

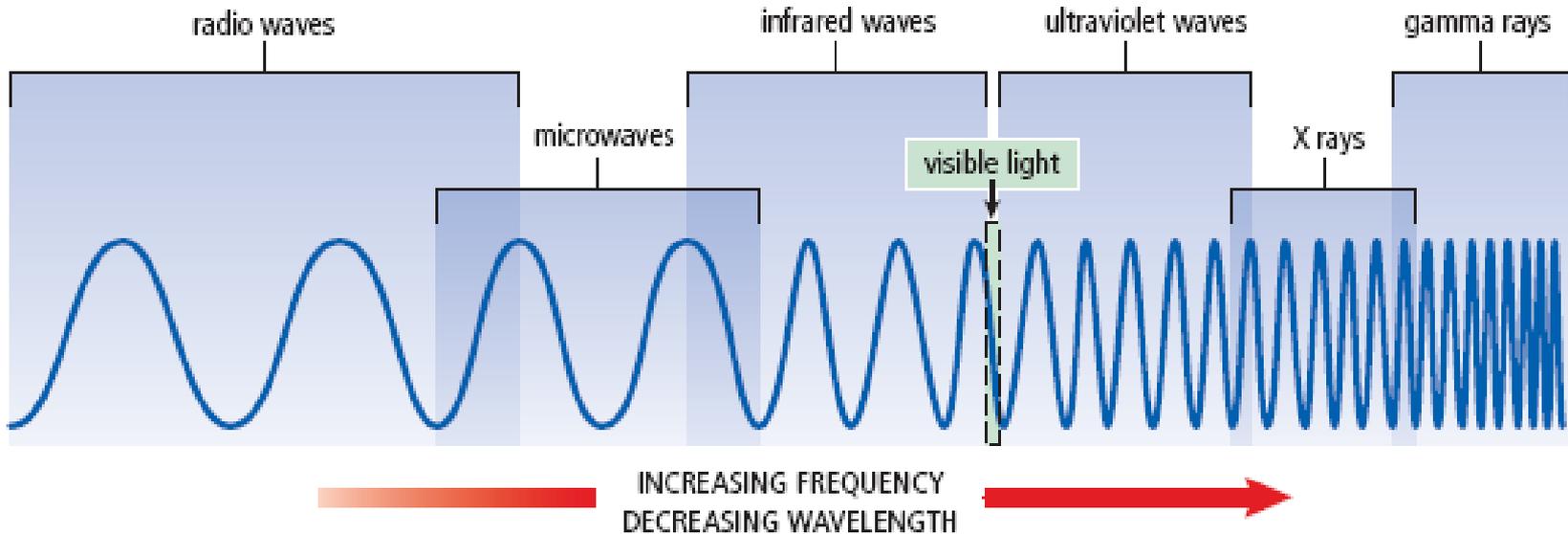
4.3 Light and the Electromagnetic Spectrum

<http://www.pbslearningmedia.org/resource/phy03.sci.phys.energy.nasaspectrum/the-electromagnetic-spectrum-nasa/>

<http://www.pbslearningmedia.org/resource/phy03.sci.ess.eiu.chandra/astronomical-images-in-different-wavelengths/>

4.3 Light and the Electromagnetic Spectrum

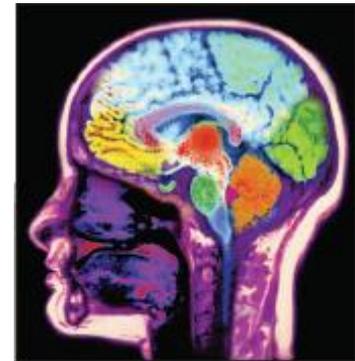
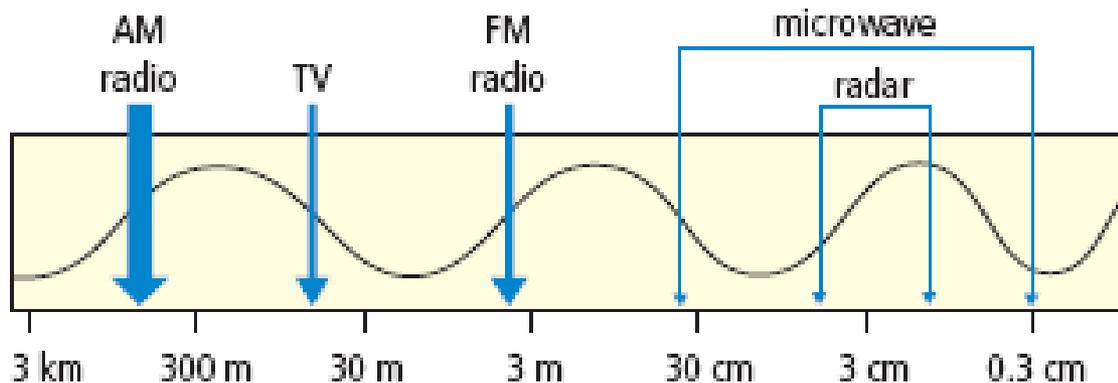
- The visible spectrum is a tiny portion of a much larger spectrum of radiation called the electromagnetic spectrum.
- Electromagnetic radiation is transmission of energy from the longest radio waves to the shortest gamma waves.



Wavelengths Longer than Visible Light

Radio Waves

- Radio waves have the longest wavelength and lowest energy and frequency compared to all other types of electromagnetic radiation.
- MRI technology uses radio waves to see inside our body.

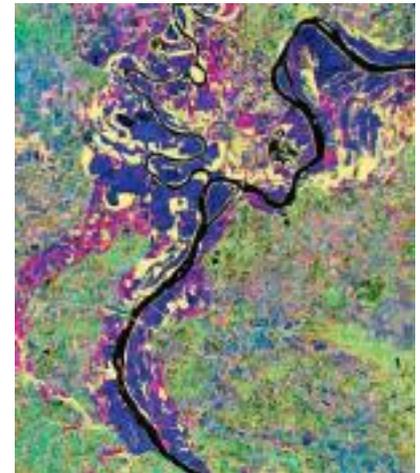


MRI scan of the brain

Wavelengths Longer than Visible Light

Microwaves

- **Microwaves have the shortest wavelength and highest frequency of all the radio waves.**
 - ◆ **Microwaves are used in: cooking food, and telecommunications.**
- **Radar uses short wavelength microwaves.**
 - ◆ **Radar is used in: tracking the motion of objects, weather forecasting, and taking images of the Earth's surface.**

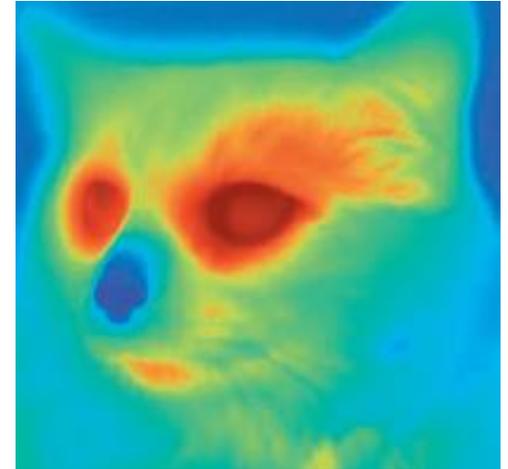


A radar image of the Earth's surface

Wavelengths Longer than Visible Light

Infrared Waves

- Electromagnetic radiation that has a wavelength longer than red light but shorter than that of radio waves.
- Infrared radiation is also referred to as heat.
 - ◆ Infrared waves are used in: remote controls, infrared cameras, and CD-ROM readers.



Infrared cameras record differences in temperature.

Wavelengths Shorter than Visible Light

Wavelengths shorter than visible light have more energy than visible light.

Ultraviolet Waves

- Ultraviolet waves (UV) are just beyond the visible region of the spectrum.
- This radiation possesses much more energy than visible light.
 - ◆ UV waves striking your skin allows your body to make Vitamin D.
 - ◆ Overexposure to UV can cause sunburns and possible skin cancer.

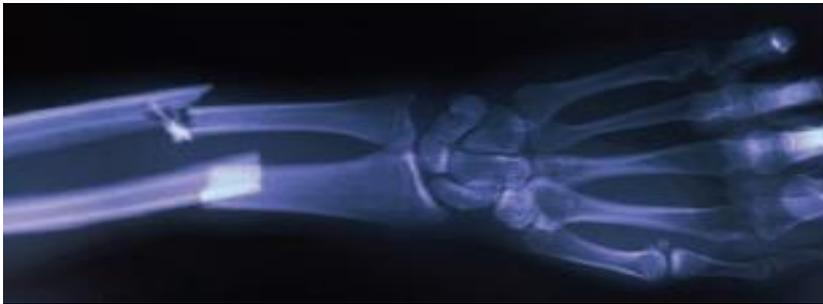


Wearing sunglasses and sunscreen help protect you against harmful UV radiation.

Wavelengths Shorter than Visible Light

X rays

- X rays have a much shorter wavelength and higher energy and frequency than ultraviolet waves.
 - ◆ X rays are commonly used to photograph teeth and bones.
 - ◆ X rays are also used to detect small cracks in metals and also to photograph the inside of machines.



Wavelengths Shorter than Visible Light

Gamma Rays

- Gamma rays are the shortest wavelength and highest energy and frequency of the electromagnetic spectrum.
- Gamma rays result from nuclear reactions.
- Gamma rays can be used in radiation therapy to kill cancer cells.



Gamma rays can be used to kill cancer cells.