Lesson 3

What Is Radiant Energy?

Watch a colorful sunset. Tune in to a radio station. Look at an X ray of your teeth. What do they have in common? Without radiant energy, they wouldn't be possible.

You will learn:

- **how radiant energy moves.**
- **how radiant energy is used.**

How Radiant Energy Moves

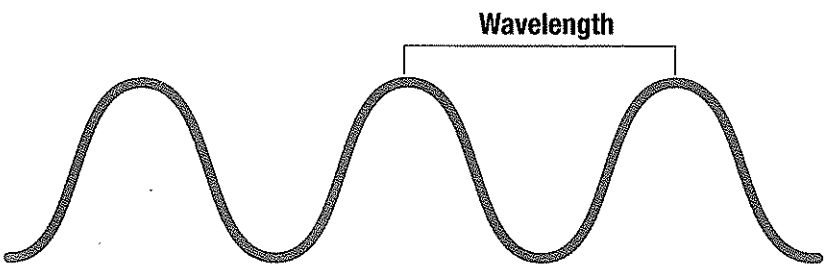
Radiant energy from the sun includes infrared (heat) rays that warm you, ultraviolet rays that cause you to sunburn, and visible light that lets you see. All types of radiant energy travel in waves. Unlike water waves you see at the beach or sound waves that carry sound to your ears, radiant energy waves can travel where there is no matter. The sun's radiant energy travels through space to reach the earth.

The various types of radiant energy are different because their wavelengths are different. **Wavelength** is the distance from one point on a wave to the same point on the next wave. Find the wavelength in the picture below. Each type of radiant energy has a different wavelength.

Glossary

wavelength (wāv′lengkth′), the distance from a point on one wave to the same point on the next wave

glossary

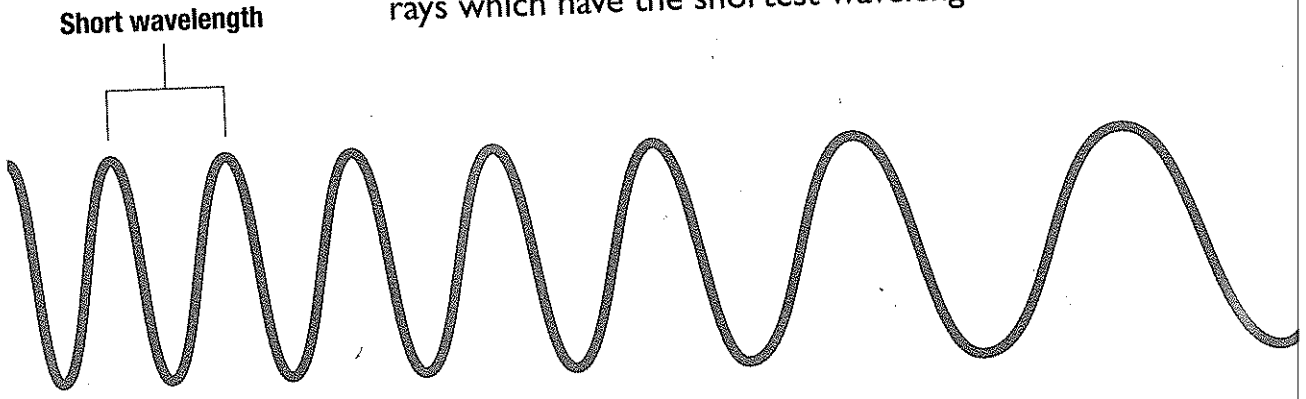


◀ **Measuring Wavelength**
Radiant energy travels in waves. Scientists use special instruments to measure wavelength. Human eyes can't see what these waves look like, not even those for visible light.

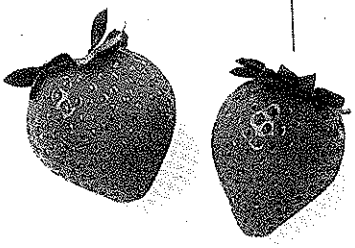
Uses of Radiant Energy

Types of Radiant Energy

The pictures on these two pages show seven types of radiant energy. Notice again that different types have different wavelengths. The shortest wavelengths are on the left. The longest are on the right. The different types have a variety of uses. Read how each type of radiant energy is used, beginning with gamma rays which have the shortest wavelengths.

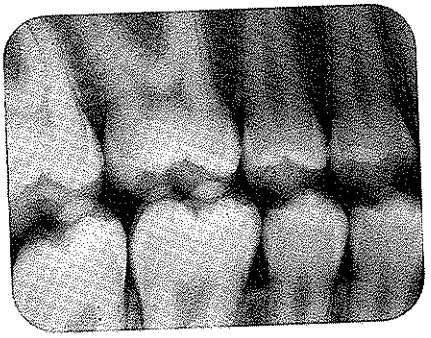


Gamma rays



▲ *Treating some foods with gamma rays helps preserve them by killing the organisms that cause the food to spoil. Doctors also use gamma rays to treat some cancers.*

X rays

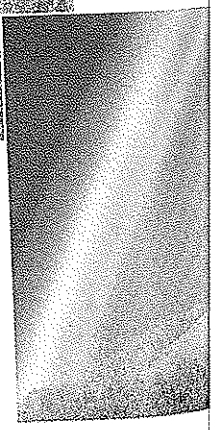


▲ *X-ray images show breaks in bones or cavities in teeth. They help doctors and dentists care for you.*

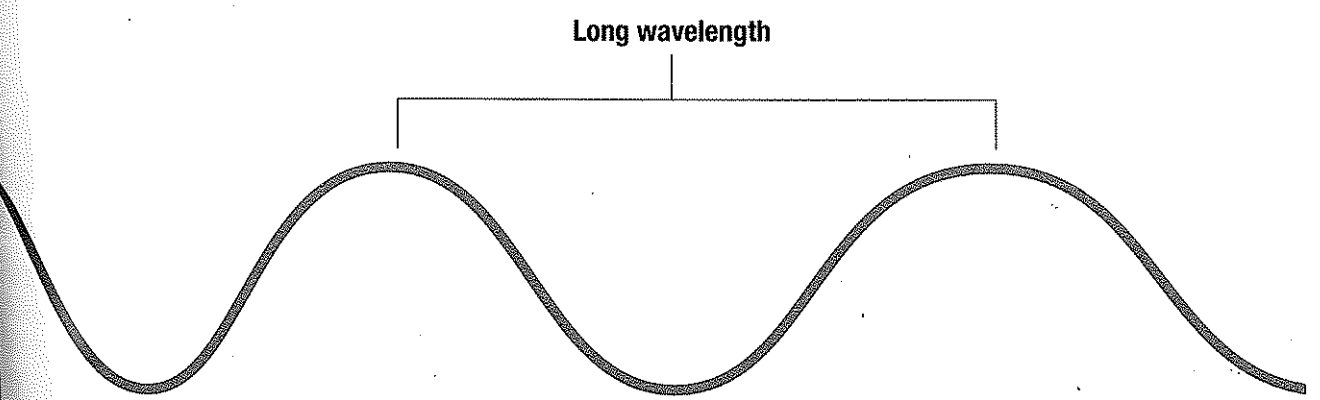
Ultraviolet rays

▲ *In some laboratories, ultraviolet rays are used to kill germs. In people, ultraviolet rays cause sunburn, wrinkling, skin cancer, and eye damage. Protect yourself from their effects.*

Visible ligh

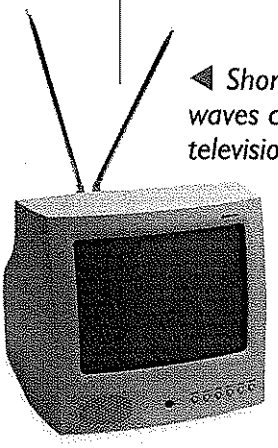


▲ *Visible light is only radiant ener you can see.*



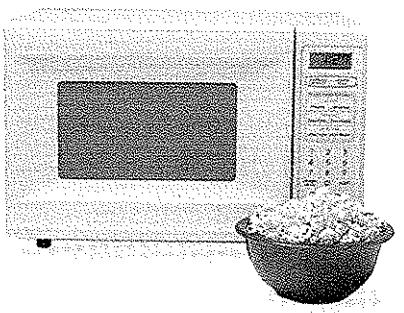
Infrared rays **Microwaves** **Shorter radio waves** **Longer radio waves**

▲ *All objects give off infrared rays—the warmer the object, the more rays it gives off. Special "heat" photographs use infrared rays rather than visible light. People use these photographs to find out where buildings lose heat.*

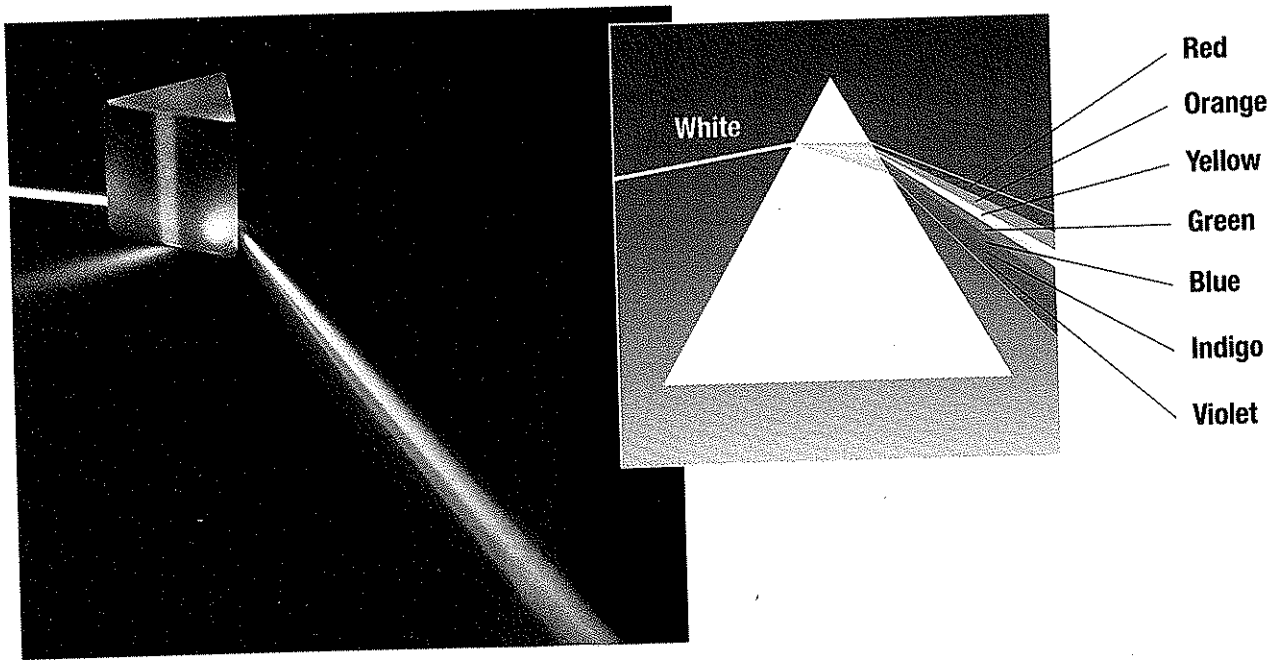


◀ *Shorter radio waves carry television signals.*

Longer radio waves carry radio signals. ▼



▲ *You may pop popcorn in a microwave oven, which uses microwaves. Police catch speeders with radar, which also uses microwaves. Telephone companies use microwaves to carry portions of some phone calls.*

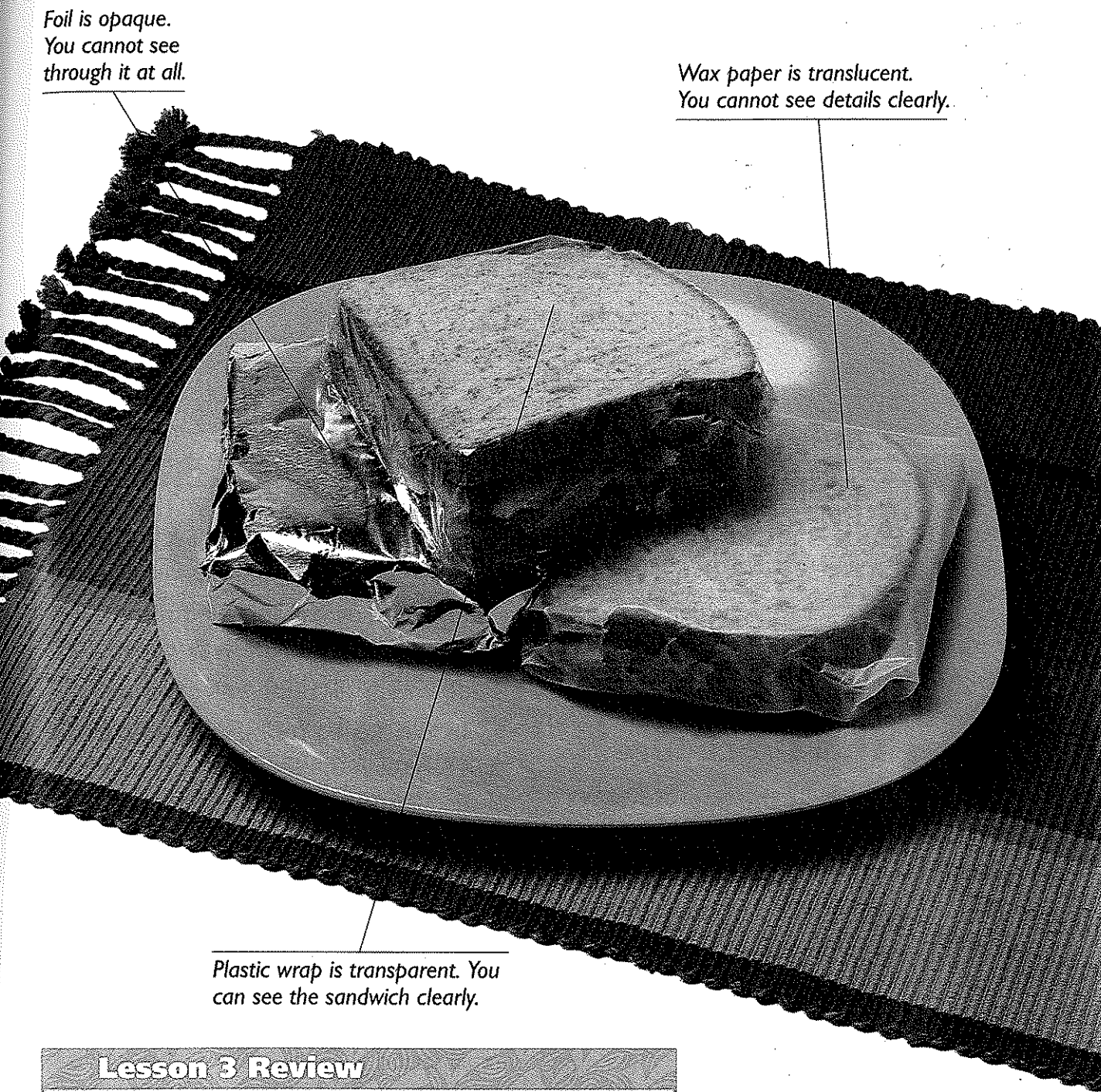


▲ *All the colors of visible light mix together to make white light. When white light passes through a prism, the colors separate.*

Your eyes are sensitive to a very small part of all radiant energy, the portion called visible light. Even though it makes up just a small part of all radiant energy, visible light still has a range of wavelengths. You see these different wavelengths as different colors.

Colors play a key role in how you see the world. All mixed together, the different colors make white light. You can use a prism like the one above to separate the colors. As white light travels through the prism, it bends. Because different wavelengths bend different amounts, the white light spreads out into a band of colors.

When visible light hits an object, it may behave in one of three ways. If the object is transparent, the light passes through almost unchanged, as through a window. You can see clearly what is behind it. In contrast, if the object is opaque, no light at all can pass through it. You can see nothing behind it. If the object is translucent, some light can pass through but you can't see details clearly. Look at the plastic wrap, aluminum foil, and wax paper on the next page. Which is translucent? transparent? opaque?



Lesson 3 Review

1. How are all types of radiant energy the same? In what way are they different?
2. What are seven types of radiant energy?
3. **Draw Conclusions**
   You can clearly read traffic signs through the tinted windows of a car. Are the windows transparent, translucent, or opaque?