ACTIVITY - WHEN WILL THE SUN RISE?

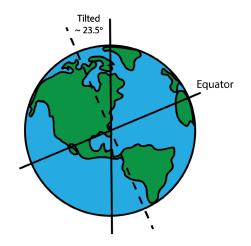
Adapted by NSO from "The Reasons for the Seasons" © 1996-2016 National Geographic Society

OBJECTIVES

- 1. Describe the Earth's rotation, revolution, and tilt
- 2. Understand how they effect Sun rise and Sun set time throughout the year

MATERIALS

- Foam Balls
- Permanent Markers
- Flashlights
- Pushpins
- Stop Watches or other timer
- Data Sheets (included)



BACKGROUND

Build background knowledge and curiosity about what causes there to be longer periods of sunlight during summer days and shorter periods during winter. Ask students how they would explain this phenomenon. Our planet does not stand upright, but instead tilts to the side. *The direction of the Earth's tilt never changes*. Depending on where the Earth is during its revolution around the Sun, the tilt will cause either the northern hemisphere or the southern hemisphere to lean towards the Sun. If you live in the hemisphere leaning towards the Sun, it is summer and you will experience a longer period and more direct sunlight. If you live in the opposite hemisphere, you receive less direct sunlight, have shorter days and it is winter.

DIRECTIONS

- Use a pre-made "globe" or foam ball to review the Earth's tilt and axis. Before beginning, introduce the vocabulary terms: *Tilt, Axis, Hemisphere, Equator, Rotation, Revolution*
- 2. Students team up in groups of 2 or 3. Each group will mark the "equator" of their foam ball by drawing a line around the middle.
- 3. Mark the north pole and south pole by drawing dots on the top and bottom of the foam ball.





4. Place one push pin in the northern hemisphere and one in the southern hemisphere. Make sure the pins are on the same side of your Earth and in line with each other longitudinally. You may also place skewers or chopsticks at the north and south poles to better demonstrate the orientation of Earth's tilt (as shown in "Step 4" picture).



Step 2



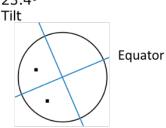
Step 3



Step 4

- 5. Choose a point in the room (e.g. over the door) to represent the North Star, at about 23° from directly overhead. This will help students maintain the direction of Earth's tilt.
- 6. Choose one person in the group to represent the Earth (holds the ball). Keep the north axis of the Earth pointed at the North Star at all times. Choose another person to represent the Sun (holds flashlight).
- 7. The student holding the "Earth" should walk around the student holding the "Sun", while spinning the "Earth" on its axis, keeping the north axis pointed to the North Star. Students should model both the Earth's revolution around the Sun and rotation on its axis. The Earth's tilt is always about a 23.5 degree tilt away from its median, and always in the same direction. The student modeling the Earth's rotation and revolution must be sure to demonstrate this as well.

Demonstrating the Earth's tilt



8. Students develop a hypothesis for the following question: "When the Earth is in this position (refer to the graphic below), which hemisphere has longer daylight? North or South?" **Students can record their hypothesis on the data sheet provided**.



23.4°
Tilt
Equator

Answer: Northern Hemisphere

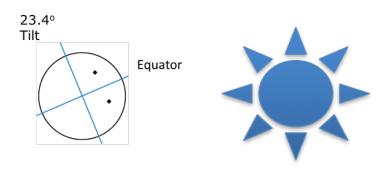




9. Students test this hypothesis by spinning the Earth one full rotation and observing which pushpin (north or south) stays in the light longer with the Earth tilted.

Students can record their observations using the data sheets provided.

10. Repeat steps 7 & 8, except this time place the student holding the Earth in the opposite position, where the southern hemisphere is pointed towards the Sun (as shown below).



Ask: "Which hemisphere has longer daylight now?"

Ask: Where is Hawaii? (close to the equator) how does length of daylight compare to somewhere like Alaska? (further from the equator)

CHECK FOR UNDERSTANDING

Question: What are the two main reasons for the difference in length of daylight between

each hemisphere?

Answer: The tilt of the Earth's axis and its revolution around the Sun.

ENRICHMENT

Do other planets in our solar system have seasons? Do they show differences in how long daylight periods are throughout their revolution around the Sun?

Have students brainstorm answers to these questions and follow-up with a research assignment on the tilts, revolutions, and seasons of other planets within our solar system.

ADDITIONAL ACTIVITIES

For more activities addressing questions like:

"Why are summers warmer?" and "Why are there differences in periods of sunlight between polar and equatorial regions?"

We recommend: LHS GEMS "The Real Reasons for the Seasons" curriculum book.





STUDENT DATA SHEET

Name:

DATA SHEET - EARTH POSITION 1

STUDY QUESTION:

When the Earth is in this position (see picture below), which hemisphere has longer days? North or South?

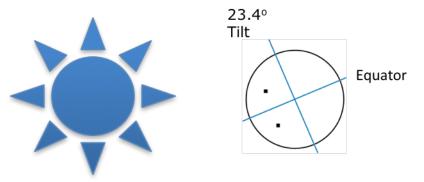


Figure 1. Earth Position 1

Hemisphere	Time (seconds)	Notes
Pushpin in the Northern Hemisphere		
Pushpin in the Southern Hemisphere		

Hypothesis:	

Test your hypothesis:

- 1. Position the flashlight "Sun" and the styrofoam ball "Earth" as you see in figure 1.
- 2. Slowly spin the Earth one full rotation while observing which pushpin (north or south) stays in the light longer with the Earth tilted.
- 3. Using two timers, measure the amount of time, during one full rotation, that each pushpin stays in the light. Be sure to measure both pushpins simultaneously to ensure that the speed of "Earth's" rotation remains the same when testing for both pushpins.
- 4. Record your findings in the data table.

NAME:

DATA SHEET - EARTH POSITION 2

STUDY QUESTION:

When the Earth is in this position (see picture below), which hemisphere has longer days? North or South?

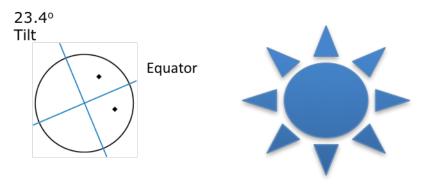


Figure 2. Earth Position 2

Hemisphere	Time (seconds)	Notes
Pushpin in the Northern Hemisphere		
Pushpin in the Southern Hemisphere		

Hypothesis:	

Test your hypothesis:

- 1. Position the flashlight "Sun" and the styrofoam ball "Earth" as you see in figure 2.
- 2. Slowly spin the Earth one full rotation while observing which pushpin (north or south) stays in the light longer with the Earth tilted.
- 3. Using two timers, measure the amount of time, during one full rotation, that each pushpin stays in the light. Be sure to measure both pushpins simultaneously to ensure that the speed of "Earth's" rotation remains the same when testing for both pushpins.
- 4. Record your findings in the data table

- 1. Does the Earth's tilt ever change? Explain. ______
- 2. If the Earth is in this position (Figure 1.) during its revolution around the Sun, and you live in the USA (northern hemisphere), are you experiencing summer or winter? Explain your answer.

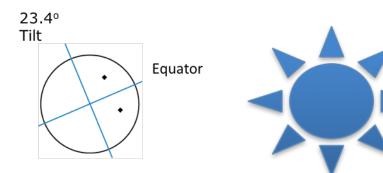


Figure 1.



- 3. What are two main reasons for differences in sunrise and sunset times between each hemisphere? Explain.
- 4. Hawaii is close to the equator. How do you think length of daylight during summer in Hawaii would compare to length of daylight in Alaska, which is further from the equator? Would there be a difference? Why or why not? What about during winter? Move the pushpins in your model to the approximate locations of Hawaii and Alaska to test your hypotheses.