

Base your answers to questions 1 and 2 on the data table below and on your knowledge of Earth science. The data table shows the average percentage of insolation from 2006 to 2012 that was reflected during the summer months by the ice sheet that covers a large portion of Greenland.

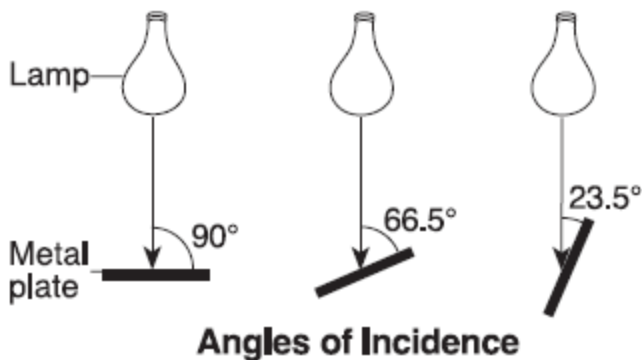
Data Table

Year	Average Insolation Reflected During the Summer (%)
2006	74.3
2007	72.8
2008	72.9
2009	71.8
2010	70.3
2011	70.1
2012	68.3

1. Describe *one* characteristic of the ice sheet that makes it a good reflector of insolation.
2. Describe the general trend for the average insolation reflected by the Greenland ice sheet from 2006 to 2012 and state what can be inferred about the change in size of the Greenland ice sheet during this time period.

Base your answers to questions 3 through 5 on the experiment description and diagram below.

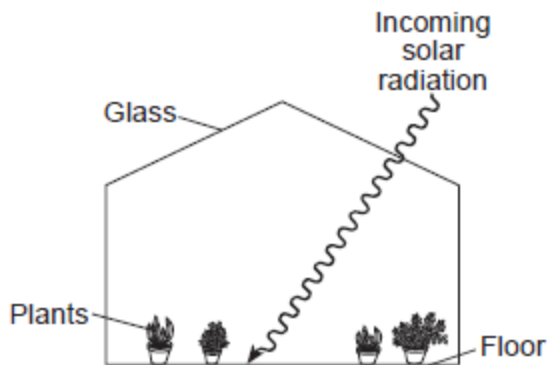
A student was interested in how the angle of insolation affects absorption of radiation. The student took three black metal plates, each containing a built-in thermometer, and placed them at the same distance from three identical lamps. The plates were tilted so that the light from the lamps created three different angles of incidence with the center of the plates, as shown in the diagram. The starting temperatures of the plates were recorded. The lamps were turned on for 10 minutes. Then the final temperatures were recorded.



3. The metal plate at a 90° angle of incidence represents a location on Earth at solar noon on March 21. What is the latitude of this location?

- How would the final temperatures of the three metal plates be different if the experiment was repeated using white metal plates? Explain why the white plates would have these final temperatures.
- Explain why the metal plate at a 90° angle of incidence had a final temperature higher than the other two plates.

Base your answers to questions 6 and 7 on the diagram below, which shows incoming solar radiation passing through the glass of a greenhouse and then striking the floor.



- Describe *one* way the glass in the greenhouse acts like the greenhouse gases in Earth's atmosphere.
- Some of the incoming solar radiation is absorbed by the floor. Identify the type of electromagnetic energy reradiated by the floor.

Base your answers to questions 8 through 11 on the table and map below. The table shows the duration of insolation, in hours, at Barrow, Alaska, on the twentieth day of each month during 2008. The map shows the location of Barrow at 71° N 156.5° W.

Duration of Insolation at Barrow, Alaska

Date	Duration of Insolation (h)
Jan 20	0
Feb 20	7.8
Mar 20	12.5
Apr 20	17.6
May 20	24
June 20	24
July 20	24
Aug 20	16.7
Sept 20	12.6
Oct 20	7.8
Nov 20	0
Dec 20	0



- On what date was the noontime Sun highest in the sky at Barrow?

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9. Explain why Barrow is in a different time zone than New York City.
10. State the altitude of *Polaris* as seen from Barrow.
11. Explain why Barrow receives 0 hours of insolation on December 20.
12. The diagram below represents a beaker of water that is being heated. As the colored dye pellet dissolves, the dye will show the movement of water in the beaker. On the diagram, draw arrows in the water to show the direction the colored dye will move when the water is heated as shown.

