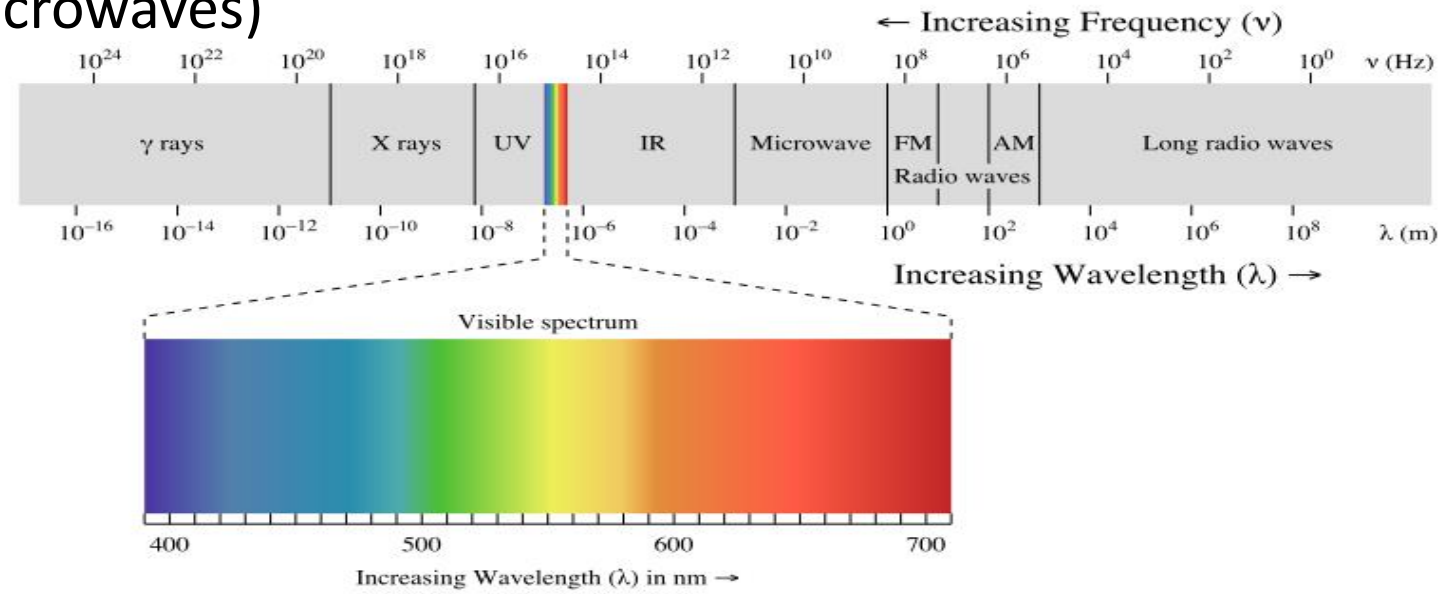
Light and the Electromagnetic Spectrum

Lesson 21b

Recap

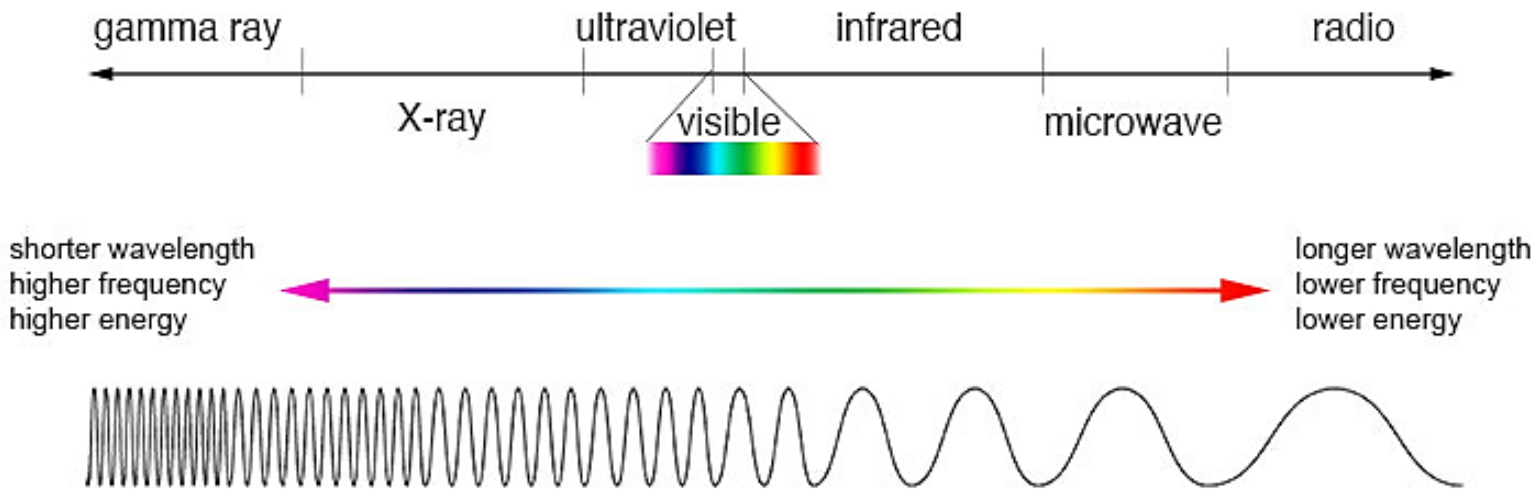
- There is a spectrum of electromagnetic radiation (waves of energy) called the **electromagnetic spectrum**
  - Visible light (the colours of the rainbow) is only a small portion of the larger spectrum
  - Different electromagnetic waves have different wavelengths and frequencies
  - Radio waves (FM, AM, Microwaves)
  - Infrared waves
  - Visible light spectrum

Longer wavelengths, less energy than visible light



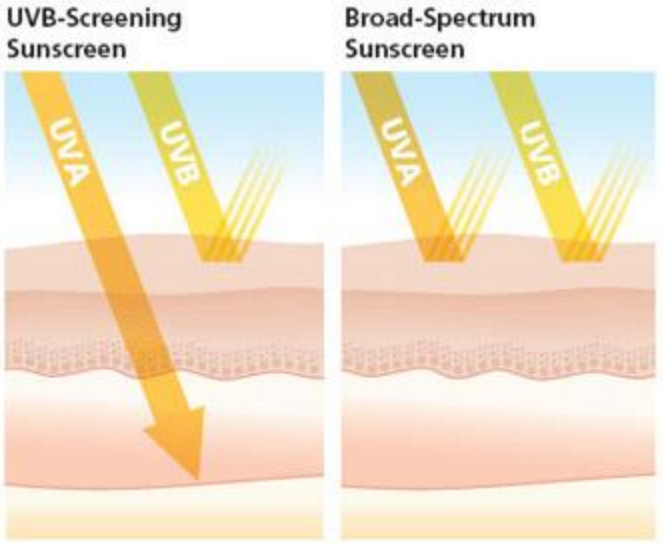
Wavelengths Shorter than Visible light

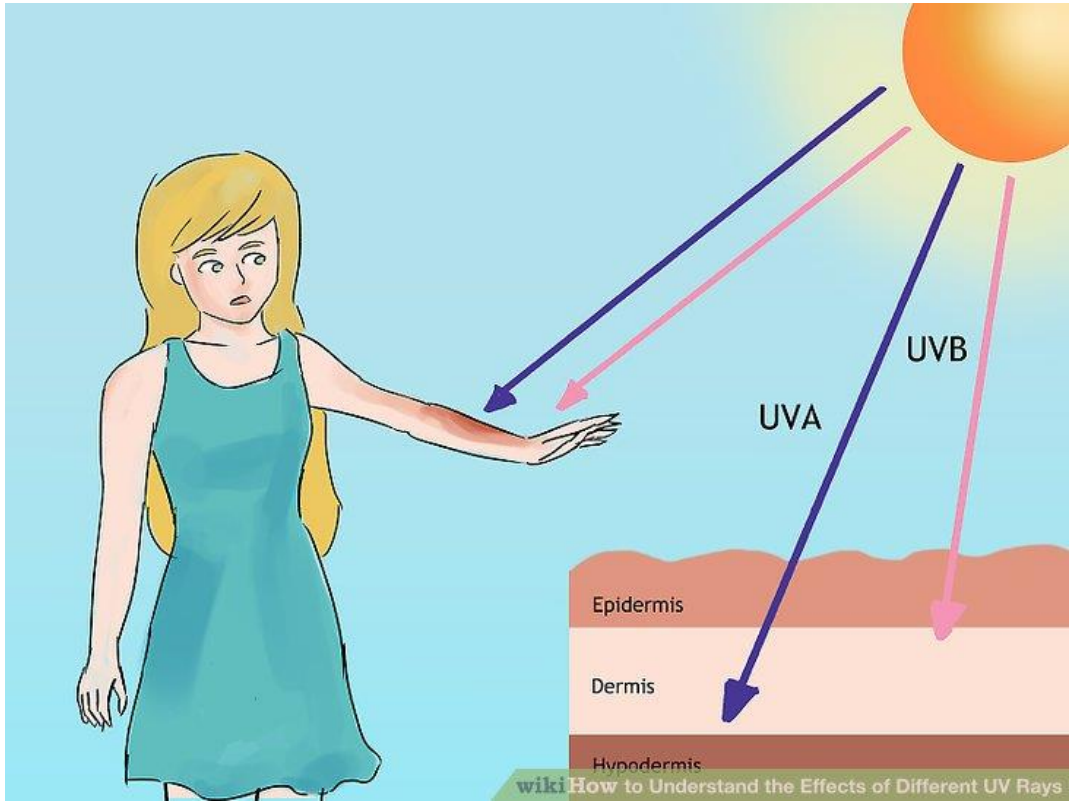
- Wavelengths that are shorter than visible light carry more energy than the electromagnetic waves in the visible region
  - These shorter wavelength higher frequency waves include **ultraviolet waves**, **X rays,** and **gamma rays**



Ultraviolet Waves

- **Ultraviolet waves** are a type of electromagnetic radiation that, relative to light, has a shorter wavelength and higher energy and frequency
- This radiation is very energetic
- UV radiation striking your skin enables your body to make vitamin D, which you need for healthy bones and teeth
  - However, overexposure to UV radiation can result in sunburns and skin cancers, and damage to the surface of the eye





Other uses for UV waves

- Fluorescent materials absorb ultraviolet waves and emit the energy as visible light
- Police detectives sometimes use fluorescent powder to study fingerprints when solving crimes
- UV waves can kill bacteria in food, water, and medical supplies

X Rays

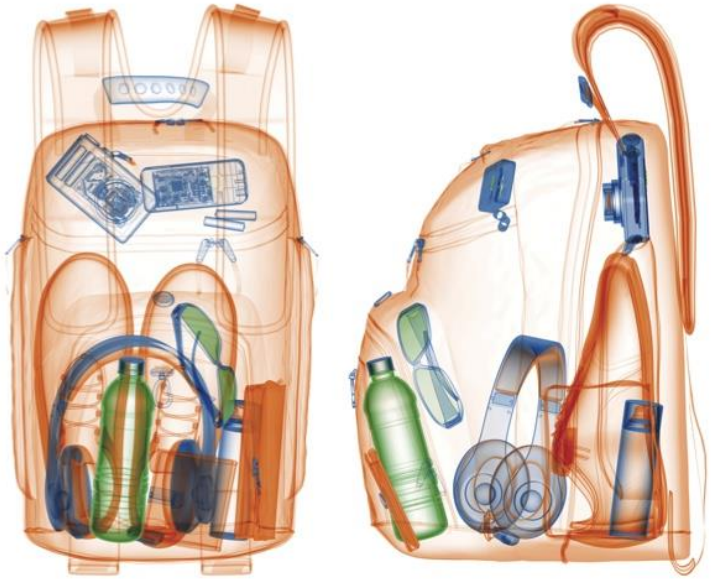
- **X rays** are a type of electromagnetic radiation that have a much shorter wavelength and higher energy and frequency than ultraviolet waves
- Wilhelm Roentgen, a German physicist, discovered X rays in 1895
  - A week after his discovery, he made an X-ray photograph of his wife's left hand
  - Her wedding ring is visible as a dark lump
- Today, X rays are commonly used to photograph teeth and bones

Other uses for X rays

- Doctors and dentists use low doses X rays to form images of internal organs, bones, and teeth
- People who work with X rays protect themselves from harmful radiation by leaving the room while the equipment is being used
- When a dentist takes and X ray of your teeth, he or she places a shielding pad on your body to protect you

Other uses for X rays

- Airport security may use X-ray screening devices to exam the contents of luggage
- X rays can also be used to inspect for cracks inside high performance jet engines without taking the engine apart, and to photograph inside



Gamma Rays

- **Gamma rays** are the highest energy and frequency and shortest wavelength portion of the electromagnetic spectrum
- Gamma rays result from nuclear reactions and are produced by the hottest regions of the universe
- Focused bursts of gamma rays are used in radiation therapy to kill cancer cells