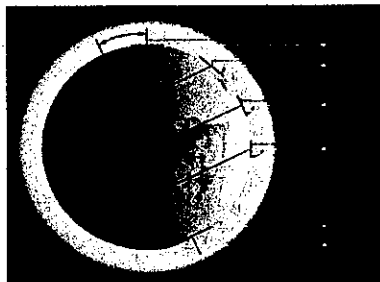
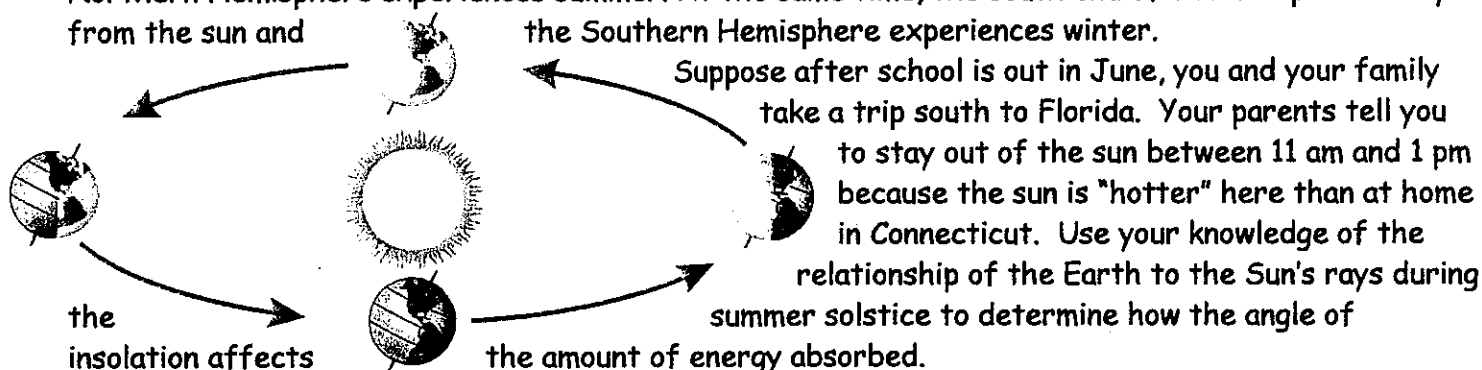


ANGLE OF INSOLATION (CAPT style task)**Student Directions****Introduction**

Have you ever wondered why temperatures are cooler in the winter and warmer in the summer? This happens because the Earth's axis is tilted. The Earth remains tilted as it revolves around the sun. Because of this tilt, different locations on the Earth receive different amounts of solar radiation at different times of the year. The amount of solar radiation received by the Earth or another planet is called insolation.

The angle of insolation (incoming solar radiation) is the angle at which the sun's rays strike a particular location on Earth. When the north end of the Earth's axis points toward the sun, the Northern Hemisphere experiences summer. At the same time, the south end of the axis points away from the sun and the Southern Hemisphere experiences winter.



Suppose after school is out in June, you and your family take a trip south to Florida. Your parents tell you to stay out of the sun between 11 am and 1 pm because the sun is "hotter" here than at home in Connecticut. Use your knowledge of the relationship of the Earth to the Sun's rays during summer solstice to determine how the angle of

Your Task

You will design and conduct an experiment to determine how the angle of insolation affects the amount of energy absorbed. During this activity you will work with a lab partner (or possibly two partners). You must keep your own individual lab notes because after you finish, you will work independently to write a lab report about your experiment.

You have been provided with the following materials and equipment. It may not be necessary to use all of the equipment that has been provided. You may use additional materials or equipment if they are available.

wooden blocks (arranged in 30°, 60°, & 90°)

Timer or clock

3 thermometer probes

High wattage lamp

Laptop

Protractor

Masking tape

Metric ruler

Vernier computer interface

Steps to Follow

1. In your own words, clearly state the problem you are going to investigate. Include a clear identification of the independent and dependent variables that will be studied.
2. Design an experiment to solve the problem. Your experimental design should match your statement of the problem, should control variable, and should be clearly described so that someone else could easily replicate your experiment. Include a control if appropriate.

Write your experimental design in your notes. Show your design to your teacher before you begin your experiment.

3. After receiving approval from your teacher, work with your partner to carry out your experiment.
4. While conducting your experiment, take notes in your notebook. Include the results of your experiment. All data should be organized in tables, charts or graphs, which should be properly labeled. Your notes will not be scored, but they will be helpful to you later as you work independently to write about your experiment and results.

When you have finished your experiment, your teacher will give you instructions for cleanup procedures, including proper disposal of all materials.

Directions for Writing Your Laboratory Report

*Refer to the lab checklist which you were given at the beginning of the year!

Your report should include the following:

- **A clear statement of the problem you investigated.** Include a clear identification of the independent and dependent variables that were studied.
- **A description of the experiment you carried out.** Your description should be clear and complete enough so that someone else could easily replicate your experiment.
- **The results of your experiment.** All of your data should be organized in tables, charts or graphs, which should be properly labeled.
- **Your conclusions from the experiment.** Your conclusions should be fully supported by data.
- **Comments about how valid you think your conclusions are.** In other words, how much confidence do you have in your results and conclusions? Any factors that contribute to a lack of confidence in the results or conclusions should be discussed. Also, include ways that your experiment could be improved if you were to do it again.
- **Answers to these additional questions:**
 1. Why are temperatures warmer near the equator year round? How does this relate to the angle of insolation?
 2. Explain why temperatures are colder during our winter. Use the major concepts from this lab in your answer. Think about how the angle of insolation relates to the amount of energy being concentrated in a particular area.
 3. Explain when the earth is at perihelion and aphelion. Does distance from the sun cause the seasons? Why/why not?
 4. Every year, many hapless vacationers from the Northeast travel to sunny Florida for spring break and receive nasty sunburns. Is the sun really "stronger" in Florida? Why/why not?