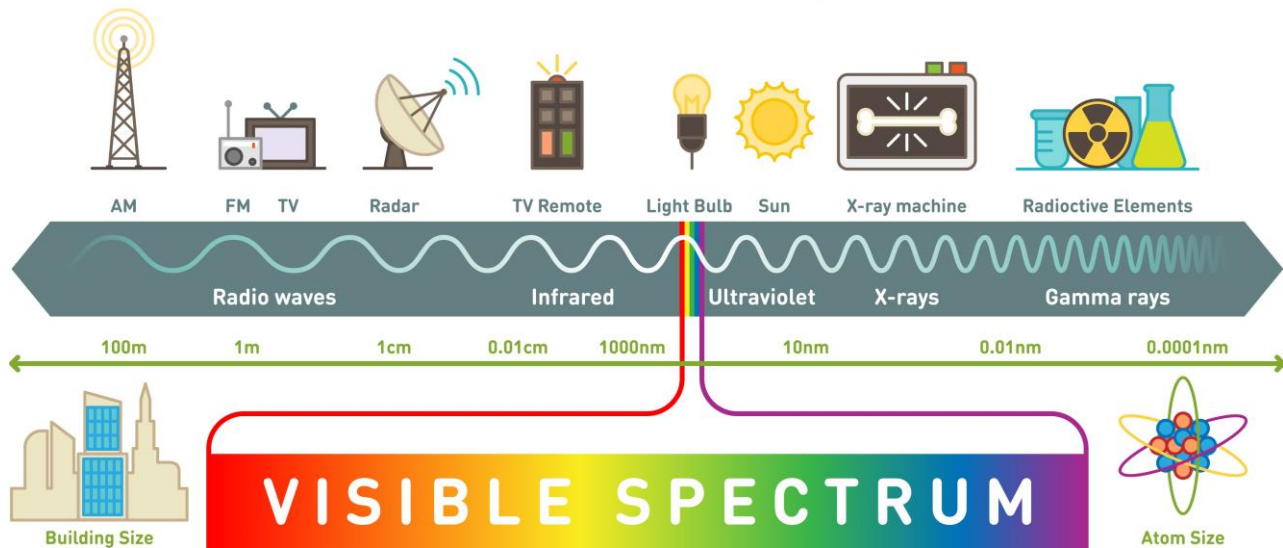


# Waves & the Electromagnetic Spectrum

## Section 4: Electromagnetic Waves

### Electromagnetic Spectrum



All of the wavelengths, including those we can and cannot see, make up the **electromagnetic spectrum**, which includes the entire range of electromagnetic wave frequencies. **Electromagnetic waves** are made by vibrating electric charges, and they can travel through space. The frequency of electromagnetic waves is the number of vibrations per second. All of these types of waves can be reflected, refracted, and diffracted.

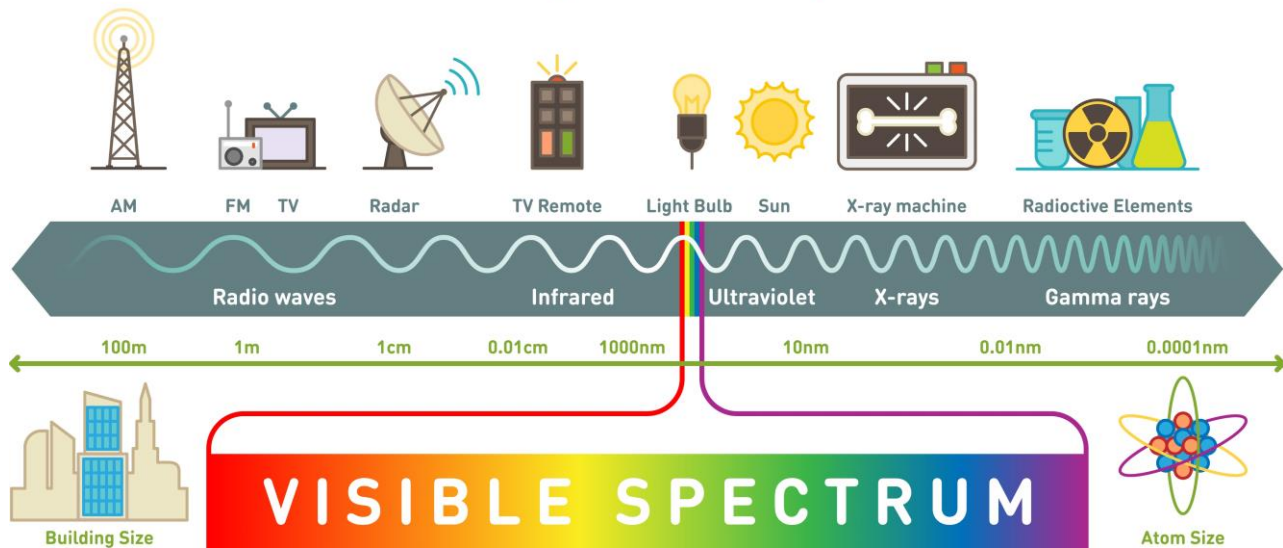
**Radio waves** have long wavelengths, and they emit low-frequency waves with wavelengths of about 1–10 cm. They are used to transmit information on the radio, on television, and even in phones. They can determine the position of objects when the waves are transmitted towards an object using radar. By measuring the amount of time it takes for a wave to bounce off an object and return, the location of an object can be found.

On the electromagnetic spectrum, **infrared waves** have longer wavelengths than visible light but shorter wavelength than radio waves. Much of today's technology incorporates infrared waves used in equipment. Examples are weather satellites that use infrared detectors to form images for meteorology or night vision equipment that detects infrared radiation and can produce images based on temperature for the military. Infrared is also used in communication devices, such as remote controls, by emitting a narrow beam of infrared radiation to control appliances.

# Waves & the Electromagnetic Spectrum

## Section 4: Electromagnetic Waves Continued

### Electromagnetic Spectrum



**Visible light** is the range of electromagnetic waves you can detect with your eyes. The human eye can only see certain wavelengths, the longest being red and the shortest being violet. Red, orange, yellow, green, blue, indigo, and violet are the different colors that each have different wavelengths.

**Ultraviolet waves** have frequencies that are slightly higher than visible light and are able to enter the skin. They can cause sunburns and even skin cancer. They do produce vitamin D, which is good for your bones and teeth.

**X-rays and gamma rays** have ultra-high frequencies that can travel through matter and damage cells. They are able to penetrate most materials. Doctors use x-rays to look at images of bones or internal organs.

#### Review:

1. What are electromagnetic waves?
2. Explain how radio waves work.
3. What type of wave do doctor uses to look at images of bones?