

# WAVE INTERACTION



## VOCABULARY

**refract** (ri-'frakt) to bend light or sound waves as they pass through different mediums

**reflect** (ri-'flekt) to bounce energy off an object

**convex lens** ('kän-veks 'lenz) a lens that focuses light

**concave lens** (kän-'käv 'lenz) a lens that causes light to spread out

Light passes through transparent objects easily. Translucent objects allow some light to pass through. Light does not pass through opaque objects at all. In some cases, an object will allow light to pass through it but will cause the light to bend, or **refract**. For example, water refracts light, causing objects to look different under the water than above the water.

Most surfaces **reflect** light. Devices such as microscopes, binoculars, and telescopes use lenses and reflecting mirrors to make small objects appear larger or distant objects appear closer. A lens is typically made of transparent glass or plastic. Some lenses focus light, and others cause light to spread out. A lens that focuses light and makes objects appear larger is called a **convex lens**. A lens that spreads out light and makes objects appear smaller is called a **concave lens**.

Light is refracted by the water in this glass, making the pencils appear to be in pieces.




Can you pick out the transparent, translucent, and opaque objects in these pictures?



Light and sound interact with matter in a number of ways. Opaque objects prevent light from passing through by absorbing or reflecting it. Darker objects absorb more light than lighter objects. Objects with rough surfaces spread out light more than objects with smooth surfaces. Sound waves react to surfaces in a similar way. Porous objects, or objects full of tiny openings, absorb more sound than dense objects. Objects with rough surfaces spread out sound more than objects with smooth surfaces. This effect is why objects with rough surfaces cannot be used as mirrors and do not produce good echoes.

**QUICK FACT**

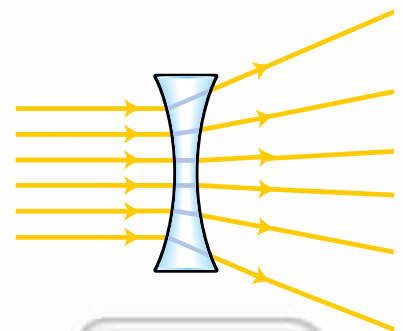
The lenses in eyes are made out of tissue rather than glass. They can change shape by flattening or thickening in order to focus the light on the retina at the back of the eye.



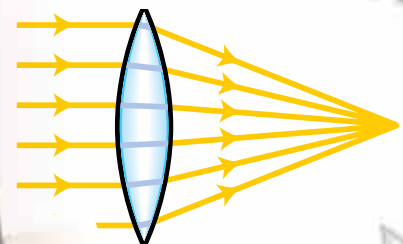
Would this material produce a good echo?



When light is reflected off a mirror, the light changes directions, reversing the image. This causes the letters on the sign to look backwards.



A concave lens spreads out light.



A convex lens focuses light.

## ***Instructions: Reflection Exercise***

**BLM 6.5A**

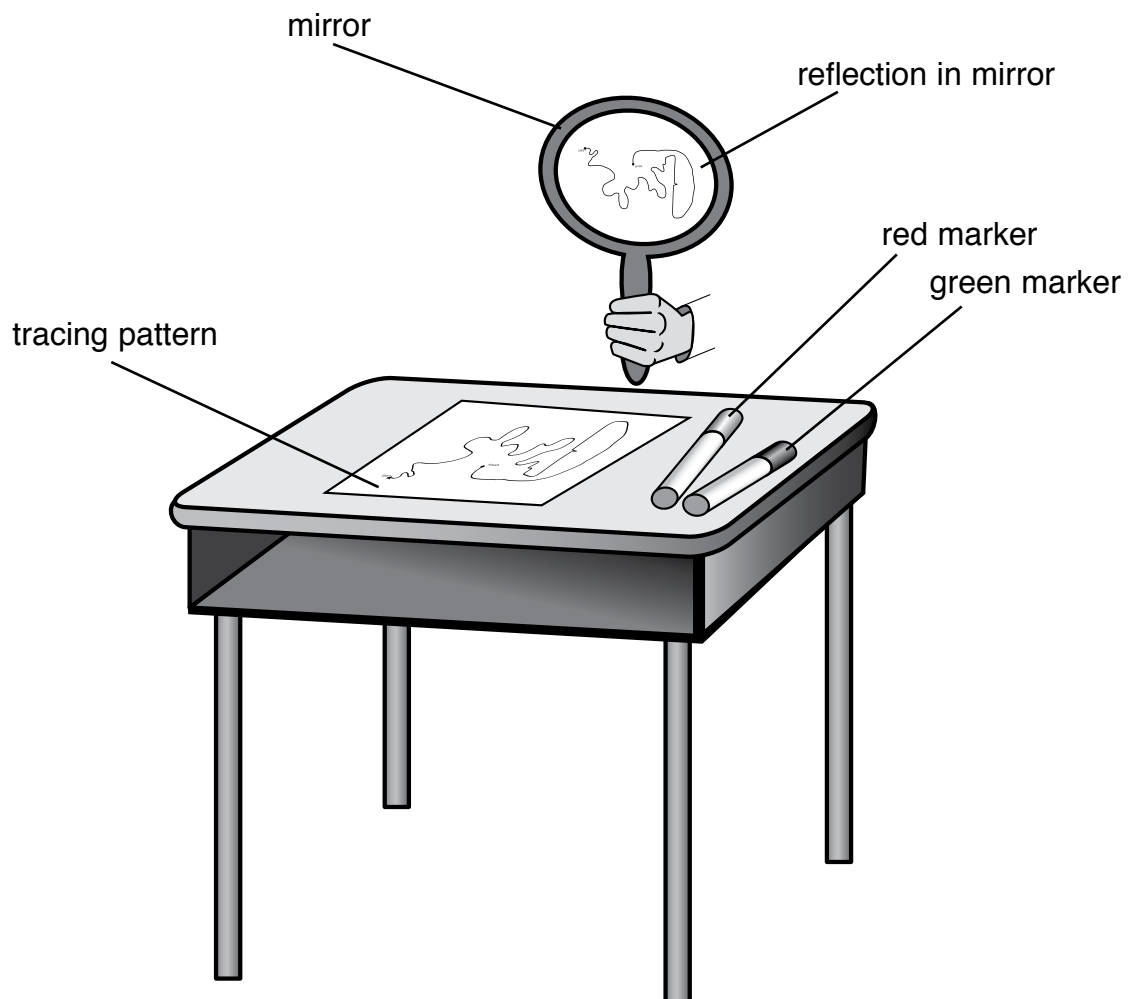
### ***Materials***

- Handheld mirrors, at least 15 cm x 15 cm (6 in. x 6 in.)
- Red and green markers
- BLM 6.5B Tracing Pattern

### ***Procedure***

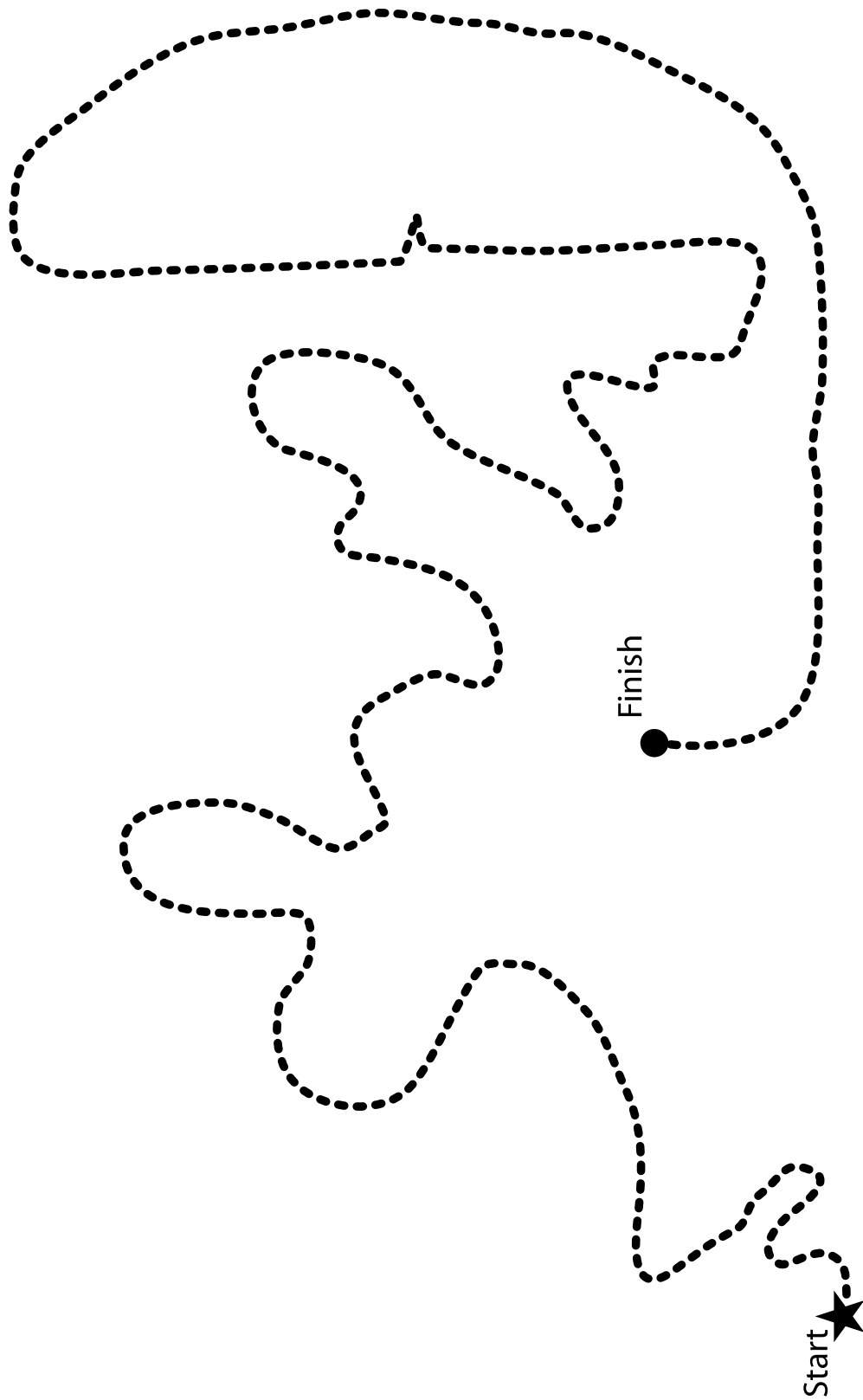
Set up one station for every student pair. Each station will need two copies of **BLM 6.5B Tracing Pattern**, a red marker, and a green marker. Have each pair of students position their materials as shown below.

1. Have a student hold a mirror very still at the back of the desk. It should be at a 90-degree angle to the top of the desk.
2. Place the tracing pattern near the front edge of the desk.



*Tracing Pattern*

**BLM 6.5B**



# BLOOD VESSELS



## VOCABULARY

**artery** ('är-tə-rē) a blood vessel that carries oxygen-rich blood away from the heart

**capillary** ('ka-pə-lār-ē) a tiny blood vessel that connects arteries to veins

**vein** ('vān) a blood vessel that carries oxygen-poor blood back to the heart

Blood circulates throughout the body in blood vessels. When the left ventricle of the heart contracts, it pumps oxygen-rich blood into vessels called **arteries**. Arteries have very thick, muscular walls. The walls expand every time the heart contracts and blood is pumped through them. These vessels carry blood away from the heart to other organs. Oxygen-rich blood leaves the heart through a large artery called *the aorta*. The aorta branches off into smaller and smaller arteries. These small arteries enter the organs and bring oxygen to the cells.

Once in the organs, the smallest arteries keep branching off until the walls are only one layer of cells thick. This type of blood vessel is called a **capillary**. Oxygen and other nutrients move out of the capillaries into the cells. The waste from the cells, such as carbon dioxide, moves into the capillaries. The blood is now oxygen-poor.

Oxygen-rich blood flows through arteries. The walls of the arteries are very muscular so they can withstand the pressure of blood being pumped through them.

What causes a bruise?



Blood vessels bring blood to every part of the body, even the eyeball!

The oxygen-poor blood in the capillaries must return to the heart and lungs to pick up more oxygen. After it moves through the capillaries, it enters larger blood vessels called **veins**. Veins are also muscular, but they are much thinner than arteries. Like the heart, veins have valves. The valves keep the oxygen-poor blood flowing in one direction so it does not go backward.

The small veins get bigger as they leave the organs. The veins join with other veins until they finally become two large veins. One of these veins brings blood back from the upper body. The other vein brings blood back from the lower body. These two veins bring the oxygen-poor blood to the right atrium of the heart, and the cycle begins again!



Just like the veins in this leaf, blood vessels keep branching to reach every part of the body.

Why does your face get red or darker when you blush?

