**How Is A Controlled Experiment Performed?**

**I. Introduction**

 Have you ever wondered whether light or dark clothing would be more comfortable to wear on a hot, sunny day? Scientists conduct scientific experiments to solve problems like this.

 They use a process called a scientific method, which consists of some or all of the following

 procedures:

 1. Recognize the problem: State what you want to find out.

 2. Form a hypothesis: A prediction that you want to test.

 3. Test the hypothesis: State the steps you will take to test your hypothesis. Then design

 and conduct your experiment. Make observations. Record your results.

 4. Analyze the data: Explain any patterns you see. Organize your observations and data

 into a usable table.

 5. Draw conclusions: Is your hypothesis correct? Describe what your observations and

 data indicate about your hypothesis. Did your data support your hypothesis? Decide

 whether your hypothesis was supported. If not take another look at the problem and

 propose a new hypothesis.

 In this Virtual Lab you will use a scientific method and conduct a controlled experiment

 to determine how color affects heat absorption. A controlled experiment involves setting up two

 experimental conditions that are exactly the same except for a single factor that the scientist

 manipulates. The factor you will manipulate in this controlled experiment is color. You will

 apply a heat source, represented by the 60-watt lightbulb, to different colored jackets, and

 compare the temperature change for each color. White light from the sun or from a lightbulb is a

 mixture of all colors of the spectrum: red, orange, yellow, green, blue, and violet. When an

 object is struck by white light, the color you see is the color reflected back to your eyes. For

 example, blue jeans reflect blue light back to your eyes and absorb all of the other colors of the

 spectrum. Objects that appear black absorb all colors of light and reflect little or no light back to

 your eye. Light produces heat and is used in this Virtual Lab to investigate the problem: How

 does color affect heat absorption?

**II. Procedure**

 1. Start the activity by going to the following website :

<http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html> .

 2. Record each step of the procedure.

 ***Make a hypothesis***: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 ***State a testable prediction*** about how color affects heat absorption.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 ***Test your hypothesis***: Select a jacket material by clicking the Wool, Nylon, or Denim

 button. Then drag a different colored jacket into each of the experiment boxes. A

 temperature probe will automatically be placed in the pocket of each jacket.

 3. Click the Test button to start the experiment. When the timer stops, calculate the average

 temperature for each color of jacket, and record these averages in the table. Repeat the

 experiment and test a different jacket material or color.

|  |
| --- |
| **Average Temperature Of Jackets** |
|  **Jacket Color** |  **Wood ˚C** |  **Nylon ˚C** |  **Denim ˚C** |
|  **Black** |  |  |  |
|  **Blue** |  |  |  |
|  **Green** |  |  |  |
|  **Yellow** |  |  |  |
|  **White** |  |  |  |

 4. ***Analyze your data***: Analyze the data in the table. Explain any patterns you observed.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 6. ***Draw a conclusion***: Draw a conclusion about how color affects heat absorption.

 Did your data support your hypothesis? Yes No

 Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 How does the material of the jacket affect heat absorption? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Describe the strengths and weaknesses of the computer model you used in the

 experiment.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 What other parameters could you use in such an experiment to determine the effect of

 color on heat absorption?

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_