

Microwaves

The wavelengths of microwaves range from 30 cm to 1 mm in length. These waves are considered to be part of the radio spectrum and are also regulated by the FCC. Microwaves are used to study the stars, to talk with satellites in orbit, and to heat up your after-school snack.

Microwave ovens use the longer-wavelength microwaves to cook your popcorn quickly. Microwaves are also useful for transmitting information because they can penetrate mist, clouds, smoke, and haze. Microwave towers throughout the world convey telephone calls and computer data from city to city. Shorter-wavelength microwaves are used for radar. Radar works by sending out bursts of microwaves and detecting the reflections off of objects the waves hit.

Infrared

Infrared light lies between the microwave and the visible parts of the electromagnetic spectrum. The *far-infrared* wavelengths, which are close to the microwave end of the spectrum, are about the size of the head of a pin. Short, *near-infrared* wavelengths are microscopic. They are about the size of a cell.

You experience far-infrared radiation every day as heat given off by anything warm: sunlight, a warm sidewalk, a flame, and even your own body! Television remote controls and some burglar alarm systems use near-infrared radiation. Night-vision goggles show the world as it looks in the infrared, which helps police officers and rescue workers to locate people, animals, and other warm objects in the dark. Mosquitoes can also “see” in the infrared, which is one of the tools in their arsenal for finding dinner.

Visible light

The wavelengths that the human eye can see range from about 700 nm (red light) to 400 nm (violet light). This range is a very small part of the electromagnetic spectrum! We see the visible spectrum as a rainbow, as shown in **Figure 23**.

Visible light is produced in many ways. An incandescent light bulb gives off light—and heat—from a glowing filament. In neon lights and in lasers, atoms emit light directly. Televisions and fluorescent lights make use of *phosphors*, which are materials that emit light when they are exposed to high-energy electrons or ultraviolet radiation. Fireflies create light through a chemical reaction.

Ultraviolet

Ultraviolet (UV) light has wavelengths that are shorter than visible light, just beyond the violet. Our sun emits light throughout the spectrum, but the ultraviolet waves are the ones responsible for causing sunburns. Even though you cannot see ultraviolet light with your eyes, this light will also damage your retina. Only a small portion of the ultraviolet waves that the sun emits actually penetrates Earth’s atmosphere. Various atmospheric gases, such as ozone, block most of the UV waves.



Figure 23

When white light shines through a prism or through water, such as in this rainbow, you can see the colors of the visible light spectrum.