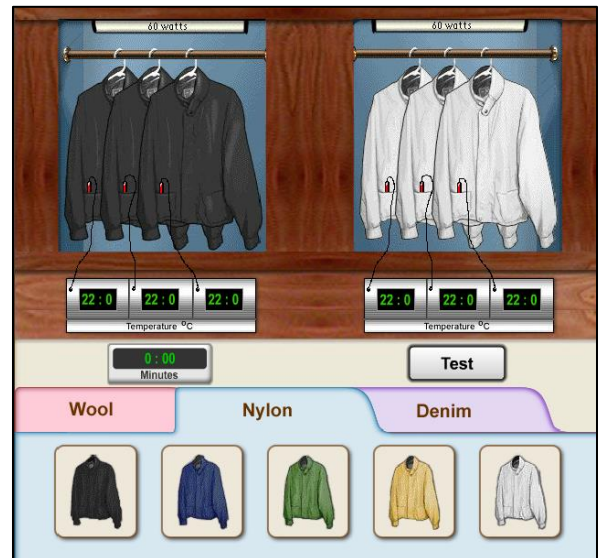


Lab: How is a Controlled Experiment Performed?

HONORS BIOLOGY: CHAPTER 1

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 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 the 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?

Objectives:

- Design a controlled experiment.
- Apply a scientific method to solve a problem.
- Collect and analyze data from a controlled experiment.

Procedure:

1. Go To website: http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html
2. Use your **Journal Questions** section below to record each step of the procedure (*Questions 1-3*).
3. **Make a hypothesis:** State a testable prediction about how color affects heat absorption.
4. **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. Click the Test Button to start the experiment. When the timer stops, calculate the average temperature for each color of the jacket and record these averages in Table #1.
5. **Repeat the experiment** and test a different jacket material or color.
6. **Analyze your data:** Analyze the data in the Table.
7. **Graph your data** in the grid provided on page 4. *Important: Remember to title your graph and label both the x and y axes (Independent and dependent variables)*
8. **Draw conclusions:** Draw a conclusion about how color affects heat absorption. (*Answer questions 4-7 in Journal Questions*)

Journal Questions:

1. What is the **problem** you are trying to solve?

2. Form a **hypothesis**. What is the prediction you want to test?

3. Test your **hypothesis**. How will you use the computer model to test your hypothesis?
 - a. What steps will you follow?

b. What data will your record?

(Conduct your experiment and record your results.)

4. **Analyze the results** of your experiment. Explain any patterns you observed.

5. **Draw a conclusion.** Did the results of your experiment support your hypothesis? Why or why not?

6. How does the material of the jacket affect heat absorption?

7. 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?

DATE TABLE #1

Jacket Color	Wool °C	Nylon °C	Denim °C
BLACK			
BLUE			
GREEN			
YELLOW			
WHITE			
