

Properties of Light

Light is one form of energy that travels in electromagnetic waves. This energy is both magnetic and electrical.

There are many different types of electromagnetic (EM) waves. Most of them cannot be seen by humans. Our eyes see only a small portion of EM waves called visible light. Visible light is made up of different colors. The colors are red, orange, yellow, green, blue, indigo, and violet. The colors are due to the different wavelengths of light. The longer the wavelength, the less energy the wave has. The shorter the wavelength, the more energy it has. The longest wavelength of visible light looks red to us. The shortest wavelength of visible light looks violet to us.



Here are some **properties of light:**

Light travels out in all directions from its source. What are some sources of light? The sun is our main source of light on Earth. Some other sources are other stars and fire.

Light is made of little particles called photons. A photon is the smallest possible particle of electromagnetic radiation. These particles travel in waves.

Light travels in straight lines called rays.

Light travels "at the speed of light." This speed is about 186,000 miles per second (670 million miles per hour), or about 300,000 kilometers per second. The speed of light is sort of a galactic "speed limit." So far, nothing has been found that can travel faster than light.

Light can travel in a vacuum. A vacuum is empty space. There are no molecules of air or anything else in a vacuum. Like all forms of electromagnetic waves, light can travel through empty space, as well as through matter.

Light can be absorbed. Absorbed light energy is converted into some other form, such as thermal or heat energy. You can test this by putting a piece of black construction paper and a piece of white construction paper on a sunny windowsill. Place a thermometer for measuring outdoor or room temperature under each piece of paper. Wait a few hours, and then check the two temperatures. The thermometer underneath the black paper should be hotter than the one under the white paper. This is the reason people tend to wear dark colors in the wintertime and white or light colors in the summer. Dark colors absorb light, helping us keep warmer in the winter. In the summer, light colors absorb little of the sun's energy, keeping us cooler.

Light can be reflected. If you shine light on a surface, some of that light will bounce off, or be reflected by, the surface. The *law of reflection* tells us that light will always be reflected by a surface at the same angle at which it hits the surface. Objects that we see get their color from the light they reflect. A green object looks green because it absorbs all other colors but reflects green.

Light can be refracted. Light always travels in straight lines. But when it passes from one medium into another, it changes direction slightly. Refraction occurs because light travels at different speeds through different materials. When light passes through air into water, for example, it slows down. The light rays are bent slightly. You can see this if you put a pencil into a half-glassful of water. The pencil looks bent or broken at the water line. This is due to refraction.

Light can be transmitted. Sometimes light passes through matter. This is called transmission. Light is transmitted through some matter more easily than through other kinds of matter. Light is transmitted through water, air, and glass very easily. These materials are said to be transparent. *Transparent* materials allow light to be transmitted through them easily. Some matter transmits some, but not all, of the light that hits it. This material is called *translucent*. Some examples of translucent material are waxed paper or glass blocks. *Opaque* matter does not transmit any light. You cannot see through it because light doesn't pass through it. A book and a brick wall are two examples of opaque materials.

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Questions

- ____ 1. What is the smallest possible piece of electromagnetic radiation?
 - A. waves
 - B. rays
 - C. photons

- ____ 2. How does light travel?
 - A. in straight lines
 - B. in rays
 - C. in waves
 - D. all of the above

- ____ 3. What is the speed of light?
 - A. about 186,000 miles per second
 - B. about 300,000 kilometers per second
 - C. about 670 million miles per hour
 - D. all of the above are correct

- ____ 4. Light cannot be absorbed.
 - A. true
 - B. false

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- ____ 5. Light can be reflected.
A. true
B. false
- ____ 6. Light can be transmitted through matter.
A. false
B. true
- ____ 7. These materials allow light to be transmitted through them easily.
A. translucent
B. opaque
C. transparent
- ____ 8. Something that transmits some, but not all, of the light that hits it is called:
A. translucent
B. opaque
C. transparent

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How many of these can you write about? Think! Write! Check all the ones you answered.

- Describe in your own words some of the properties of light.
 - Write a paragraph about a time when you observed some of these properties of light. What did you see?