That Greenhouse Effect!

Welcome to another round of *That Greenhouse Effect!*—the game show on which the contestants not only predict outcomes but also use their keen intellect while working against the clock. I am your host Blaise Haht. Today, contestants are warming up to investigate the results of the greenhouse effect. First let's introduce the contestants. Meet Professor Luke Wharm, who will determine whether the air above light surfaces or the air above dark surfaces is cooler. At the water versus land station is Ms. Sylvia Aguapher, two-time medalist in swimming. Mr. Phil Ruetrot, a landscape architect, is at the wet-soil-versus-dry-soil station. Mr. Ed Blooms, a local paleobotanist, will be at the plants-versus-no-plants station. And last but not least, Ms. Lilith Friese, a professional ice-wall climber, will test the effects of ice and snow on the greenhouse effect. Each contestant will have 40 minutes to construct two greenhouse models and determine which condition is cooler. Let's get the game going. Grab a jar, and check out the heat!

Complete entire lab page on page _____ of your notebook.

1) **Part 1**
2) **Problem:** How do different surface conditions contribute to the temperature of Earth's Atmosphere?
3) **Create a Hypothesis:** In the first round, you have 20 minutes to construct a model and determine what can happen if sunlight were trapped in Earth's atmosphere. Write your hypothesis in your notebook (page)
4) **Materials:**
   a. 2 index cards
   b. Tape
   c. 2 thermometers
   d. 2 rubber bands
   e. Clear plastic wrap
   f. ruler
   g. graph paper
   h. 2 large beakers (same size)
5) **Conduct an Experiment**
   a. **Inside:** Tape an index card around the bulb of each thermometer to shield the bulb from the sun.
   b. Tape each thermometer inside a jar so that the bulb doesn't touch the bottom of the jar, as shown below.

Greenhouse-Model Temperature Data

Observation point	Temperature (°C) control jar	Temperature (°C) experimental jar
Initial temperature in the sun		
2 min		
4 min		
6 min		
8 min		
10 min		

   - In your data table, record the initial temperature of both thermometers.

   d. Cover the opening of one jar with plastic wrap. Secure the wrap with a rubber band. This jar will model the greenhouse effect on Earth while the uncovered jar serves as a control.

   e. Outside: Place the jars in a bright, sunny spot. Read both thermometers every 2 minutes for 10 minutes. Record the temperatures in your data table.

6) **Form a Hypothesis: Round 2**
   a. Many scientists believe that the Earth's surface will heat up as greenhouse gases build up in the atmosphere. But they don't expect all parts of the Earth to warm equally. Consider the following questions:

• Which will heat faster, the air over snow-covered plains or the air over newly plowed fields?
• Which will heat faster, air over the ocean or air over land?
• Does vegetation affect the rate of global warming?
• How does the amount of moisture in the soil affect the rate of global warming?
• Does the temperature of the land affect the temperature of the air above it?

Generate a hypothesis based on one of the questions, and record the hypothesis in your Notebook.

7) **Design an experiment that will test your hypothesis.**
   a. Think of a procedure you could do to test your hypothesis.
   b. Choose materials from the following list for your procedure:
      i. Water
      ii. Wet and dry soil
      iii. Sod or plant pieces
      iv. Ice cubes
      v. White and black paper
   c. Reuse the jars you used in steps 1–4.
   d. Sketch your design in your Notebook.
8) Based on your experimental design in step 5, predict the results that you expect. Write your prediction in your notebook.
9) **Test your Hypothesis**
   a. Create a data table similar to the one you made before.
   b. Describe the conditions of each jar listed in the column headings.

c. Be sure to cover both jars with plastic wrap.
d. Record the results of your experiment in the table.
e. Graph your data.
f. Note any changes you made to your experiment.

10) Take it one step further:

a. Design an experiment that will test "the hole" in the ozone.
b. Does a change in the ozone of your jar affect the overall temperature from Steps 5-8?
c. Be sure to write your prediction
d. Record your results

11) Analyze Your Results

a. Did your results agree with your hypothesis?
b. What does this tell you about your hypothesis?
c. Which variables had the greatest influence on the rate of warming in a greenhouse?
d. Which had the least influence?
e. How did the experiment model the variation in warming different parts of the world?
f. Explain how your model is different from the real "greenhouse" of Earth.
g. How could we use this type of model to help us understand the Greenhouse Effect?
h. Explain how your model differed between the enclosed ozone to an ozone hole.
i. Compare your results with those of your classmates.

EARTH SCIENCE LAB REPORT RUBRIC

Title & Names: 3 points - Clear and concise with correct spelling

Purpose: 10 points - The purpose is a simple statement of purpose or problem to be investigated during the lab. This may be written as a question or as a statement. Use the introduction to the lab to **get you on the right track**. Don't just copy the information. Put this in your words. Give enough information that an uneducated person reading the report would have enough background to understand what is going on

Materials: 6 points - This can be a list. Be accurate if stating units of measure.

Procedure: 10 points **-** List the action steps.

Write a **hypothesis** using an **if →then statement.** State the conditions of the situation and the outcome that is expected. (You will also be able to figure out what should be graphed if you will make a statement. What is the effect of the Independent Variable on the Dependent Variable. IV goes on the x-axis (horizontal) and DV goes on the y-axis (vertical).)

Data: 25 points - Most of the time, a data table is the best way to report this. Use a straight edge when making your tables and make sure they are "roomy" enough for the data. *Always use the proper units!* Clearly organize and label the columns and rows. Identify each sample by either number or letter. There should also be room in this section of the report where you record observations or comments about what happened while running the experiment; as well creating graphs.

Analysis & Conclusion: 46 points - This is the heart and soul of your report. *No report will receive a passing grade without an analysis written in paragraph form and a written conclusion that answers the questions below.* This is the place where you explain the interaction of variables. Illustrate with specific citing of data by sample. You should explain **what the data means** and the sources of errors. If there are ways to improve the lab, mention them here. If there are **graphs** include them in the analysis. Always use graph paper (or computer generated graphs) with the essentials: title, both axes labeled with units of measure, and a legend. The **Conclusion** should answer the question in the purpose. Avoid "wordy" phrases which are unnecessary and do not add to the report. State whether the hypothesis is accepted or rejected. Cite specific data that supports the conclusion.

General Information: Write in the passive force, no first person "I" or ""we".