

Name: _____
Mr. Willis
Conceptual Physics: _____
Date: _____

Unit XII
The Universe
Need extra help?
Check out <http://www.bayhicoach.com>

XII

Sun, Moon & Seasons Activity

Directions: First complete the prelab by circling the correct response. When everyone has finished the prelab correctly then we will start the activity.

Reading: (Circle the correct response.)

1. From the perspective of the North Pole the Earth spins [clockwise, counterclockwise.]
2. During the summer solstice the North Pole is pointed [toward, away from] the sun.
3. The equinox is when the length of day is [equal to, less than, greater than] the night.
4. The tropics surround the equator indicating positions where the sun can be [directly south, directly north, directly overhead]

Activity: Start by choosing one of the six months. Bring a globe near the position and point the north pole of the globe toward the front of the room. Spin the globe counter clockwise (CCW).

June: The North Pole is toward the North Star. Spin the globe CCW once to simulate the passage of one day.

- a. Does the South Pole receive any direct sunlight during the month of June? _____
- b. Where on Earth is the sun at zenith? (lies on the ecliptic) Tropic of? _____

February: The North Pole is toward the North Star. Spin the globe CCW once to simulate the passage of one day.

- a. Is the phase of the moon a full moon, new moon or half moon? _____
- b. Can the moon possibly cause a solar eclipse at this position? _____

September: The North Pole is toward the North Star. Spin the globe CCW once to simulate the passage of one day.

- a. Imagine a line from the center of the Earth straight to the sun. Does this line pass through the equator? _____
- b. Where on Earth is the sun at zenith? _____ (Hint: This line is traced around the Earth.)

March: The North Pole is toward the North Star. Spin the globe CCW once to simulate the passage of one day. Place your fist (the moon) between the Earth and the sun.

- a. Is this a new moon or a full moon? _____
- b. If the moon (your fist) casts a shadow on the Earth is it a solar eclipse or a lunar eclipse?

- c. Where on Earth is the sun at zenith? _____ (Hint: This line is traced around the Earth.)

July: The North Pole is toward the North Star. Spin the globe CCW once to simulate the passage of one day. Place your fist (moon) on the opposite side of Earth from the sun.

- a. Is this a full moon or a new moon? _____
- b. If the Earth casts a shadow on the moon is this a lunar or solar eclipse? _____

December: The North Pole is pointed toward the North Star. Spin the globe CCW once to simulate the passage of one day.

- Which hemisphere receives more sunlight the north or south? _____
- Imagine a line from the center of the Earth straight to the sun. Does this line pass through the equator? _____
- Where on Earth is the sun at zenith? Tropic of _____
- Does the sun rise at the South Pole at this time of year? _____

THE SEASONS

- Our planet takes just over 365 days to orbit the Sun – the basis of our calendar year
- The Earth's axis is tilted at an angle of 23.5 degrees
- This means that different parts of the globe receive varying amounts of sunlight during the year, creating the seasons

Day and night

Imagine a rod going from the north pole through the centre of the Earth and out of the south pole. Over the course of 24 hours, the planet spins once around this central rod or 'axis'. When we're facing the Sun, the sky is light and it's daytime. Then we turn away from the Sun and it's night.

Years and seasons

The Earth takes just over 365 days to move around the Sun once and end up back in the same position. This is the basis of our calendar year.

We divide the year into seasons. Many people think that some parts of the year are hotter because we're nearer to the Sun. But the real reason is that the Earth is wonky.

Our wonky planet

The central axis that goes through the poles is tilted at an angle of 23.5 degrees, so it's not at right angles to the way we're traveling. As we move around the Sun during the year, the amount of light each area of the planet receives varies in length.

Here's a description of how the seasons change in the northern hemisphere. (If you live in the southern hemisphere, then you need to reverse the seasons).

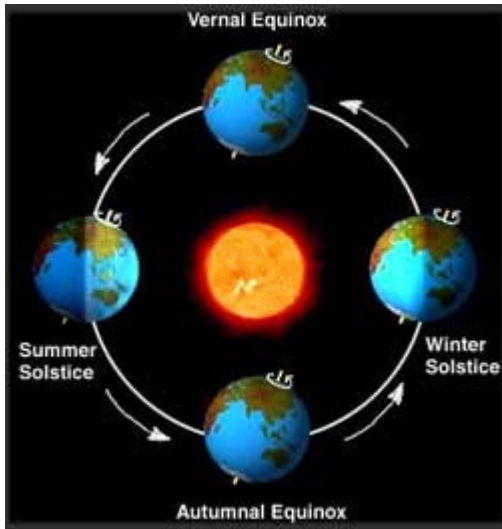
Glossary

Spring equinox - day and night are each 12 hours long and the Sun is at the midpoint of the sky.

Summer solstice - the longest day of the year, when the Sun is at its most northern point in the sky.

Autumn equinox - day and night are each 12 hours long and the Sun is at the midpoint of the sky.

Winter solstice - the shortest day of the year, when the Sun is at its most southern point in the sky.



As the Earth orbits the Sun it tilts on its axis

Summer

The day the north pole is nearest the Sun is called the 'summer solstice'. (You can see this from the picture on the right). Looking from Earth, the Sun reaches its highest point in the sky all year. This means it takes the most amount of time to cross the sky. So this is the longest day of the year. Its called the 'summer solstice' and happens around 21 June. Astronomers call this the start of summer and after this date, days start getting shorter.

Autumn

As we continue our journey around the Sun, the north pole moves away from the Sun. The Sun rises lower in the sky so the days continue getting shorter. When the Sun is at its mid-point in the sky, we reach the 'autumn equinox', around 22 September. Day and night are both 12 hours long and its the beginning of autumn.

Winter

The day when the north pole is furthest from the Sun is called the 'winter solstice'. The Sun crosses the sky at its lowest point all year. Therefore it crosses the sky in the quickest time so this is the shortest day of the year. Winter solstice happens around 22 December and marks the start of winter. From then on, the days start getting longer.

Spring

The Earth continues on its path, and our north pole starts moving towards the Sun again. The Sun moves upwards in our skies and the days continue getting longer. Again, we reach a midpoint when day and night are both 12 hours long. This is called the 'vernal (or spring) equinox' and happens around 21 March.

Seasons across the world

The further north or south you live in the world, the more pronounced the seasons are. For example, in the far north, Alaska has sunshine 24 hours a day during their summertime.

On the equator

If you live near the equator, the Sun doesn't shift up and down in the sky as much. This means that the length of day temperature doesn't vary as much. So countries near the equator only have two seasons - rainy and dry.

Why does the Earth tilt?

No one knows why the Earth's axis is tilted by 23.5 degrees. Some astronomers think that

about 5 billion years ago, when the Earth was still very young, it was struck by a Mars-sized planet. This colossal impact could have tipped our planet over. Whatever the reason, it's a good thing - if the Earth did not tilt, countries near the poles would be cold and dark all year round. If it tilted too much, the seasons would be very extreme – like on the planet Uranus. Here the winter lasts for 42 years in total darkness!