

## Explore the Seasons Lab

## Today's Main Idea

- **Heat energy** received on the Earth is dependent on the angle in which the sunlight strikes the Earth.

### Homework Question

**2. Explore today's main idea with this question:**  
What would our seasons be like if Earth's axis were not tilted?

### Vocabulary

- Precession
- Nutation

Helpful Textbook Pages:  
373, 783, dictionary

### Station 1 – Origin of the Seasons

- Read "Reading 1"  
**Record in Your Notebook:**  
 A) Which season's name origin did you find most intriguing or fitting? Why?
- Read "Reading 2"  
**Record in Your Notebook:**  
 B) Sketch the Earth-Sun diagram below in your notebook:
 
 C) Color in the northern hemisphere of the four Earths in each of the positions (#1-4). *Hint: The line shown bisecting the Earth is its axis.*  
 D) Label the positions of the four Earths in your diagram as:  
 #1 = December 21-Winter Solstice ; #2 = March 21-Vernal Equinox ; #3 = June 21-Summer Solstice ; #4 = September 22-Autumnal Equinox  
 E) Using Reading 2, label the arrows appropriately with the name of the four seasons: summer, fall/autumn, winter and spring.  
 C) Is there a trend between Earth's distance to the Sun and hotter seasons? Explain.

### Station 2 – Sunlight Investigation

- Hold the flashlight approximately 6 inches above the paper.
- Shine the flashlight straight down at 90° on the sheet of paper.
- Observe
- Angle the flashlight so that its light hits the paper at a slant of about 45°.
- Observe.

**Record in Your Notebook:**

A) Comment on the different observations you made for each angle of the flashlight. Draw a sketch to help illustrate the difference.

B) What does the flashlight represent in this experiment? What does the paper represent?

C) Which angle (straight down/90° or 45°) gives more intense light? Which gave more overall light energy? Explain.

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- Using the ball to represent the Earth, tilt the Earth to mimic its axis.
- Hold the flashlight in the five locations of the Sun's rays as shown in the diagram to the right.
- Observe.

Each ray

1

2

3

4

5

Arctic Circle 66° N

30° N Tropic of Cancer

Equator

Tropic of Capricorn 30° S

66° S Antarctic Circle

**Record in Your Notebook:**

D) Why is the climate consistently cold at the Arctic Circle and Antarctic Circle?

E) Why is there little change in the climate at the equator?

## Station 2 - Sunlight Investigation

"I am the sheet of paper. Do not write or draw on me!" 😊

### Station 3 – Differential Heating

**Part 2: Heating of the Earth**

- Travel to the heating lamp at the back of the room.
- Create the following table in your notebook:

Time (Seconds)	Temperature of Sand ( )	Temperature of Water ( )
0		
30		
60		
90 (1 min, 30 sec.)		
120 (2 min.)		
150 (2 min, 30 sec.)		
180 (3 min.)		



Record in Your Table in Your Notebook:

- A) What is the initial temperature (at time zero) of the sand? Of the water?

- Turn on the heat lamp. Careful the yellow casing may be HOT!!

Record in Your Table in Your Notebook:

- B) Record the temperature of the sand and water into your table every 30 seconds up to 3 minutes.

- Turn off the heat lamp. Careful the yellow casing may be HOT!!

Record in Your Notebook:

- C) Explain the trend you see in your data table.

### Station 4 – Origin of the Seasons

- Read "Reading 1"

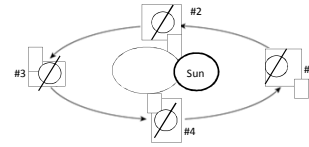
Record in Your Notebook:

- A) Which season's name origin did you find most intriguing or fitting? Why?

- Read "Reading 2"

Record in Your Notebook:

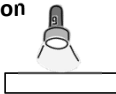
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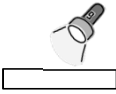
### Station 5 – Sunlight Investigation

- Hold the flashlight approximately 6 inches above the paper.
- Shine the flashlight straight down at 90° on the sheet of paper.
- Observe.
- Angle the flashlight so that its light hits the paper at a slant of about 45°.
- Observe.

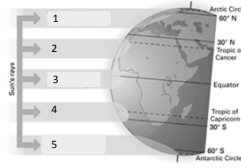


Record in Your Notebook:

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- B) What does the flashlight represent in this experiment? What does the paper represent?
- C) Which angle (straight down/90° or 45°) gives more intense light? Which gave more overall light energy? Explain.



- Using the ball to represent the Earth, tilt the Earth to mimic its axis.
- Hold the flashlight in the five locations of the Sun's rays as shown in the diagram to the right.
- Observe.



Record in Your Notebook:

- D) Why is the climate consistently cold at the Arctic Circle and Antarctic Circle?
- E) Why is there little change in the climate at the equator?

### Station 5 - Sunlight Investigation

"I am the sheet of paper. Do not write or draw on me!" ☺

### Station 6 – Differential Heating

**Part 2: Heating of the Earth**

- Travel to the heating lamp at the back of the room.
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Record in Your Table in Your Notebook:

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- Turn off the heat lamp. Careful the yellow casing may be HOT!!

Record in Your Notebook:

- C) Explain the trend you see in your data table.