

Light and Materials



What three types of materials affect the behavior of light?



Materials can be transparent, translucent, or opaque.

Light and Materials

A **transparent** material transmits light, which means it allows most of the light that strikes it to pass through it.

The water where the fish and coral live is transparent. While riding on a bus, you can see buildings and trees outside because the bus windows are transparent.

DOK Question

Hypothesize why this is important.

Light and Materials

A **translucent** material scatters light. If you can see through a material, but the objects you see through it do not look clear or distinct, then the material is translucent.

Looking into a room through a frosted glass door, you can make out shapes, but they are fuzzy and lack detail.

DOK Question

Hypothesize why this is important.

Light and Materials

An **opaque** material either absorbs or reflects all of the light that strikes it. Most materials are opaque.

An opaque object does not allow any light to pass through it. Wood and metal are examples of opaque materials.

DOK Question

Hypothesize why this is important.

Interactions of Light



How does light behave when it enters a new medium?



When light strikes a new medium, the light can be reflected, absorbed, or transmitted. When light is transmitted, it can be refracted, polarized, or scattered.

Interactions of Light

Reflection

An **image** is a copy of an object formed by reflected (or refracted) waves of light.

Regular reflection occurs when parallel light waves strike a surface and reflect all in the same direction.

Diffuse reflection occurs when parallel light waves strike a rough, uneven surface and reflect in many different directions.

Interactions of Light

Refraction

A light wave can refract, or bend, when it passes at an angle from one medium into another.

Refraction makes underwater objects appear closer and larger than they really are.

Refraction can also make an object appear to break at the surface of the water.

Interactions of Light

Refraction can also sometimes cause a **mirage**, a false or distorted image.

- Mirages occur because light travels faster in hot air than in cooler, denser air.
- Refraction causes some of the light to follow a curved path, rather than a straight path to the ground.
- Light that reaches your eyes after traveling in this manner can look as if it was reflected from a layer of water.

Interactions of Light

Polarization

Light with waves that vibrate in only one plane is **polarized light**. Light reflecting from a nonmetallic flat surface, such as a window or the surface of a lake, can become polarized.

Horizontally polarized light reflects more strongly than the rest of the sunlight. This reflection produces glare. Polarized sunglasses have vertically polarized filters to block the horizontally polarized light.

Interactions of Light

Scattering

In scattering, light is redirected as it passes through a medium.

- Most of the particles in the atmosphere are very small. Small particles scatter shorter-wavelength blue light more than light of longer wavelengths.
- Blue light is scattered in all directions more than other colors of light, which makes the sky appear blue.

Interactions of Light

A scattering effect reddens the sun at sunset and sunrise.

DOK Question

Hypothesize why this is important.



Assessment Questions

1. How do polarized sunglasses reduce glare?
 - a. by scattering light as it passes through the glasses
 - b. by providing a smooth surface that light can reflect off
 - c. by absorbing all light
 - d. by blocking horizontally polarized light

ANS: D

Assessment Questions

1. An opaque material passes light through but scatters the light so that objects do not look clear.

True

False

ANS: F, translucent