

Name _____ Date _____

Title: What's the Angle?

Background Information:

Solar radiation from the sun strikes Earth at different angles depending on latitude, time of day, and the time of year. The angle at which the sun's rays hit Earth is called the angle of insolation. The angle of insolation changes, depending on latitude, because of the spherical shape of Earth. At the equator the sun's rays are most direct, striking at a 90° angle. This provides the most concentrated solar radiation, correlating to warm temperatures. At the poles, Earth's surface is curved, causing the solar radiation to hit at a much smaller angle. This spreads the radiation out over a greater distance, providing the least concentrated radiation. Scattered radiation correlates to colder temperatures.

The angle of insolation changes depending on the time of day because of the rotation of Earth on its axis. This causes the sun to appear to rise and set. At sunrise and sunset the sun is low on the horizon striking Earth at a smaller angle. This scatters the radiation and correlates to cooler temperatures in the morning and evenings. At midday the sun is at its highest point in the sky giving the most direct radiation.

As Earth orbits around the sun, throughout the calendar year, the angle of insolation changes. This is because Earth is tilted slightly on its axis. In this lab you will be investigating how that tilt affects the angle of insolation and in turn causes the seasons experienced in latitudes away from the equator.

Objective: To see how the angle of the sun's rays changes over time and to relate this to seasonal climate changes.

Materials: 2 rulers

Procedures:

1. Stand one ruler up straight, touching the ground.
2. Measure the length of the shadow.
3. Record in data table.
4. Repeat once weekly, at the same time of day.
5. Answer analysis questions, make graph, and draw conclusions.

Prediction: What will happen to the length of the shadow as time progresses?

Quantitative Data:

[illegible]

Graphs:

Make a line graph showing how the length of shadow changed over time. Be sure to label your axis.

[illegible]

Analysis Questions:

1. What happens to the angle of sunlight as summer approaches?
2. Is the sun higher or lower in the sky?
3. Are the sun's rays warmer or colder at these angles? Why?
4. The summer solstice is June 22. This is when the angle of the rays starts to get smaller again. Why is this an important day?
5. Why does the sun's angle change as the year progresses?
6. How does this relate to seasons and climate?
7. Many people think it is colder in the winter because Earth is farther from the sun. Is Earth farther from the sun in winter in our hemisphere?
8. Does the angle of insolation change at the equator throughout the year? What does this mean about the climate at the equator?
9. Draw a diagram representing the position of Earth on its axis during each of the seasons. Draw the angle of insolation as well.
10. What was the rate of change for the shadow? How would this rate of change vary depending on your latitude?

Conclusions: Please explain two things you learned from completing this lab. Be sure to use complete sentences.