**Seasons Vocabulary**

***Axis*** - An imaginary line going from the North Pole to the South Pole. The Earth spins on this line.

***Axis***



***Axis***

(Image source: PhysicalGeography.net)

***Direct Sunlight*** - Covers a small surface area; heat is concentrated and warmer; Sun is high in the sky; summer heat energy is direct.



***Indirect Sunlight*** - Covers a large surface area; heat is spread out and colder; Sun is low in the sky; winter heat energy is indirect.



***Orbit*** - The path that a planet travels as it goes around the Sun or a moon takes as it goes around a planet.



(source: Clark Planetarium)

***Revolution*** - The circling of the Earth around the Sun. (The Moon also revolves around the Earth.) It takes 365 days (one year) for the Earth to revolve once around the Sun.



***Rotation*** – The Earth spinning on its axis. It takes the Earth 24 hours (one day) to revolve one time around its axis.

***Axis***



***Earth rotates counterclockwise.***

***Axis***

(Image source: PhysicalGeography.net)

***Seasons*** - Due to the tilt of Earth as it travels around the Sun, we have spring, summer, fall, and winter.

***Tilt*** - The Earth’s axis is not straight up and down, instead it leans at a 23.5-degree angle.





*Q: What is more useful: the Sun or the Moon?
A: The Moon, because the Moon shines at night when you want the light, but the Sun shines during the day when you don't need it.*

*Unknown Student*

The Earth is tilted as it revolves around the Sun.



(Image source: FactMonster.com)

Why do we have seasons?

***It’s the tilt, baby!***



(Image source: http://www2.astro.psu.edu)

As the Earth revolves around the Sun, the Earth remains tilted. The North Pole always points at the Polaris, the North Star.



***Misconceptions about the Seasons***

* That it is winter because it is cold or because of snow, or that it is summer because it is hot (rather than it is cold because it is winter).
* That we experience seasons because of the Earth's changing distance from the Sun (closer in the summer, farther in the winter), instead of understanding that Earth’s orbit around the Sun is almost a perfect circle.
* Seasons happen at the same time everywhere on Earth.
* Seasonal characteristics and change are the same everywhere on Earth.

***All of these statements are wrong!!!!!!!***

The distance from the Sun doesn’t have any effect on the heating and cooling of Earth. In fact, we are closest to the Sun during winter in the Northern Hemisphere. The combination of the Earth’s revolution around the sun and Earth’s 23.5o tilt are the reasons we have seasons.

As Earth revolves around the Sun, different parts of the Earth are tilted towards or away from the Sun. In the summer, the Earth (Northern Hemisphere) is tilted towards the Sun.



(source: British Sundial Society)

In the winter, the Earth (Northern Hemisphere) is tilted away from the Sun.



(source: British Sundial Society)

During autumn and spring, the Earth is neither tilted towards nor away from the Sun.



When the Northern Hemisphere is tilted towards the Sun, we receive direct heat energy. The heat energy covers a smaller area. The heat energy we receive is warmer.



Facts about direct sunlight (heat energy).

* We begin receiving direct sunlight (heat energy) around spring (Vernal Equinox – March 21st).
* Sunlight (heat energy) covers a small area on the Earth’s surface. (Sunlight [heat energy] is concentrated.)
* Sunlight (heat energy) is warmer ***because*** it covers a small area.
* Temperatures increase.
* We stop receiving direct sunlight (heat energy) around fall (Autumnal Equinox – September 21st).



*I am often amazed at how much more capability and enthusiasm for science there is among elementary school youngsters than among college students.*

*Carl Sagan*

When the Northern Hemisphere is tilted away from the Sun, we receive indirect heat energy. The same amount of heat energy covers a larger area. The heat energy we receive is cooler.



Facts about indirect sunlight (heat energy).

* We begin receiving indirect sunlight (heat energy) around fall (Autumnal Equinox – September 21st).
* Sunlight (heat energy) covers a larger area on the Earth’s surface. (Sunlight [heat energy] is ***not*** concentrated.)
* Sunlight (heat energy) is colder ***because*** it covers a larger area.
* Temperatures decrease.
* We stop receiving indirect sunlight (heat energy) around spring (Vernal Equinox – March 21st).

The Sun changes position in the sky during the year.



(source: Solar Today)

During the winter months, the Sun appears low in the sky. It reaches its lowest point on the winter solstice (December 21st).

From December 21st, the Sun appears to move higher in the sky. It reaches its highest point on the summer solstice (June 21st).

|  |  |
| --- | --- |
| **Date** | **Event** |
| March 21st  | Vernal Equinox (First day of Spring) |
| June 21st  | Summer Solstice (First day of Summer) |
| September 21st  | Autumnal Equinox (First day of Autumn) |
| December 21st  | Winter Solstice (First day of Winter) |

In between December and June, we have the equinoxes. The dates of the equinoxes are March 21st (vernal equinox/first day of spring) and September 21st (autumnal equinox/first day of autumn/fall). Equinox means equal (equi) nights (nox). On March & September 21st, everywhere in the world has twelve hours of daylight and twelve hours of darkness.

After the vernal equinox, daylight hours increase until the summer solstice (June 21st). This is called the “longest day” of the year. We have around 16 hours of daylight and 8 hours of darkness. After the summer solstice, daylight hour begin to decrease.

Daylight hours continue to decrease until the winter solstice (December 21st). This is called the “shortest day” of the year. We have around 8 hours of daylight and 16 hours of darkness. After the winter solstice, daylight hours begin to increase.

During the summer, the Northern Hemisphere has longer days and shorter nights. With more hours of daylight, the amount of heat energy we receive increases. This raises our temperatures and it becomes warmer.

After the autumnal equinox, we have more hours of darkness than daylight. With fewer hours of daylight, the amount of heat we receive decreases. This causes our temperatures to fall and it becomes colder.

**Sunrise/Sunset Table – Salt Lake City**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date** | **Sunrise** | **Sunset** | **Date** | **Sunrise** | **Sunset** |
| 1-Jan | 7:54 am | 5:07 pm | 1-Jul | 4:57 am | 8:04 pm |
| 15-Jan | 7:52 am | 5:22 pm | 15-Jul | 5:06 am | 8:00 pm |
| 1-Feb | 7:40 am | 5:42 pm | 1-Aug | 5:53 am | 7:46 pm |
| 15-Feb | 7:22 am | 6:00 pm | 15-Aug | 5:36 am | 7:28 pm |
| 1-Mar | 7:03 am | 6:14 pm | 1-Sep | 5:54 am | 7:01 pm |
| 15-Mar | 6:40 am | 6:27 pm | 15-Sep | 6:06 am | 6:39 pm |
| 1-Apr | 6:10 am | 6:52 pm | 1-Oct | 6:24 am | 6:10 pm |
| 15-Apr | 5:50 am | 7:06 pm | 15-Oct | 6:39 am | 5:49 pm |
| 1-May | 5:25 am | 7:24 pm | 1-Nov | 6:58 am | 5:24 pm |
| 15-May | 5:09 am | 7:39 pm | 15-Nov | 7:16 am | 5:09 pm |
| 1-Jun | 4:56 am | 7:54 pm | 1-Dec | 7:34 am | 4:59 pm |
| 15-Jun | 4:52 am | 8:02 pm | 15-Dec | 7:46 am | 4:58 pm |

**Sunrise/Sunset Graph - Salt Lake City**

Time

12 pm

 9 pm

 5 pm

 7 am

 4 am

This graph shows sunrise and sunset times throughout the year.

Notice the pattern. Daylight hours increase from January to June. The daylight hour decrease from July to December.

***Seasons are Reversed in the Hemispheres***

When it is summer in Utah, what is the season in Australia? It’s winter! Why? The seasons are reversed!

Look at the diagram. It’s summer. The Northern Hemisphere is tilted ***towards*** the Sun. What about the Southern Hemisphere?



(source: British Sundial Society)

The Southern Hemisphere is titled ***away from*** the Sun. It’s winter in the Southern Hemisphere. It is receiving indirect heat energy from the Sun. The Sun is low in the sky. There are more hours of darkness than daylight. It’s winter.

Six months later. It’s winter. The Northern Hemisphere is tilted ***away from*** the Sun. What about the Southern Hemisphere?



(source: British Sundial Society)

Look at the diagram. The Southern Hemisphere is tilted ***towards*** the Sun. It’s summer in the Southern Hemisphere.

|  |  |  |
| --- | --- | --- |
| **Season** | **Northern Hemisphere** | **Southern Hemisphere** |
| Spring | Vernal Equinox, March 21st  | Vernal Equinox, September 21st  |
| Summer | Summer Solstice, June 21st  | Summer Solstice, December 21st |
| Autumn | Autumnal Equinox, September 21st  | Autumnal Equinox, March 21st  |
| Winter | Winter Solstice, December 21st  | Winter Solstice, June 21st  |

