

- Wavelength: 0.001m to 1m
- Frequency: 3×10^{12} to 3×10^{9} Hz
- Uses: Telecommunications, RADAR, Cooking
- Dangers: can produce burns, cataracts, cancer (?)

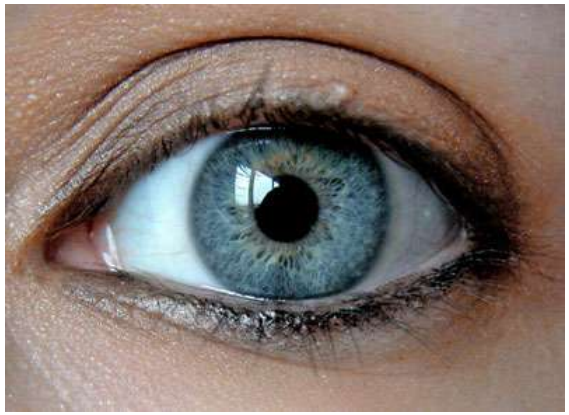
INFRA-RED

- Wavelength: 740nm to 0.01m
- Frequency: 4 x 10^{14} to 3 x 10^{11} Hz
- Uses: Heating, cooking, TV remotes, night-vision
- Dangers: can burn

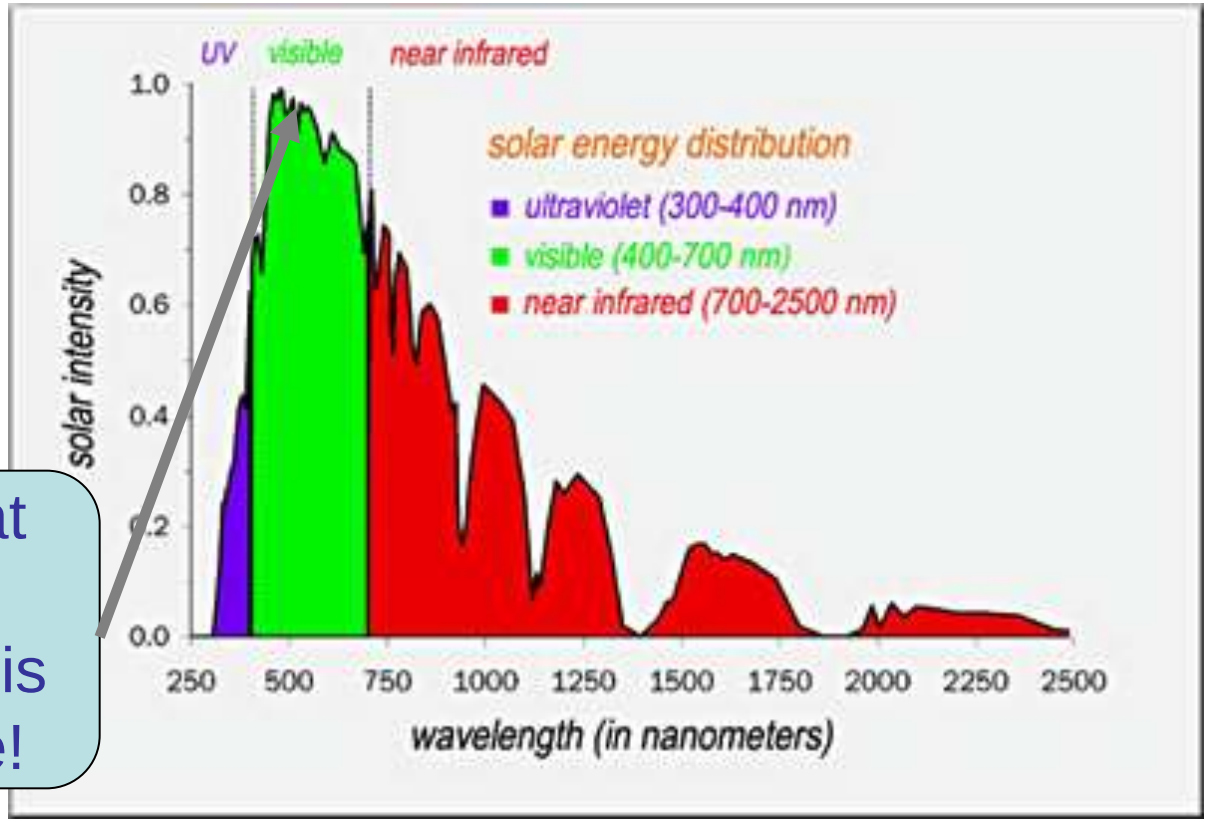


VISIBLE LIGHT

- Wavelength: 370nm (violet) to 740nm (red)
- Frequency: 8 x 10^{14} to 4 x 10^{14} Hz
- Uses: seeing
- Dangers: eye damage from bright lights

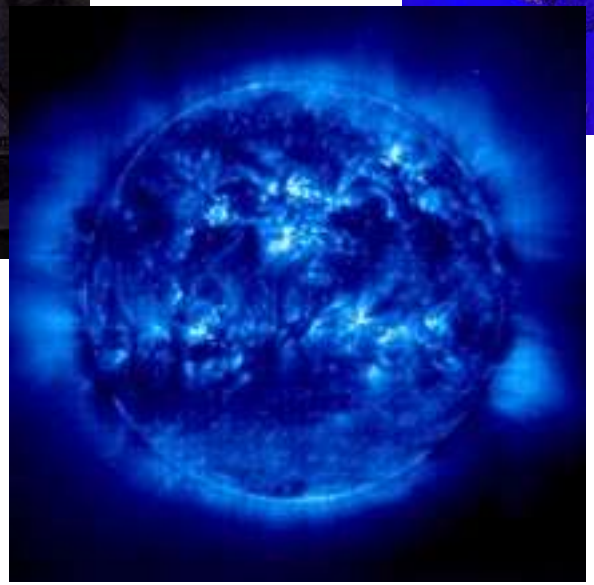


Visible light is best at getting through our atmosphere – which is why we use it to see!



ULTRAVIOLET

- Wavelength: 10^{-9} m to 370nm
- Frequency: 3×10^{17} to 8×10^{14} Hz
- Uses: discos, tanning salons, counterfeit detections, pollination
- Dangers: skin cancer



Bees see in UV to help them find pollen!

X-RAYS

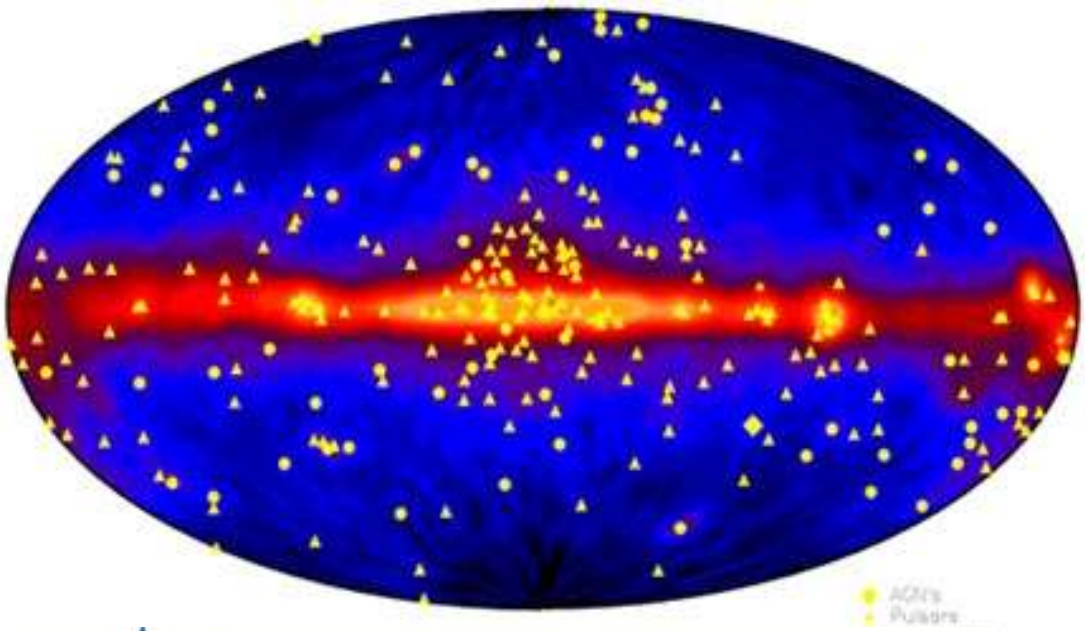
- Wavelength: 10^{-12} to 10^{-7} m
- Frequency: 3 x 10^{20} to 3 x 10^{15} Hz
- Uses: medical imagery, security
- Dangers: cancer

Hand with Rings by Wilhelm Röntgen.

The first "medical" X-ray of his wife's hand taken on 22 December 1895.

GAMMA RAYS (γ)

- Wavelength: 10^{-16} to 10^{-9} m
- Frequency: 3×10^{24} to 3×10^{17} Hz
- Uses: cancer treatment, observing the universe
- Dangers: cancer



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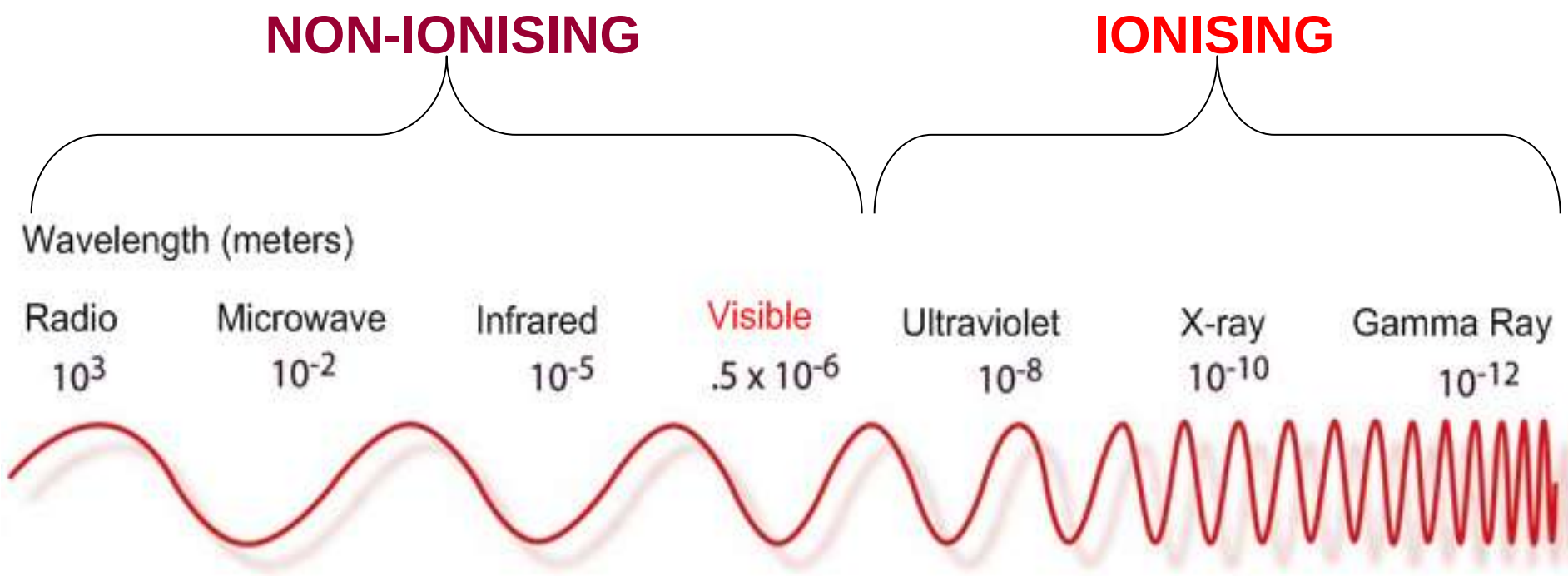
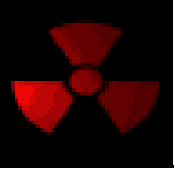
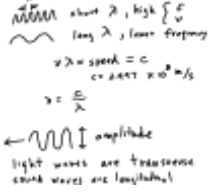
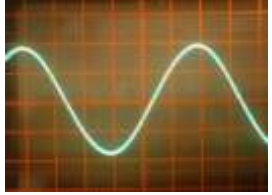
The Dangers of the EM Spectrum

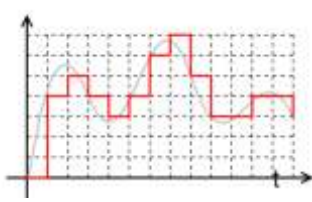
As the wavelength of EM spectrum changes, the way the different wavelengths interact with matter also changes.

As the **frequency increases, wavelength** gets **smaller.** Eventually the waves are so small that they can interact with cells, DNA and atoms. This is called **IONISING RADIATION.**



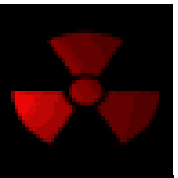


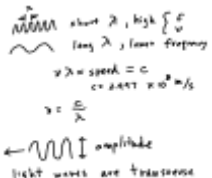
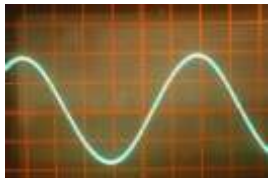






Electromagnetic quick quiz!

1. What is the unit of speed?
2. Do higher frequency e/m waves have more or less energy than low frequency e/m waves?
3. What group in the e/m spectrum has the lowest frequency?
4. What is the unit of wavelength?
5. What group in the spectrum has the longest wavelength?
6. What group is situated between infrared and U.V?
7. What is the unit of frequency?
8. Do Gamma rays have the shortest or longest wavelengths?
9. What ray is used to image the bones in your body?
10. What group of the spectrum is between radio waves and infrared?
11. What equation links speed, frequency and wavelength?
12. What part of the electromagnetic spectrum do we use to communicate with satellites?



Answers

1. m/s
2. More
3. Radio waves
4. Metres
5. Radio waves
6. Visible light
7. Hertz
8. Shortest
9. X-ray
10. Microwaves
11. Speed = frequency x wavelength
12. Microwaves