Name: _____ Earth Science Date: _____

# Angle of Insolation Lab

**Objective:** To determine the relationship between the angle of insolation and the intensity of heating at Earth's surface

**Vocabulary:**

- Insolation = _____

- Angle of Insolation = _____

_____

**Procedure:**

1. Imagine that you had set up 3 different thermometers at different angles underneath the same heat lamp and recorded the temperatures every minute. (The data has already been collected for you in the Report Sheet)

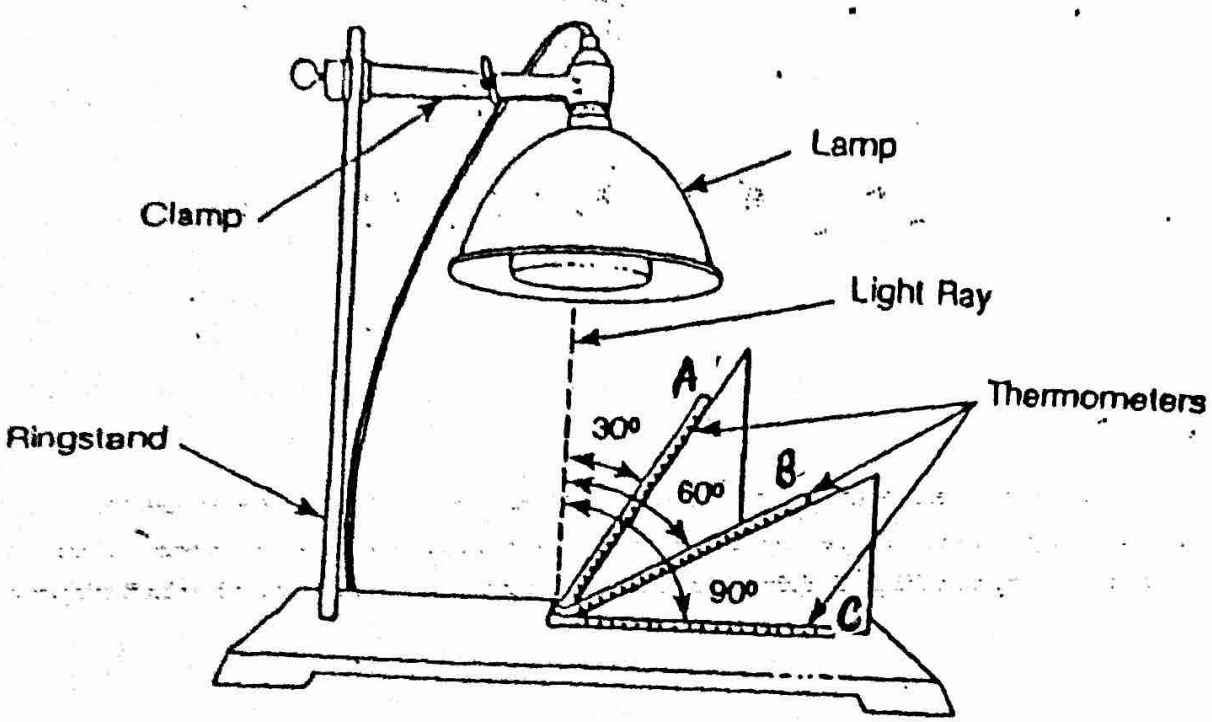
2. Determine the appropriate scale for time (x-axis) and temperature (y-axis) on the graph.

3. Plot the data from position A on the graph and use a colored pencil to draw a *best fit* line.

4. Then plot the data from positions B and C on the same set of axes and use different colored pencils to plot the *best fit* lines. Provide a color key for your graph and label the lines.

5. Respond to the Discussion Questions that follow.

# DIAGRAM




# REPORT SHEET

A

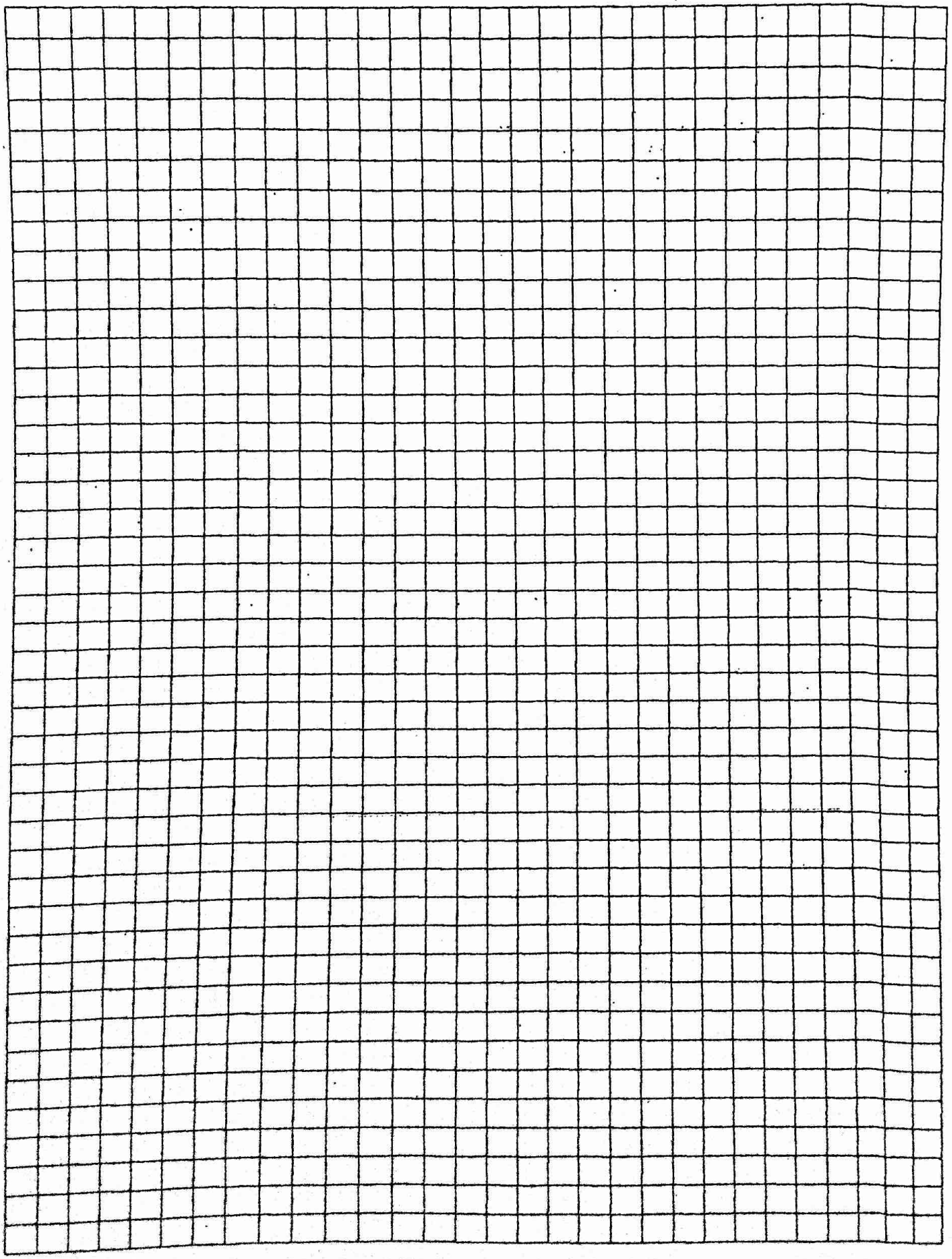
| Time (min) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | 20 | 20 | 22 | 23 | 24 | 25 | 25 | 26 | 27 | 27 | 28 | 28 | 28 |

B

| Time (min) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | 20 | 22 | 24 | 27 | 27 | 28 | 28 | 30 | 32 | 32 | 33 | 33 | 34 |

C

| Time (min) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | 20 | 24 | 26 | 28 | 30 | 32 | 34 | 35 | 36 | 37 | 38 | 38 | 39 |



**Discussion Questions:**

1. Why was it necessary to place all three thermometers the same distance from the light source?

2. a) Which thermometer received the **most intense** radiation? Explain your reasoning.

   b) Which thermometer received the **least intense** radiation? Explain your reasoning.

3. Calculate the rate of heating for each of the thermometers from the beginning to the end of the experiment. Don't forget units!!

| Formula for Rate of Change: | | |
|---|---|---|
| Rate of Change for A: | Rate of Change for B: | Rate of Change for C: |

a) Which thermometer heated at the fastest rate? _____

b) How can you explain your results in terms of the angle of insolation?

3. a) Where on Earth would there be the most direct rays of the Sun (most intense radiation)? Explain.

b) At what time of day would the Earth receive the most direct rays of the Sun? Explain.

**Conclusion:** What is the relationship between latitude and the angle of insolation?

**Critical Thinking:**

Fact #1: The Earth is tilted 23.5° on its axis of rotation.

Fact#2: The tilt of the Earth always faces the same direction in space as it revolves around the Sun.

In each box below, draw the Earth (include tilt) and tell me how these positions relate to the seasons (Northern Hemisphere only).