

Inquiry 1.2 Reason for Seasons

Directions: Write down the purpose on the first line of your paper.

Purpose: What factors cause the Earth to have seasons?

Background Information:

1. When the sun is high in the sky, what length shadows are made?
2. What season has the shortest shadows?
3. When the sun is low in the sky, what length shadows are made?
4. What season has the longest shadows?
5. What is revolution?
6. What is rotation?



Hypothesis:

If I change the revolution and _____ of earth, **then** there will be different seasons on Earth.

Procedure:

- A. Spin your SEM board around until the Earth's axis (north pole) points towards the clock. No matter where you place the SEM board, the Earth must always point in this direction because Earth's tilt never changes.
- B. Place the clay with the toothpick on the Earth where we live (Illinois, USA).
- C. Shine the flashlight on the toothpick to make a shadow on your globe.
 1. *What needs to happen to make the shadow change length and direction without moving the flashlight (the sun does not move)? Write down the answer on your notebook paper.*
 2. *What does the Earth rotating on its axis cause Earth to have?*
- D. The Sun rises in the East and sets in the West.
 3. *Which direction does the Earth (globe) need to rotate to make shadows appearing on the left of the toothpick (west) move to the right of the toothpick (east) - clockwise or counterclockwise?*
- E. Place the flashlight in the middle of the Earth's "orbit". (Above the sticker that says SUN) Keep the flashlight there throughout the entire simulation because the Sun does not move. The flashlight should be the same height as the globe (aimed at the equator.)
- F. Move the Earth (on the SEM board) around the Sun above all 4 stickers until you see a shadow made by the toothpick that would indicate **summer** in the Northern Hemisphere (NH). After everyone agrees that this arrangement of the sun and Earth makes summer in the NH, *draw this arrangement of the sun and Earth onto your paper.* (Don't forget the Earth's axis!)
- G. Move the Earth (on the SEM board) around the Sun again until you see a shadow made by the toothpick that would indicate **winter** in the NH. Keep your axis tilted towards the clock. Once everyone agrees that this arrangement of the sun and Earth makes winter in the NH, *draw the arrangement of the Sun and Earth on your paper.* (Don't forget the Earth's axis!)

- H. Knowing now where the Earth is (compared to the sun) during summer and winter, move the Earth (on the SEM board) around the Sun to where the Earth would be in the **spring**. Keeping the axis tilted towards the clock, *draw the arrangement of the Sun and Earth on your paper*. (Don't forget the Earth's axis!)
- I. Knowing now where the Earth is (compared to the sun) during summer, winter and spring, move the Earth (on the SEM board) around the Sun to where the Earth would be in the **fall**. Keeping the axis tilted towards the clock, *draw the arrangement of the Sun and Earth on your paper*. (Don't forget the Earth's axis!)
- J. Using your knowledge from this inquiry, redraw the 4 seasons for the Southern Hemisphere.
- K. While shining the flashlight at the same height (parallel to the globe) move the SEM board to the 4 different locations. Observe how much light hits each hemisphere (top half or bottom half of Globe).
4. *For EACH of the 4 seasons, record how much light hits each hemisphere.*

Analyzing the Data:

While answering the following questions, remember to put part of the question back into your answer.

1. How do seasons in the Northern hemisphere compare to seasons in the Southern Hemisphere?
2. Recreate the illustration below and name each of the seasons.
3. What do you notice about the heights of the sun in each of the images below?
4. What are the 2 main factors as to why the Earth has seasons?
5. What would happen to seasons if the Earth were not tilted?
6. What would happen to seasons if the Earth did not revolve around the Sun?
7. What is the relationship between the amount of sunlight that hits the hemisphere and the temperature of that hemisphere?
8. How do you know that Earth rotates counter clockwise (think of how you proved this in the inquiry)



Conclusion:

- Restate your Hypothesis.
- Explain why your hypothesis was correct or incorrect.
- Why is the tilt of the Earth responsible for making seasons?
- Why is the revolution of the Earth (around the sun) responsible for making seasons?
- In which direction does the South Pole have to be tilted in order for the Southern Hemisphere to receive the most amount of light?
- What you learned – based on the results from your lab, explain why we have seasons on Earth. (answer the purpose question).