CO₂ – The Invisible Gas
How do scientists know how much CO₂ is in the air?

Scientists use infrared light to detect CO₂ levels in the air. Practice measuring CO₂ 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.

**Climate Connection**

CO₂ levels in the atmosphere can be measured using infrared light and a device (CO₂ monitor) to detect light reflected by the CO₂ molecules. Direct measurements of CO₂ 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!”*
What’s Happening?

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 (CO₂), 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 CO₂ 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 CO₂ 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 CO₂ emits back when illuminated with infrared radiation. They needed to set up test situations, adding CO₂ 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 CO₂ in the atmosphere?

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