Name: _____

Period: _____

Lab #2: The ***Enhanced*** Greenhouse Effect

Question

Does an Increase in Greenhouse Gasses Cause an Increase in Temperature?

Background Information

Many scientists believe that our Earth is experiencing an ***enhanced*** greenhouse effect, or Global Warming. Global Warming is the heating of the Earth beyond what is natural. These scientists believe that human activities have added greenhouse gasses to the atmosphere, causing it to increase the average temperature of Earth. They believe that continued Global Warming will lead to numerous disasters, such as the melting of the polar ice caps, larger and more destructive hurricanes, and droughts.

In our previous lab, we simulated the *natural* greenhouse effect using a sealed glass flask that was placed in front of a lamp. The average rise in temperature for that experiment was an increase of **21 degrees Celsius** over a 20 minute period. For this lab, we will be adding greenhouse gasses (carbon dioxide and water vapor) to the sealed flask. This will allow us to investigate whether the presence of those gasses does increase temperature.

1. For this lab, what is the manipulated variable? _____

2. For this lab, what is the responding variable? _____

3. Write the scientific question:

   How does (MV) _____*affect (RV)* _____?

4. Write the hypothesis:

   If the (*MV*) _____ is _____

then the (*RV*)_____ will _____

_____.

This will happen because _____

_____

_____

Methods

Materials:

2 glass flasks	1 stopper with thermometer inserted
1 solid stopper (no hole)	1 stopper with tube attached
1 Alka-seltzer tablet	1 plastic tub with water
1 lamp with 100-watt light bulb	Safety goggles
Timer	

Procedure

1. Report to your assigned lab station. Inventory your supplies to make sure you have everything you will need.
2. Collect a flask of carbon dioxide by following the procedure that was demonstrated by Mrs. Redding.
    A. Fill the plastic tub half full with water. Completely submerge one flask.
    B. Hold the submerged flask with its bottom up, but with the rim still below the surface of the water. It should be completely full of water.
    C. Fill the other flask with 25 mL of water. Have the stopper with tubing and one Alka-seltzer table ready to use. Wait until your team is ready before beginning the reaction.
    D. NOT YET, but when everyone is ready, drop the Alka-seltzer into the flask with water. Insert the rubber stopper and feed the end of the tubing under the water in the bowl so that the bubbles coming from the tube go into the upside-down flask. It will fill up with carbon dioxide gas.
    E. Once the flask is full of gas, and while it is still under water, seal off the top of the flask with the solid stopper. Dry the flask and set it aside.
    F. Carefully dump the water from the bowl into the sink. Rinse and dry the flask that had the Alka-seltzer in it.
    G. Completely dry your work station before you continue.
3. Set the lamp up in the same manner that you used for the previous lab.
4. Take the stopper with the thermometer in it and quickly insert it into the flask that contains the carbon dioxide and water vapor. Wait a minute until the temperature adjusts, then record the temperature on your data table.
5. Place the flask approximately 5 cm in front of the light bulb. Face the thermometer so that you can read it easily.
6. NOT YET, but in just a moment, one partner will turn on the light. Before they do so, be sure that another partner is ready with the timer. Also be sure that the light is not pointed at anyone's eyes.
7. TURN ON THE LIGHT. Quickly make any adjustments that are needed. Be sure that the flask is about 5 cm fro the light bulb.
8. Take a temperature reading every minute for 20 minutes.
9. You may stop recording information if the same temperature is recorded five times in a row.
10. When you are finished collecting data, clean up.
11. Graph and analyze your results.

Safety Precautions- Caution! Danger of broken glass!
Handle glass with care and use protective goggles during the lab.

Data:

Time Elapsed (Minutes)	Temp. (°C)	Change from Start
Before starting		**XXX**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

:

After all teams have reported their data, record the class average for the following data:

	"Air"	"Air in Flask"	Flask w/CO$_2$, H$_2$O
Class Results	Average change in temp.	Average change in temp.	Average change in temp.
	13	21	

Analyze your results:

1. What is global warming? _____

_____

2. How many °C did the air/CO2/water vapor in **your** flask rise? _____

3. Fill in the table below with data that shows the **class average**:

Experiment:	Average Rise in Temp. (°C)
The Greenhouse Effect: Air	13
The Greenhouse Effect: Air in Flask	21
Global Warming Lab: Air/CO2/H2O vapor in flask	

4. Did the data that was collected support our hypothesis? _____ Explain why or why not (using data!). _____

_____

_____

5. Does this experiment show that an increase in carbon dioxide and water vapor in the atmosphere will cause Earth's climate to get warmer? _____ Why/why not?

_____

_____

_____

6. If Earth's climate does get warmer, what are some ways that life on Earth might be affected? (Name two.) _____

_____

_____

_____

7. Sometimes investigating one question leads to even more questions, or give us ideas for other experiments. What other experiments related to greenhouse gasses or global warming would you like to try in the future? Are there any other questions that you could investigate to help you to understand the issue better? (Write two of your choice.)

1. _____

_____

_____

2. _____

_____

Absent? Use this set of data:

MV: Added CO_2 and H_2O

RV: Temperature

Scientific Q./Problem: The Effect of Added CO_2 and H_2O on Temperature

Hypothesis: If (MV) carbon dioxide and water vapor **are** added to the atmosphere, **then the** (RV) temperature **will** increase higher than the previous result of 21°C. **This will happen because** the added gasses will trap and spread more heat.

Finish filling in the "Change from Start" column in the data table.
Graph the "Change from Start" data onto the graph from the "Greenhouse Effect" lab.

Time Elapsed (Minutes)	Temp. (°C)	Change from Start
Before starting	24	**XXX**
1	27	3
2	29	5
3	31	7
4	33	9
5	35	
6	37	
7	38	
8	39	
9	40	
10	40	
11	41	
12	42	
13	42	
14	43	
15	43	
16	43	
17	44	
18	44	
19	45	
20	46	