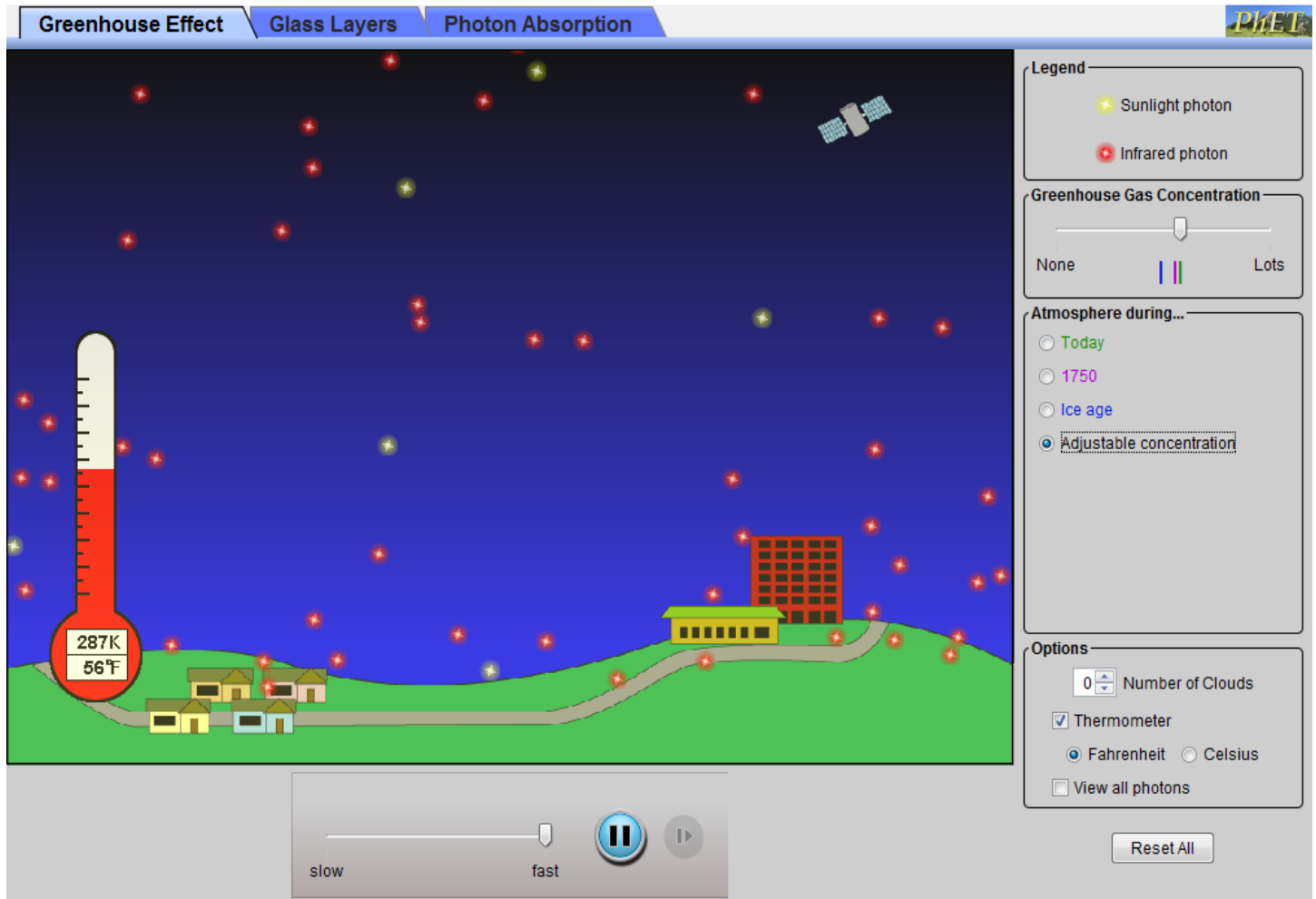


PhET – The Greenhouse Effect

Instructions

1. Go to PhET's "**The Greenhouse Effect**" page (phet.colorado.edu/en/simulation/greenhouse) and either run or download (then run) the simulation.
2. Select the "**Adjustable concentration**" option in the "**Atmosphere during...**" section on the right side of the screen.
3. Use the "**Greenhouse Gas Concentration**" slider control to vary the amount of greenhouse gases; observe the effect on temperature.
4. Set the greenhouse gas concentration to "**Lots**", then observe the behaviors of the yellow photons representing sunlight and the red photons representing infrared emissions from Earth. Follow the paths of several photons of each type and report any differences you notice.



The screenshot displays the PhET simulation interface for 'The Greenhouse Effect'. At the top, there are three tabs: 'Greenhouse Effect', 'Glass Layers', and 'Photon Absorption'. The main simulation area shows a landscape with a thermometer on the left, a satellite in the sky, and a city with buildings on the right. Sunlight photons (yellow) and infrared photons (red) are shown moving through the atmosphere. The thermometer displays a temperature of 287K (56°F). On the right side, there is a legend with 'Sunlight photon' (yellow star) and 'Infrared photon' (red star). Below the legend is a 'Greenhouse Gas Concentration' slider set to 'Lots'. Underneath that is the 'Atmosphere during...' section with radio buttons for 'Today', '1750', 'Ice age', and 'Adjustable concentration' (which is selected). At the bottom right, there is an 'Options' section with a 'Number of Clouds' dropdown set to 0, a checked 'Thermometer' checkbox, radio buttons for 'Fahrenheit' (selected) and 'Celsius', and a 'View all photons' checkbox. A 'Reset All' button is located at the bottom right of the simulation area. At the bottom center, there is a speed slider from 'slow' to 'fast' and a play/pause button.

The Concord Consortium

What is the Future of Earth's Climate?

Instructions

1. Go to the "**What is the Future of Earth's Climate?**" lesson module on The Concord Consortium's web site (concord.org/stem-resources/what-future-earths-climate).
2. Click the "**Launch Activity**" button.
3. Click the link to lesson 2, "**Interactions within the atmosphere**".
4. This lesson has six sections. You can click the small circles in the upper right to navigate to any of the sections. The greenhouse effect simulation is embedded, in a few slightly different forms, in several of the lesson segments.
5. Use the version of the simulation embedded in **section 2** of the lesson, since it includes graphs of temperature and carbon dioxide concentration.
6. Click the "**Erupt!**" button several times to add carbon dioxide to the atmosphere. Observe the effect on temperature.
7. Click the "**Remove CO₂**" button a bunch of times to remove most or all of the carbon dioxide from the atmosphere. Observe the effect on temperature.
8. Use the "**Follow energy packet**" and "**Follow CO₂**" buttons to focus in on individual photons and gas molecules to better understand their behaviors.

