

## Why We Have Seasons

**Grade Level:** 1-2

**Teaching Methods:** Brainstorm, Demonstration, Discussion, Modeling, Observation

**Time:**

- Preparation Time: 15 minutes
- Activity Time: 30-40 minutes

**Materials:**

- Globe
- Lamp
- Pink and purple paper cut outs
- Tape
- *The Seasons* diagram—reference only

### Summary:

Students observe a demonstration that shows how the earth's tilt causes the seasons.

### Objectives:

- Students will name the four seasons and describe at least three similarities and differences between them.
- Students will explain why the seasons are different due to the tilt of the earth and its relationship to the sun.
- Students will interpret differences between seasons in the northern and southern hemispheres.

### PA Environment & Ecology Standards:

- 4.6.4. Ecosystems and their Interactions  
B. Understand the concept of cycles.

### PA Science & Technology Standards:

- 3.1.4. Unifying Themes  
C. Illustrate patterns that regularly occur and reoccur in nature.  
E. Recognize change in natural and physical systems.
- 3.2.4. Inquiry and Design  
A. Identify and use the nature of scientific and technological knowledge.
- 3.5.4. Earth Sciences  
C. Know basic weather elements.

### Other PA Standards:

- Geography

### Background:

The four seasons are the result of the tilt of the earth. The earth rotates around an imaginary line passing through the poles, called the *axis*. This line forms a  $23.4^\circ$  angle, called the *tilt*. As the earth orbits the sun, the axis always points in the same direction. When the north pole is tilted toward the sun, it is summer in the northern hemisphere because the sun's rays strike the earth more directly above the equator. When the north pole is tilted away from the sun, its rays strike the northern hemisphere less directly. Because the sunlight is more spread out and weaker, it is when we

have winter. (See attached image.)

The seasons are opposite in the southern hemisphere. The sun's rays shine more directly on the southern hemisphere in December and less directly in June. In the spring and fall, the sun shines fairly straight on the equator, giving both hemispheres equal warming. If the earth were not tilted, there would be no difference in how the sun's rays hit different regions, and there would be no seasons.

Polar zones experience the greatest seasonal change. Parts of Siberia can vary in temperature from  $-108^{\circ}\text{F}$  in winter to over  $97^{\circ}\text{F}$  in summer. On the other hand, areas near the equator have balmy temperatures year round with little annual temperature change. Between these extremes temperate areas at mid-latitudes, such as Pennsylvania, have four well-defined seasons.

Each of the four seasons begins and ends at an equinox or a solstice. The two yearly equinoxes occur when the sun crosses the celestial equator. Equinox comes from a Latin word meaning "equal night." On an equinox, sunrise and sunset are about 12 hours apart everywhere on earth. In the northern hemisphere, the vernal equinox occurs around March 21 and the autumnal equinox occurs around September 21.

Solstices occur when the sun is furthest from the equator and one pole is at its closest position to the sun. In the northern hemisphere, the summer solstice occurs around June 21, when the sun reaches its most northern point over the planet. The days around the summer solstice are the longest of the year. After this date the days begin to get shorter. The winter solstice is the shortest day of the year. It occurs around December 21 and marks the beginning of winter.

## Getting Ready:

- Cut out a small stick person from both the purple and pink paper. Each paper person should be about two inches high. One paper person will be taped to the globe halfway between the equator and the north pole and the other will be taped halfway between the equator and the south pole.

## Activity:

1. Explain to the students that they will be taking a trip to Presque Isle State Park where they will study what plants and animals do during different seasons of the year. Before they go, tell them that you would like them to know why we have different seasons.

2. Ask the students to name the four seasons. What are

some differences and similarities between the seasons?

3. Show the students a globe with the correct tilt. Point out the north and south poles and how the earth is tilted. Explain that as the earth revolves around the sun, the tilt always points in the same direction. This means that different parts of the earth get different amounts of sunlight at different times of the year.

4. Explain that you will demonstrate why we have seasons. (This activity works best in a darkened room.) Place a lamp on a table with the shade removed. Explain that the lamp represents the sun. Tape the purple person on a globe midway between the equator and the north pole. Tape the pink person midway between the equator and the south pole. (Both of the paper people should be at the same longitude, but different latitudes.)

5. Walk around the sun (lamp) demonstrating how the globe is always tilted in the same direction. After you make one complete circle, stop when the north pole is tilted nearest to the sun. Spin the globe so that the paper people are in the light. Ask the students if the sun is shining more directly on the purple person or the pink person. Would it be hotter for the purple person or the pink person? Is it summer or winter for the purple person? (*summer*)

6. Now orbit the sun halfway around making sure to keep the earth tilted properly. At this point the north pole should be pointing away from the sun. Spin the earth so the paper people are in the light. Is the sun more direct on the purple person or the pink person? Who is having summer this time? (*pink*) Who is having winter? (*purple*) Explain that the seasons are opposite for people who live on the top (northern) part of the earth and people who live on the bottom (southern) part of the earth. When we are having summer, people in South America are having winter.

7. Repeat the steps explaining that when the north pole is pointed toward the sun, it shines more directly on us and we have summer. When the north pole points away from the sun, it shines less directly on us. This causes the sunlight to be more spread out and weaker, and is when we have winter.

8. Remove the pink person from the globe. Ask the students where they think the earth would be when it is autumn. Remind students that autumn is between summer and winter. Have the class help you position the earth so that it is summer for the purple person. Tell the class that you will slowly move the earth toward its winter position. Ask them to tell you to stop when they think it is autumn,

or halfway between summer and winter. Repeat the process for spring.

9. As a review, have students come up and position the globe for different seasons. Have the class help any students who seem confused.

### **Evaluation:**

- Students name the four seasons and the similarities and differences between them.
- Students describe how the earth is tilted in relation to the sun in each season.
- Students identify differences in seasons between the northern and southern hemispheres.
- Students demonstrate the four seasons using a globe as a model.

### **References:**

- Macmillan Publishing, *The Way Nature Works*, 1992.
- National Wildlife Federation, *Ranger Rick's Nature Scope, Wild About Weather*, 1985.
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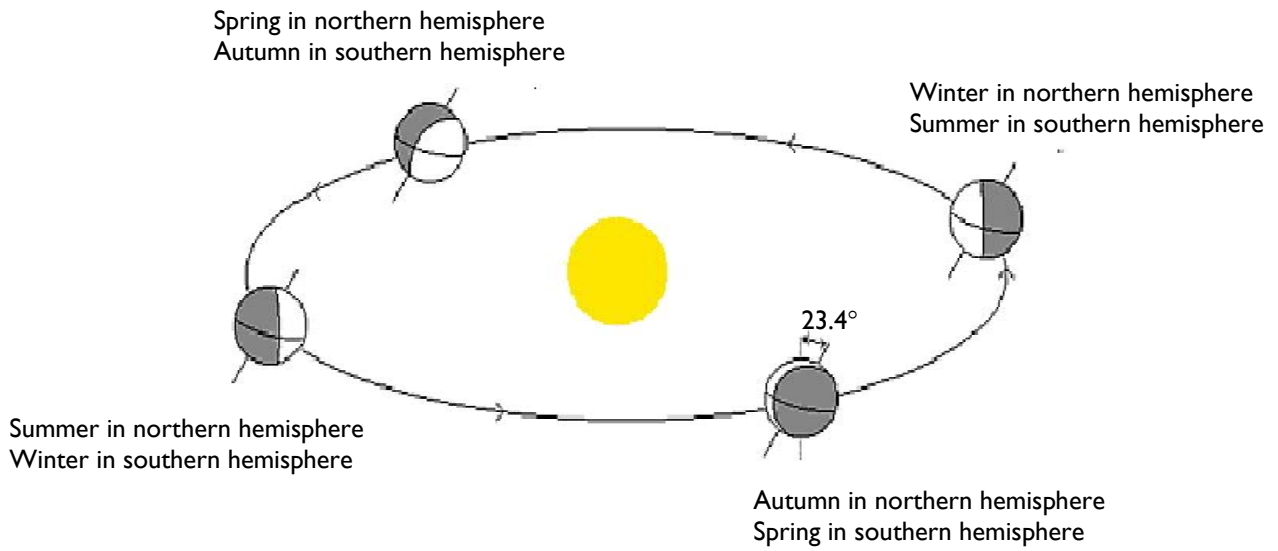
### **Developed By:**

- E-Concepts LLC, Albert, JoAnn and Davis, JoAnn, 2005.



# The Seasons

Reference Only



Produced by the Astronomy Information Service of the Royal Observatory Greenwich  
Image by Duncan Kopernicki