

## Student directions [The Greenhouse Effect](http://phet.colorado.edu) activity [phet.colorado.edu](http://phet.colorado.edu)





**Learning Goals:** Students will be able to

- Compare and contrast “light photons” and “infrared photons”.
- Identify what happens to light photons when they get to Earth and why the temperature of the earth and its atmosphere changes.
- Design experiments to observe how clouds change the photons behavior
- Design experiments to observe how greenhouse gases change the photons behavior
- Compare and contrast cloud behavior and greenhouse gas behavior.
- Use the Photon Absorption tab to identify if molecules are Greenhouse Gases and give the microscopic evidence that supports your ideas.
- Explain why inside a building or car sometimes is a different temperature than outside.

**Extension:**

- Discover when the “Ice Age” was and what has changed about the composition of the greenhouse gases.

**Important simulation information:**

- When you start [The Greenhouse Effect](http://phet.colorado.edu) or use , the earth temperature is reset to **cold** and light photons start coming from the sun.
- You might want to use the speed , pause , and step  tools to help you watch the photon and temperature changes.

**Directions:**

1. Define “light photons” and “infrared photons”
  - a. How are they represented in the simulation?
  - b. If you were talking to a friend about what you observe, how would you explain what is happening with the energy from the sun and the energy from the Earth?
2. In the winter, weather reporters often say “It will be a very cold night because there are no clouds.”
  - a. Use the sim to see if you can understand why this could be true.
  - b. Describe your observations.
  - c. If you were a weather person, how might you use what you understand about clouds and the effect on temperature to predict night-time weather for a summer month like June?
3. How can you make the greenhouse gases act similar to clouds?
  - a. Explain what you did.
  - b. Give the evidence to prove you made them act alike in a few different situations.
4. What do you notice about greenhouse gas effect on photons that is different from clouds? Give examples from situations that you made in the sim to support your ideas.
5. Use the Photon Absorption tab to identify which of the molecules provided in the sims are Greenhouse Gases. State microscopic evidence that supports your ideas.
6. Why do you think the inside of a car feels so much warmer than its surroundings on sunny days?
  - a. How can you use the sim to test your ideas?
  - b. Describe your experiment and state some evidence that explain the different temperatures on a microscopic level using photons.

**Extension:** Discover when the “Ice Age” was and what has changed about the composition of the greenhouse gases. Include cites for your answers. How did the sim developers use research information in the sim design?