Greenhouse Effect Lab - Exemplar

Pre-lab Questions:

What is the Greenhouse effect?

The Greenhouse effect is when greenhouses gases, such as carbon dioxide, cause some of the radiation from the sun to be trapped in the troposphere

Hypothesis:

If greenhouse gases from the candle are present in the covered beaker the temperature will rise more quickly than the beaker without greenhouse gases because the gases will reflect the heat from the lamp back into the beaker and raise the temperature.

Independent Variable: The addition of gases from the candle
Dependent Variable: The temperature of the beakers.
Controlled Variables: The beakers were exactly the same, the same thermometer, the same baggie size, and the same distance from the lamp.
Control Group: The beaker without the gases from the candle.
Experimental Group: The beaker that contains gases from the candle.

Problem:

How quickly does the warming of the atmosphere occur? What conditions cause the warming of the atmosphere?

Materials:

· Beakers
· Zip-loc baggies
· Thermometers
· Candle
· Match
· Soil
· Lamp

Procedure:

1. Fill two beakers with 100 mL of soil.
2. Carefully light the candle with the matches.
3. Cautiously drop the candle into one of the beakers with soil.
4. Allow the candle burn for two – three minutes to be sure gases get released in the beaker.
5. Blow out the candle.
6. Quickly place the thermometers in the beakers
7. Cover the beakers with zip loc baggies as quick as possible to be sure the gases from the candle don't escape.
8. Measure the temperature of each beaker every five minutes.

Observations and Data:

Observations:

· The temperature spiked in the beaker with the gases, in only two minutes, the temperature is already 10 degrees higher than the control beaker.

· The bag with the greenhouse gases appeared “blown up” compared to the bag without the gases.

General Conclusion:

The results did end up supporting the hypothesis. The beaker with the gases from the candle had much higher, steady increasing temperature; however, the control beaker had more of a steady temperature throughout the entire time period. The results of the experiment proved that the greenhouse gases do cause the temperature to rise. The data shows that the temperature rises at an alarming quick pace. In only five short minutes, the experimental beaker shot up ten whole degrees comparing to a mere degree increase by the control beaker.

Although the data matched the hypothesis, the experiment still had sources of error. One aspect that could have been improved was the time intervals. The data was measured every five minutes; however, if that time interval could have been shortened it would have shown much better data. In a five minute interval the data jumped very large amounts. Smaller intervals would have allowed a better picture of what was happening during the lab. The candle also was a source of error. When the candle was blown out it was left in the beaker while the data was being recorded. More accurate data would have been recorded if the candle would have been removed because the heat from the candle could alter the candle making it appear hotter than it really was.

This experiment, as a whole, is very alarming when applying it to the real world. The experiment showed a clear correlation between greenhouse gases and a raise in temperature. This shows that with increased levels of greenhouses gases, the climate is, without a doubt, rising in temperature. The speed of the increase was also very shocking. In a mere five minutes the temperature spiked an entire ten degrees higher than the control. This proves that something needs to be done about greenhouse gas emissions as quickly as possible to prevent a rapid spike in global temperatures.

Data Table

Time (minutes)	Beaker 1 Temperature (Experimental)	Beaker 2 Temperature (Control)
0	23° C / 73° F	23° C / 73° F
5	32° C / 90° F	24° C / 75° F
10	36° C / 97° F	25° C / 78° F
15	38° C / 101° F	27° C / 81° F
20	40° C / 104° F	27° C / 82° F
25	41° C / 106° F	27° C / 82° F

Graph