

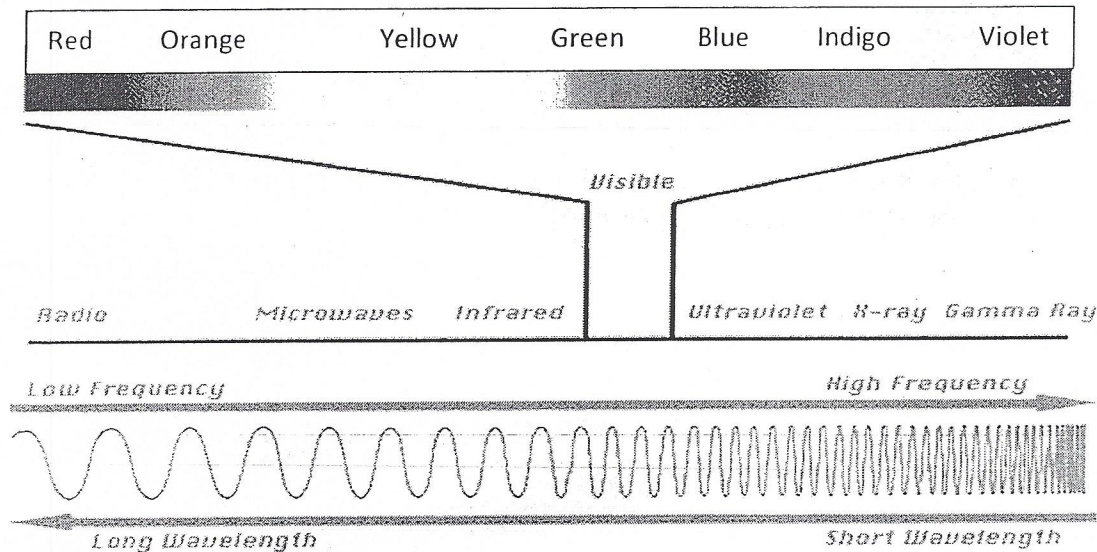
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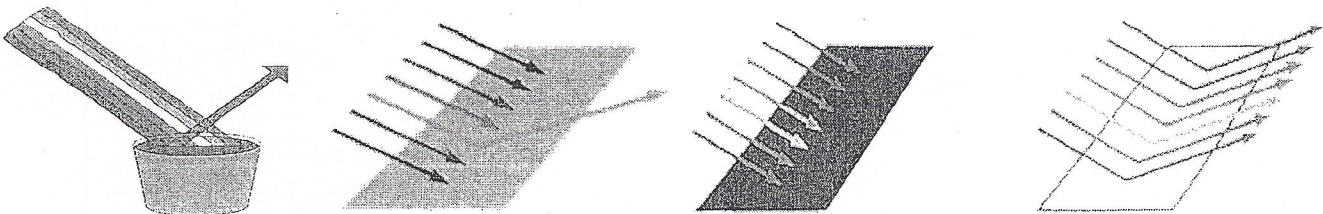
COLOR

The **Electromagnetic Spectrum** is the full range of electromagnetic waves that are produced by vibrating electric charges that consist of both an electric and a magnetic component. **Gamma rays** have the shortest wavelength and highest frequencies of all the waves, while **radio waves** have the longest wavelength and lowest frequencies.

Our eyes can detect only a tiny part of the electromagnetic spectrum, called **visible light**. Visible light is made up of the range of colors from red to violet. The acronym **ROYGBIV** represents the colors of the rainbow in order from longest to shortest wavelengths. The primary colors of light are red, blue & green. When combined they form the secondary colors yellow, cyan & magenta. **White light** is actually made up of the entire range of colors, mixed together.

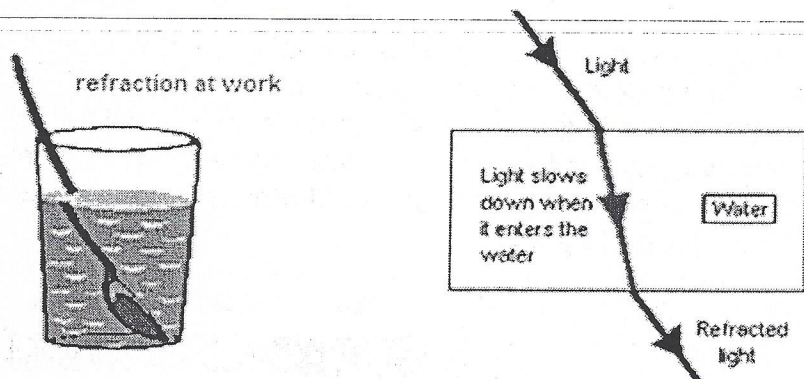


The colors of pigments are different than the colors of light. The primary pigment colors are yellow, cyan & magenta and the secondary colors are green, red & blue. The colors we see with our eyes are a result of visible light waves that are **reflected** back by the material we are looking at. The other wavelengths of color are absorbed. **Black** is the complete absorption of all the wavelengths of light while **white** is the complete reflection of all the wavelengths of light.

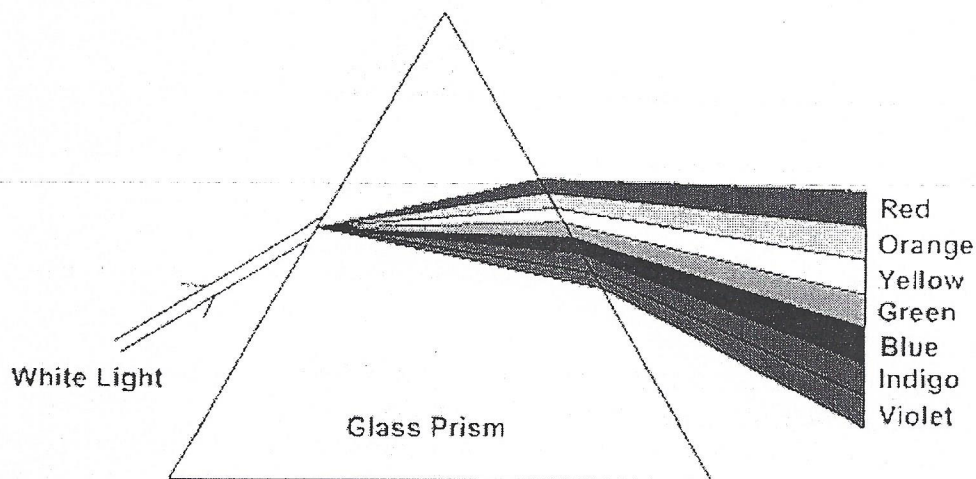


Light bends as it passes through materials such as glass, plastic, or water, this is called **refraction**.

The light bends because its **speed** changes when going from space to air to solid material. The refraction of light when it passes from a fast medium to a slow medium bends the light ray toward boundary between the two media. As the speed of light is reduced in the slower medium, the wavelength is shortened proportionately. The frequency of the light is unchanged.



When white light passes through a glass **prism**, the violet light is bent ("refracted") more than the red, because violet has a shorter wavelength than red.

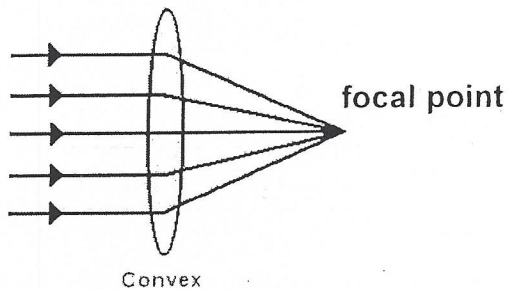


LENSES

A **lens** is a transparent material, such as glass, that has either one curved surface and one flat surface or two curved surfaces. Lenses have many uses, glasses, telescopes, microscopes, projectors, and cameras. Anything we need to get a better look at usually involves lenses.

Convex lenses are thicker in the middle than the edges. When light travels through a convex lens, the refraction that occurs causes the light to bend inward, or **converge**.

The lens of your eye is a double convex lens that helps light to focus on your retina where the photoreceptor cells are found that perceive light and color. The point where the light rays converge is called the **focal point**. Convex lenses serve as magnifiers.



Concave lenses are thicker at the edges than the middle. When light travels through a concave lens, the refraction that occurs causes the light to bend outward, or **diverge**. Concave lenses serve as demagnifiers.

