Getting to Know: Transmission and Absorption

When sunlight warms your skin on a sunny day, your body is absorbing light. *Absorption* occurs when energy from light transfers to particles in a material such as your skin. This can cause the material to increase in temperature.

Sunglasses protect your eyes by absorbing some of the Sun's rays. You can still see through them because they also transmit some of the Sun's rays.

Absorption is only one of the things that can happen when light interacts with a material. Transmission, refraction, and reflection can also occur. *Transmission* happens when light rays pass through a material. Materials that are translucent, like sunglasses, transmit some light rays and absorb others. Transparent materials, like clear glass, transmit nearly all the light rays that hit them. *Refraction* occurs when light rays bend as they pass through the boundary between one material and another. For example, light rays bend as they pass from air to water. This causes objects in water to appear distorted. *Reflection* occurs when light rays bounce off a material. You are probably familiar with reflections produced by shiny objects, like mirrors. However, nearly all objects reflect some light. In fact, that's how we see objects—our eyes detect light rays reflecting from their surfaces.

Misconception 1: ***Energy is lost when a material absorbs light energy.***

That's not correct. When a material absorbs light energy, light energy changes to heat energy in the material, but energy is not lost. Remember that energy can change from one form to another, but it cannot be created or destroyed. In other words, the energy is conserved. The *Law of Conservation of Energy* explains how the amount of energy in a system never changes, even as energy changes form.

I heard that different colors absorb different parts of light. Is this true?

You're on the right track. Our eyes detect different wavelengths of visible light as different colors. White light, like sunlight and the light produced by light bulbs, is made up of all wavelengths of visible light. Colored materials absorb some wavelengths of white light and reflect others. Our eyes detect the light rays that are reflected from objects. The particular wavelengths that are reflected determine the color that we see. For example, a piece of paper that appears green reflects the wavelengths of light that our eyes detect as green and absorbs all the other wavelengths.

The materials you work with in art class appear to have different colors because they absorb some wavelengths of light and reflect others.

Are there real-world applications of the selective absorption of light?

There are many biological and technological examples of selective absorption. Plants absorb specific wavelengths of light energy to produce food. The chlorophyll molecule absorbs red and blue light and reflects other wavelengths, including green. That is because plants only need red and blue light for photosynthesis.

Similarly, there are many real-world applications that involve materials designed to absorb specific wavelengths of light. For example, sun block absorbs some of the high-energy UV radiation emitted by the Sun. This helps protect your skin from damage. However, sun block does not absorb all of the solar radiation, because most of it is not harmful. In fact, your body needs sunlight to produce an essential vitamin called Vitamin D. Did you know that solar panels are designed to absorb specific wavelengths of light energy to produce electricity?

Misconception 2: ***The sky looks blue because it reflects the blue ocean.***

That's not correct. The sky actually looks blue because of a light interaction called *scattering*. The atmosphere is made up of different kinds of gases. Gas molecules scatter light waves that pass through the atmosphere. They scatter shorter wavelengths more than longer wavelengths. Blue is a shorter wavelength and red is a longer wavelength. Because more blue wavelengths reach our eyes, we see the sky as blue.

I noticed that darker colors get hotter in sunlight than lighter colors. Is this because darker colors attract more light?

It's true that darker colors get hotter in sunlight, but they don't attract light energy. Rather, darker colors *absorb* more light energy than lighter colors. In contrast, lighter colors reflect more light energy. Because light energy changes to heat energy in a material, materials that absorb more light energy get hotter in sunlight than materials that reflect more light energy.

You will learn a lot more about how light energy interacts with materials in the lesson, so let's get started!