

Magic Lesson 2: The Broken Pencil

In this trick you'll use water and light to perform an interesting illusion.

Materials

A glass, tap water, pencil

The Setup

- 1 Fill the glass about two-thirds full of tap water.
- 2 Place the glass of water and pencil on the table.

Magic Science Time!

- 1 Hold the pencil in front of you. Tell the audience, "I am going to break the pencil by simply sticking it in this glass of water."
- 2 Hold the pencil upright in the water so that the tip is about halfway between the surface of the water and the bottom of the glass. Make sure the pencil is near the back of the glass, away from the audience.
- 3 Move the pencil back and forth in the water, keeping it upright. Ask them what they see. It will appear as though the pencil is broken when in the water.
- 4 Remove the pencil from the water

Discussion

- Did the pencil really break when it was placed in the water?
- If not, then why did it look like the pencil was split in half?



Explanation

This trick works because of refraction. Light travels in straight lines, but when it travels from one transparent substance to another the light rays bend. This is refraction. When light travels from a more dense transparent substance, such as water, to a less dense substance, such as air, the light refracts, or bends noticeably. Light travels at different speeds in substances with different densities.

Light reflected from the pencil appears to the audience to be in one place when it travels to their eyes through the air, and in another place when it is refracted through water.

Refraction is
the change in
direction of light as it
moves from one
transparent substance
to another.