

Lamp, globe, and remote thermometers

Please complete the Flashlight activity prior to this one.

1. Make sure that the heat lamp is pointing directly at the Equator and that the heat lamp and globe are about 2 feet apart.
2. Pick up the remote thermometer and pull the trigger.
3. Eventually, it will show you the temperature of the object you are pointing at.
4. In the display, the units of the temperature are shown by a C or F at the far right. If yours is not in F (Fahrenheit), press the F button on the remote thermometer.
5. Press the red button to turn on the laser pointer. A triangle will appear along the upper edge of the display. The thermometer samples the temperature of an area centered on the laser dot. The size of the area sampled depends on how far away the thermometer is. A distance to target scale is printed on the left-hand side of the thermometer.
6. Hold the remote thermometer about 12 to 18 inches away from the globe.
7. Pull the trigger and point the laser dot at the Equator on the side of the globe illuminated by the lamp.
8. Note the temperature.
9. While holding the trigger, slowly move the remote thermometer so that the laser dot moves poleward on the illuminated side of the globe. Keep the thermometer the same distance (12-18 inches) from the globe as you move the laser dot poleward.
10. What do you observe?
11. Explain what you observe.



Sun Angle and Surface Temperature (Lamp, globe, and remote thermometers)

Summary – This activity investigates the role of sun angle on surface temperatures over the earth. When the sun is directly overhead (i.e., at a greater sun angle), sunlight is more intense and able to heat a given area of the earth to a warmer temperature.

Materials Needed

- Globe
- Infrared thermometer
- Heat lamp and stand
- Yard stick

Scientific Questions

How are surface temperatures affected by the angle at which sunlight strikes the earth's surface?

Possible Hypothesis

- Sun angle has no effect on surface temperatures
- Sun angle causes surface temperatures to be warmer at the equator than at the poles
- Sun angle causes surface temperatures to be warmer at the poles than at the equator
- It's not the sun angle that is important, but rather the distance between the sun and the earth

Set up

- Use the yard stick to place the globe about 2 feet from the heat lamp.
- Orient the heat lamp so that it points directly at the equator of the globe.
- Allow the lamp to heat the globe for about 10 minutes before measuring temperatures.

Notes

- The temperature will be warmest wherever the heat lamp is shining directly onto the globe. You may be able to re-orient the globe so that the lamp is directly overhead at other latitudes. This could help students understand that temperatures are not always warmest right at the equator.
- The distance between the globe and lamp is smaller over the equator than at the poles. Students may want to use this fact to explain the warm temperatures at the equator. While distance does affect the intensity of sunlight, sun angle is the primary reason it is warmest where the sun is directly overhead.