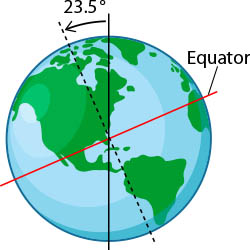
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**Earth’s Seasons Model:**

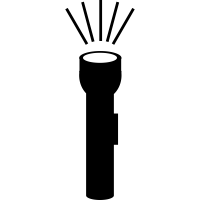
**Why is it Hotter in the Summer?**

**Goal:** In this lab, we are trying to model why it is hotter in the **SUMMER** and cooler in the **WINTER**.

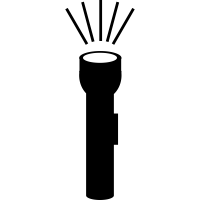


**Explanation:** Most of the heat we feel on the surface of the Earth comes from sunlight. In the summer we get more direct sunlight because the Earth’s tilt points us toward the Sun. In the winter we get less direct sunlight because the Earth’s tilt points us away from the Sun.

**Procedure:** In this lab, your flashlight will model a ray of light from the sun and your graph paper will model a piece of Earth.

1. To simulate **SUMMER**, hold your flashlight at a height of 1 inch and shine a beam of light straight down onto the graph paper. This simulates “direct” sunlight.
2. In pencil, outline the edges of the brightest area of light on your graph paper and label it “summer”.
   1. What shape is the outline?

1 inch

1. To simulate **WINTER**, hold your flashlight at a height of 1 inch but at an angle of 23.5 degrees from vertical and shine it at your graph paper. This simulates “indirect” light.
2. In pencil, outline the edges of the brightest area of light on your graph paper and label it “winter”.

23.5°

1 inch

* 1. What shape is the outline?

**Calculations:** Let’s assume that the flashlight puts out 100 Joules of energy per second (100 Watts). We need to find out how many Joules of energy are hitting each square every second.

1. Count the number of squares that are inside the “summer” circle and in the “winter” circle.
2. Divide 100 Joules by the number of squares in each circle. This will tell you how much energy each square is receiving every second.

|  |  |  |
| --- | --- | --- |
| Season | Summer  (direct light) | Winter  (indirect light) |
| Number of Squares |  |  |
| Energy per Square  (divide 100 joules by the number of squares to get Joules/square) |  |  |

**Conclusion:** When you compare the calculation for the amount of energy per square in summer vs the amount of energy per square in winter, what do you notice? How might this explain why we feel warmer in the summer and cooler in the winter? **Write an explanation of how this lab models the seasons and why there is a temperature difference. Be sure to include the evidence from your model in your explanation.**

**SUMMER** – **Aim the flashlight directly at the grid from a height of 1 inch.**

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**WINTER – Aim the flashlight at an angle of 23.5⁰ from vertical from a height and 1 inch.**

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