# Passports

Seasons

## *Celebrating Science: Seasons*

**Grade: 5-8**

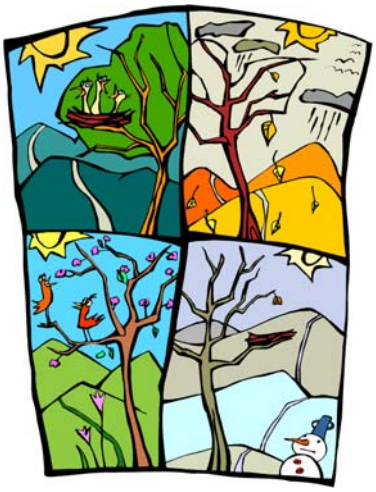
**Description of our Tour:**

Winter, spring, summer, and fall! In this Celebrating Science Passports students will explore rotation and revolution and come to understand how the earth's rotation and revolution around the sun create different seasons. Students will interact with a scientist who will present visual models of rotation and revolution.

## Information for Trip Leader:

### Lesson Outcomes:

The student will:



- Students will understand the difference between rotation and revolution of the earth.
- Students will understand the role of revolution in seasonal change, as well as rotation in creation of day and night.
- Students will become familiar with the physical bases that determine the length of day, length of year, and the differences in seasonal conditions in the northern and southern hemisphere.

### Activities:

#### *Activity # 1: Seasons Crossword Puzzle*

After learning about the seasons have the students complete the Seasons Crossword Puzzle. The challenge is that there is no word bank for the students to use (modifications can be made for younger students or students with difficulties by writing a “word list” on the board).

#### *Activity # 2: Modeling the Seasons*

How can you model the events of the seasons in the classroom? Give the students objects to model the seasons, and the length of the day (examples: globe, spherical objects, flashlight, candle). Then have the students quiz their fellow classmates! One student will model different seasons and then ask classmates to tell which season he/she is modeling. They can also draw diagrams of the different seasons and ask classmates to guess which season they drew. Have them explain their reasoning to you.

#### *Activity # 3: Myths of the Seasons*

Before science was able to explain the reason for the seasons, people came up with their own stories as to why the seasons change. Read the Greek myth about Demeter and Persephone, provided at the end of this resource guide to your students. Then let the students work alone or in groups to create a myth of their own explaining why the seasons change.

**(Reproducibles and Answer Keys Follow)**

Seasons

### Challenge Questions:

1. *What is solar insolation? What factors control solar insolation on earth?*

2. *What time of the year is the earth closest to the sun?*

3. *What is responsible for the seasons on earth?*

4. *Why is it warmer at the equator than in areas north or south of the equator? Make sure to include the idea of insolation in your answer.*

5. *Why do some parts of Alaska receive 24 hours of daylight on June 21st? How many hours of daylight occur in the South Pole on June 21st?*

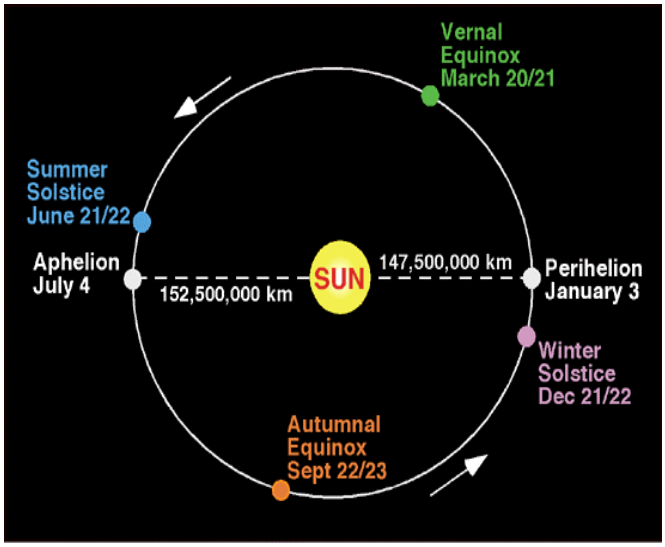
**Responses:**

1. The amount of sunlight the earth receives is called its insolation, or its incoming solar radiation. Two factors cause the solar insolation to change, the length of day and the angle that the sun strikes the earth. The length of day controls how much sun light is received on earth and the angle controls the intensity of sunlight in any given area. This diagram models how the angle of sun striking the earth impacts the insolation in an area.


   The diagram shows that when the sun shines directly overhead, the sunlight is concentrated in a small area. When the sun is lower in the sky, the sunlight is not as intense because it gets spread out over a larger area.

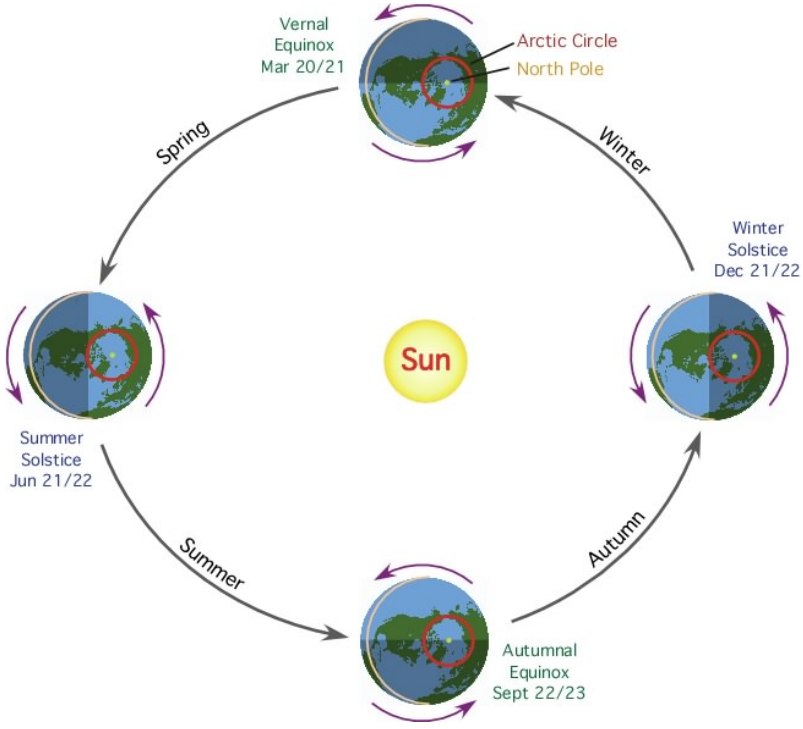
2. The earth is actually closest to the sun in early January. This is called the perihelion.

3. The earth's proximity to the sun is not responsible for the changes in seasons. The tilt of the earth on its axis is responsible for the seasons. When the axis in the North Pole points toward the sun, it is summer in the northern hemisphere because the insolation is greatest. The day of greatest insolation is called the summer solstice. It occurs in the northern hemisphere on June 21st. It is summer in the southern hemisphere when the axis in the South Pole is pointing toward the sun. The day of greatest insolation in the southern hemisphere occurs on December 21st.




4. It is warmer at the equator than in areas with mid-latitudes, because throughout the year the hours of daylight vary less as does the angle of incoming solar radiation. Insolation is greater along the equator making that region warmer than areas north or south of the equator.

5. Certain parts of Alaska received 24 hours of daylight on June 21st because the Earth is tilted on its axis (23.5 degrees). As the Earth revolves around the sun, this tilt enables certain areas on Earth to receive more daylight than others. (See the diagram below to understand what parts of the Earth receive daylight during specific times throughout the year.) The amount of daylight received by areas near the North or South Pole varies considerably throughout the year. However, the amount of daylight received in areas around the equator only fluctuates slightly throughout the year. On June 21st, all areas in the North Pole (Artic Circle) experience 24 hours of daylight, and all areas in the South Pole (Antarctic Circle) experience 24 hours of darkness or night. On December 21st, all areas in the North Pole (Artic Circle) experience 24 hours of darkness or night, and all areas in the South Pole (Antarctic Circle) experience 24 hours of daylight. During the two equinoxes, the amount of daylight cuts through the polar axis and all locations on the Earth experience 12 hours of day and night.

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**Vocabulary Words:**

**Revolution:** The movement of the earth around the sun.

**Rotation:** The spinning of the earth on its axis.

**Ellipse:** An ellipse is a shape that can be thought of as a "stretched out" circle or an oval. When one object is in orbit around another object, the orbit is usually an elliptical orbit. For example, all of the planets in our solar system move around the sun in elliptical shaped orbits.

**Solstice:** Either of two times of the year when the sun is at its greatest distance from the celestial equator. The summer solstice in the Northern Hemisphere occurs about June 21, when the sun is in the zenith at the tropic of Cancer; the winter solstice occurs about December 21, when the sun is over the tropic of Capricorn. The summer solstice is the longest day of the year and the winter solstice is the shortest.

**Summer solstice:** In the Northern Hemisphere, the solstice that occurs on or about June 21.

**Winter solstice:** In the Northern Hemisphere, the solstice that occurs on or about December 22.

**Autumnal equinox:** The point at which the ecliptic intersects the celestial equator, the sun having a southerly motion. The moment at which the sun passes through the autumnal equinox, about September 23, marking the beginning of autumn in the Northern Hemisphere.

**Vernal equinox:** The point at which the ecliptic intersects the celestial equator, the sun having a northerly motion. The moment at which the sun passes through the vernal equinox, about March 21, marking the beginning of spring in the Northern Hemisphere.

**Perihelion:** The point nearest the sun in the orbit of a planet or other celestial body.

**Aphelion:** The point on the orbit of a celestial body that is farthest from the sun.

**Insolation:** The rate of delivery of solar radiation per unit of horizontal surface.

**Video Links:**
*For teachers: Watch this introduction to the experiment.*
http://easylink.playstream.com/21_CenturyLearning/science/seasons_teacher_intro_only.rm

*For students: Watch the experiment about Seasons:*
http://easylink.playstream.com/21_CenturyLearning/science/seasons_lesson_only.rm

**Writing Prompts:**

1. The most interesting thing about the seasons is _____ because...

2. If you lived at the North Pole, you would experience 24 hours of daylight during certain times of the year and 24 hours of darkness during other times of the year. Why? Which other places on earth would this also occur?

3. How do you think it would feel to live in a place that received 24 hours of daylight or darkness? Comment on some of the things that would be different about your life in this type of environment.

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**Seasons Crossword Puzzle**

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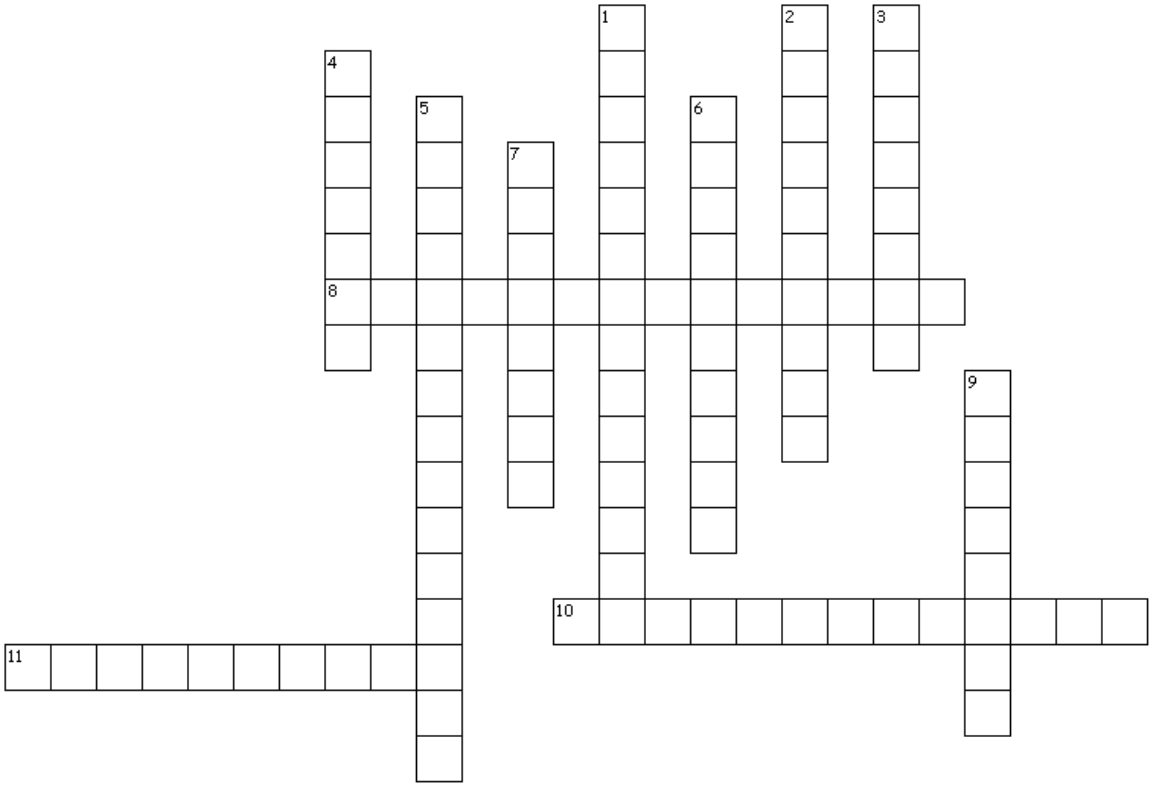

**Across**

8. In the Northern Hemisphere, the solstice that occurs on or about June 21
10. The point at which the ecliptic intersects the celestial equator, the sun having a northerly motion, about March 21.
11. The point nearest the sun in the orbit of a planet or other celestial body.

**Down**

1. In the Northern Hemisphere, the solstice that occurs on or about December 22
2. The rate of delivery of solar radiation per unit of horizontal surface.
3. Either of two times of the year when the sun is at its greatest distance from the celestial equator
4. A shape that can be thought of as a "stretched out" circle or an oval.
5. The point at which the ecliptic intersects the celestial equator, the sun having a southerly motion, about September 23.
6. The movement of the earth around the sun
7. The point on the orbit of a celestial body that is farthest from the sun.
9. The spinning of the earth on its axis.

**Seasons Crossword Puzzle Answer Key**

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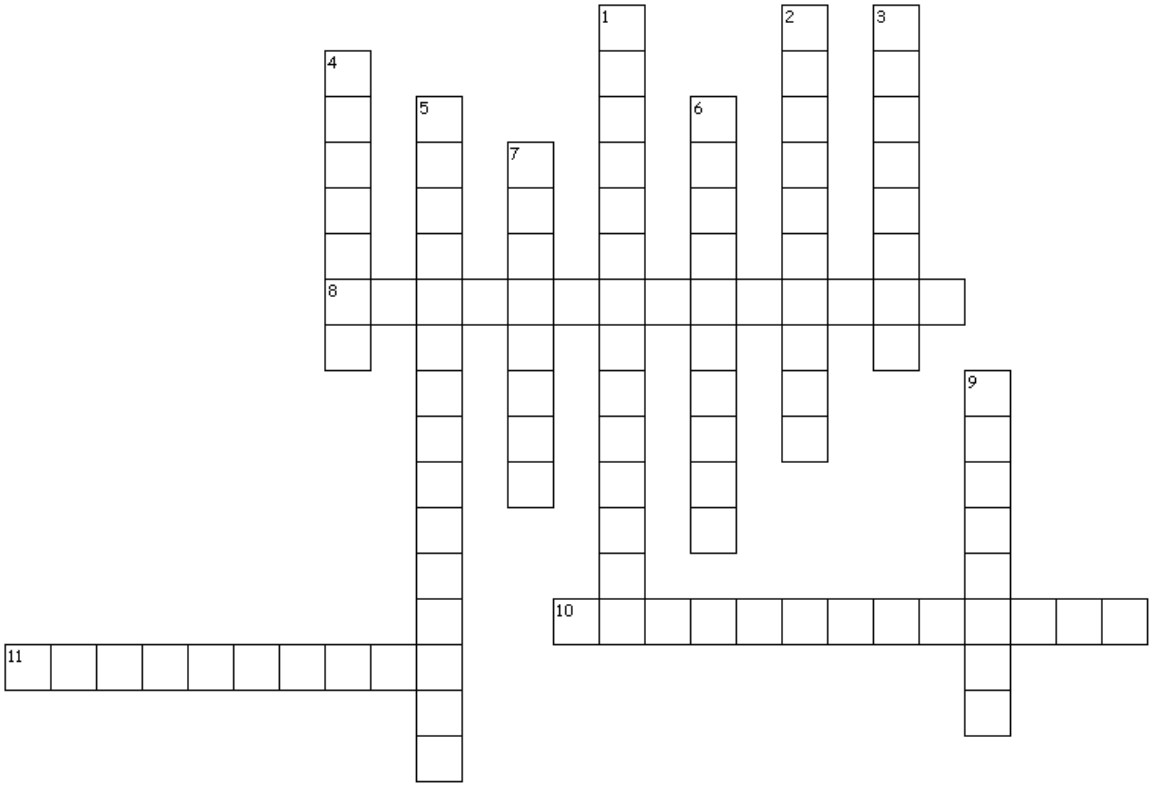

**Across**

8. Summer Solstice- In the Northern Hemisphere, the solstice that occurs on or about June 21
10. Vernal Equinox- The point at which the ecliptic intersects the celestial equator, the sun having a northerly motion, about March 21.
11. Perihelion- The point nearest the sun in the orbit of a planet or other celestial body.

**Down**

1. Winter Solstice- In the Northern Hemisphere, the solstice that occurs on or about December 22
2. Insolation- The rate of delivery of solar radiation per unit of horizontal surface.
3. Solstice- Either of two times of the year when the sun is at its greatest distance from the celestial equator
4. Ellipse- A shape that can be thought of as a "stretched out" circle or an oval.
5. Autumnal Equinox-The point at which the ecliptic intersects the celestial equator, the sun having a southerly motion, about September 23.
6. Revolution- The movement of the earth around the sun
7. Aphelion-The point on the orbit of a celestial body that is farthest from the sun.
9. Rotation- The spinning of the earth on its axis.

## Myths of the Seasons

Procedures:

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1. Ask students why the seasons change. (Earth is tilted away from the Sun, and as it moves around the Sun different regions receive more or less heat and sunlight.)
2. Tell students that before people had the science and technology to understand the relationship between the Sun and Earth, they created stories to explain why the seasons change.
3. Ask students if they know the Greek story of Hades and Persephone. If some of them know it, help them tell the story to the rest of the class. Otherwise, relate the story yourself. (below)
4. Tell students that they are going to create their own myths about changing seasons. Their stories can be funny or serious. Students can set their stories in a mythological setting or in the present day.
5. You can give your students a graphic organizer to help plan their stories.
6. When the stories are finished, have students take turns reading them to the class.
7. If you like, you can have students illustrate their myths and place the illustrations around the room.

### *Persephone and Hades*

Demeter (dee-MEE-tur; Roman name Ceres) was the goddess of agriculture. Demeter is the sister of Zeus and the mother of Persephone.

Persephone was gathering flowers in a meadow one day when a huge crack opened up in the earth and Hades, King of the Dead, emerged from the Underworld. He seized Persephone and carried her off in his chariot, back down to his realm below, where she became his queen. Demeter was heartbroken. She wandered the length and breadth of the earth in search of her daughter, during which time the crops withered and it became perpetual winter.

Finally she learned of her daughter's fate, and pleaded with Zeus, to obtain the release of Persephone from the dark kingdom of the Underworld. At length Zeus persuaded Hades to surrender Persephone for one half of every year to live in the light of day with her mother. This is when we enjoy the spring and summer seasons, when flowers bloom and the earth bears fruit once more. The half year that Persephone spends in the Underworld as Hades' queen coincides with the barren seasons of autumn and winter.

## Myth Writing Graphic Organizer

### Beginning

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