



# CO<sub>2</sub> – The Invisible Gas

How do scientists know how much CO<sub>2</sub> is in the air?

Activity Guide

Scientists use infrared light to detect CO<sub>2</sub> levels in the air. Practice measuring CO<sub>2</sub> levels like a scientist using the flashlight in this activity!

## Try This!

**Step 1:** Turn on the flashlight and try out the different colored sheets by placing them in front of the beam of light– what color light does each make? Are there any surprises?

**Step 2:** Point the light at the different colored surfaces on the block of wood. Is the color of the light different depending on the color of the surface?

**Step 3:** Experiment with combining different colored sheets – what colors would you predict from each combination? Are there any surprises?

**Step 4:** Ask someone to guess which color sheet combination you are using just from looking at the light. Offer to show them the light through each of the colored sheets separately.

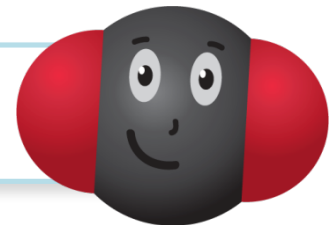


This CO<sub>2</sub> meter measures the amount of carbon dioxide in the air!

## Climate Connection

CO<sub>2</sub> levels in the atmosphere can be measured using infrared light and a device (CO<sub>2</sub> monitor) to detect light reflected by the CO<sub>2</sub> molecules. Direct measurements of CO<sub>2</sub> levels in the atmosphere are crucial information used by scientists to predict future climate changes.

*Infrared light is not visible to the human eye, because it is past the red section of the visible light. You can see it in the dark however with special lenses. This is what they call “night vision!”*



Turn the page over to learn more!

## What's Happening?

*Based on the freezing points of different gases, scientists use a process similar to the one in this activity to determine the amount of CO<sub>2</sub> in the atmosphere!*



Energy comes in many different **wavelengths** – we can detect different wavelengths with our eyes, seen as different colors of light. Other wavelengths are invisible to us, but we can feel their energy as heat. Our own bodies give off energy, just as the Earth does, in invisible wavelengths that we can't see with our eyes. This energy is called **infrared radiation**.

The greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere like carbon dioxide (CO<sub>2</sub>), trap energy from the sun. Without these gases, heat would escape back into space and Earth's average temperature would be about 60 degrees colder. Because of how they warm our world, these gases are referred to as a greenhouse gas.

Scientists discovered that CO<sub>2</sub> levels can be detected in the air by using a certain type of infrared light and measuring the amount of infrared radiation absorbed and then emitted by the CO<sub>2</sub> in the air. Just as your family member or friend probably needed to see the effects of each individual sheet color to figure out the combination you tested them on and on the color of light on the wood, scientists had to first figure out what CO<sub>2</sub> emits back when illuminated with infrared radiation. They needed to set up test situations, adding CO<sub>2</sub> in known amounts to air and then testing each amount to find out if they could then guess the amount from an unknown sample.

## Climate Detective Challenge

**How do we detect CO<sub>2</sub> in the atmosphere?**

*Find the answer to this question on the Activity Map!*

