**Greenhouse Effect**

**I. Introduction**

 The greenhouse effect is a process that occurs when gases in Earth's atmosphere trap the Sun's heat. This process makes Earth much warmer than it would be without an atmosphere. The greenhouse effect is one of the things that makes Earth a comfortable place to live. As you might expect from the name, the greenhouse effect works … like a greenhouse!

 A greenhouse is a building with glass walls and a glass roof. Greenhouses are used to grow plants, such as tomatoes and tropical flowers. A greenhouse stays warm inside, even during the winter. In the daytime, sunlight shines into the greenhouse and warms the plants and air inside. At nighttime, it's colder outside, but the greenhouse stays pretty warm inside. That's because the glass walls of the greenhouse trap the Sun's heat.

 The greenhouse effect works much the same way on Earth. Gases in the atmosphere, such as [carbon dioxide](https://climatekids.nasa.gov/greenhouse-effect-and-carbon-cycle), trap heat just like the glass roof of a greenhouse. These heat-trapping gases are called [greenhouse gases](https://climatekids.nasa.gov/greenhouse-cards). During the day, the Sun shines through the atmosphere. Earth's surface warms up in the sunlight. At night, Earth's surface cools, releasing heat back into the air. But some of the heat is trapped by the greenhouse gases in the atmosphere. That's what keeps our Earth a warm and cozy 58 degrees Fahrenheit (14 degrees Celsius), on average.

 In this activity, you will witness how the greenhouse effect develops on Earth, change atmospheric variables to see how clouds affect the greenhouse effect, and how the increase in greenhouse gases has altered the greenhouse effect over time.

**II. Procedure**

 1. Go to the following website <https://phet.colorado.edu/en/simulation/legacy/greenhouse> .

 2. Click on “Run Now!”. Then open the JNLP file.

 3. You will now perform six experiments using the simulation. For the

 experiments, click on the Greenhouse Effect tab (at the top). First, record the

 initial start temperature on the thermometer (in ˚F). Notice the relative

 amounts of greenhouse gases in the atmosphere on the Greenhouse Gas

 Concentration slider bar.

 4. Click on “Today” for the Atmosphere during…. section and set the Number of

 Clouds to “0” under the Options section. Let the simulation run for 1-minute and

 record the final temperature in ˚F.

 5. Click “Reset All”. Repeat steps 3 & 4, but change the Number of Clouds to 1,

 then 2, and then 3. Record your start and final temperatures.

 6. Next, click on the Glass Layers tab (at the top) and record the start and final

 temperatures while changing the Number of Glass Panels. Record your data.

**III. Data Table**

|  |  |  |  |
| --- | --- | --- | --- |
| **Number Of Clouds** | **Start Temp. (˚F)** |  **Final Temp. (˚F)** |  **Observations** |
|  0 |  |  |  |
|  1 |  |  |  |
|  2 |  |  |  |
|  3 |  |  |  |
| **Number Of Panels** | **Start Temp. (˚F)** |  **Final Temp. (˚F)** |  **Observations** |
|  0 |  |  |  |
|  1 |  |  |  |
|  2 |  |  |  |
|  3 |  |  |  |

**IV. Analysis & Conclusions**

 1. How did the addition of clouds (or glass panels) affect the greenhouse effect?

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 2. How has the increased concentration of greenhouse gases affected Earth over time.

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 3. Explain why the greenhouse effect is necessary for life on Earth.

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 4. How could a continued increase in the concentration of greenhouse gases affect Earth?

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