

Reason for Seasons



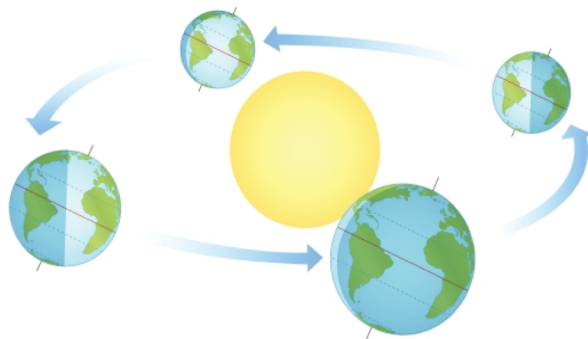
Aim: How does the tilt of Earth's axis and Earth's movement cause seasons?

Let's Review...

What are the two motions Earth makes in space?

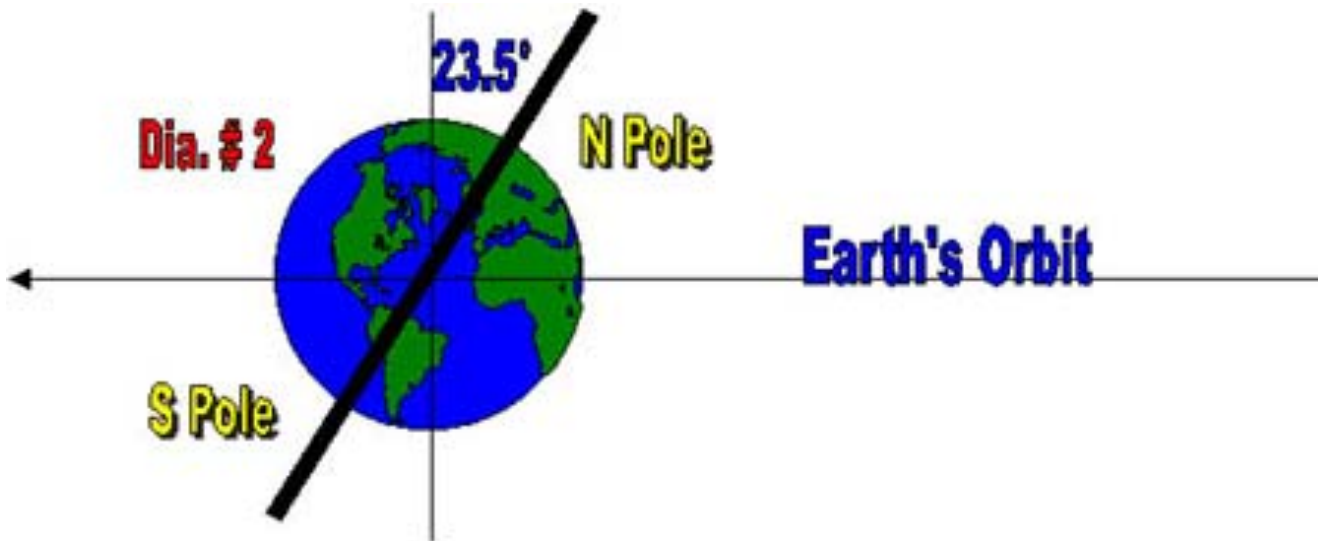
1. Rotation – spinning on it's axis

2. Revolution – going around the sun



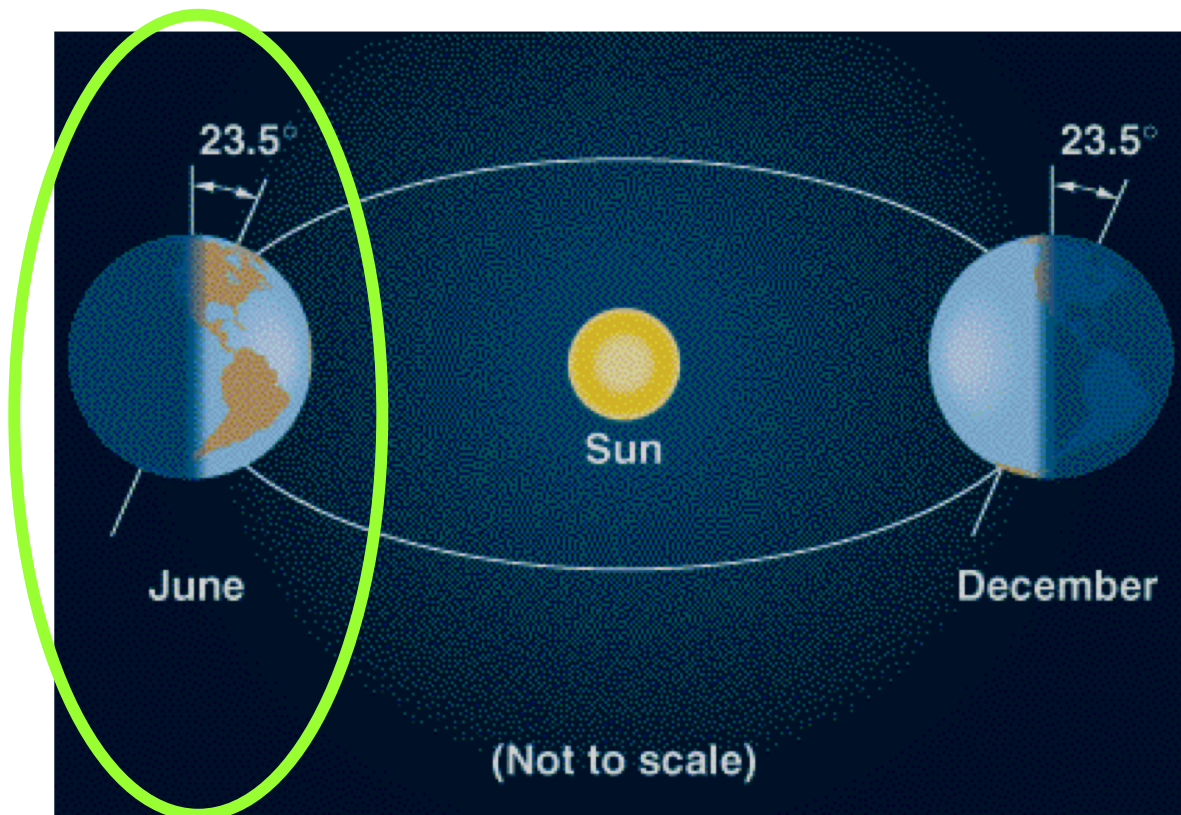
Tilt

- An **AXIS** is an imaginary line that runs through the center of the Earth and is what we rotate around.
- We are tilted 23.5° from being straight up and down. This means we have a tilt of 23.5°

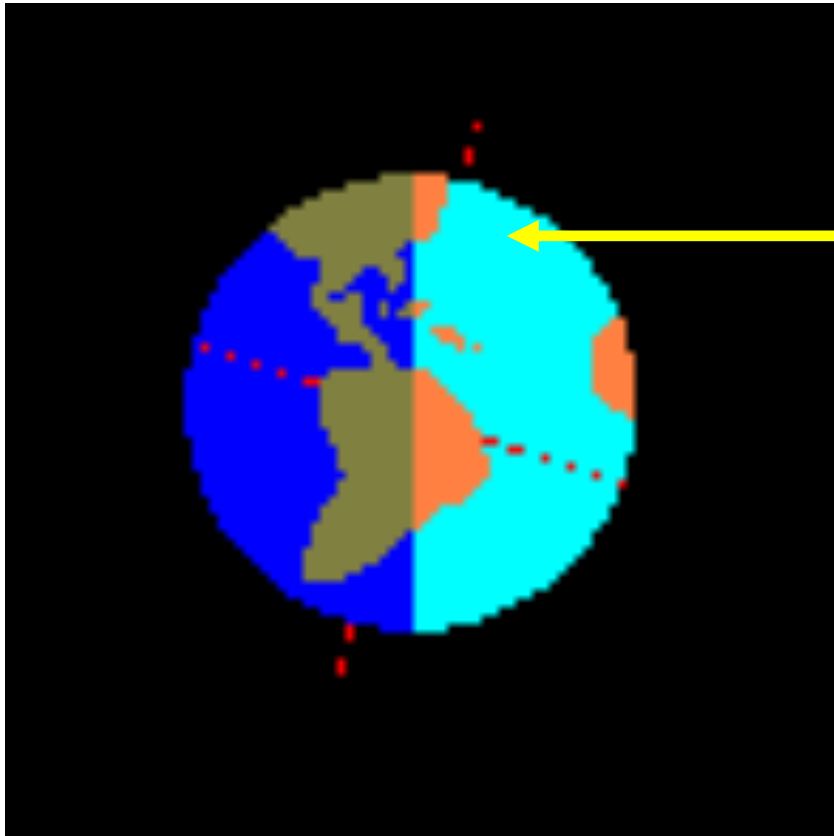


1. Tilt of Earth's Axis

- During the summer, we (in the Northern Hemisphere) are tilted towards the sun



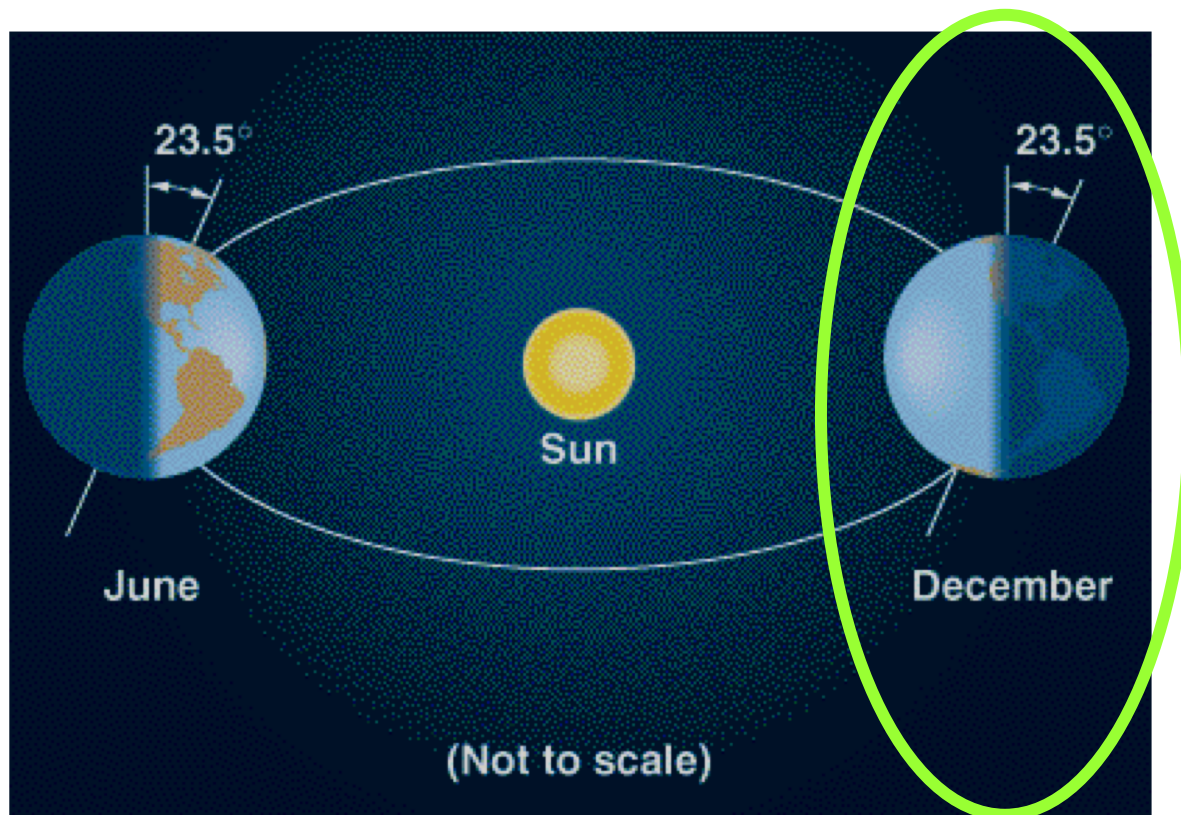
Prove it...



Earth during our summer. What do you notice about the North Pole as the Earth rotates?

The northern hemisphere will have warmer temperatures and everyone above the arctic circle including the north pole has 24 hours of daylight.

- During the winter, we (in the Northern Hemisphere) are tilted away from the sun





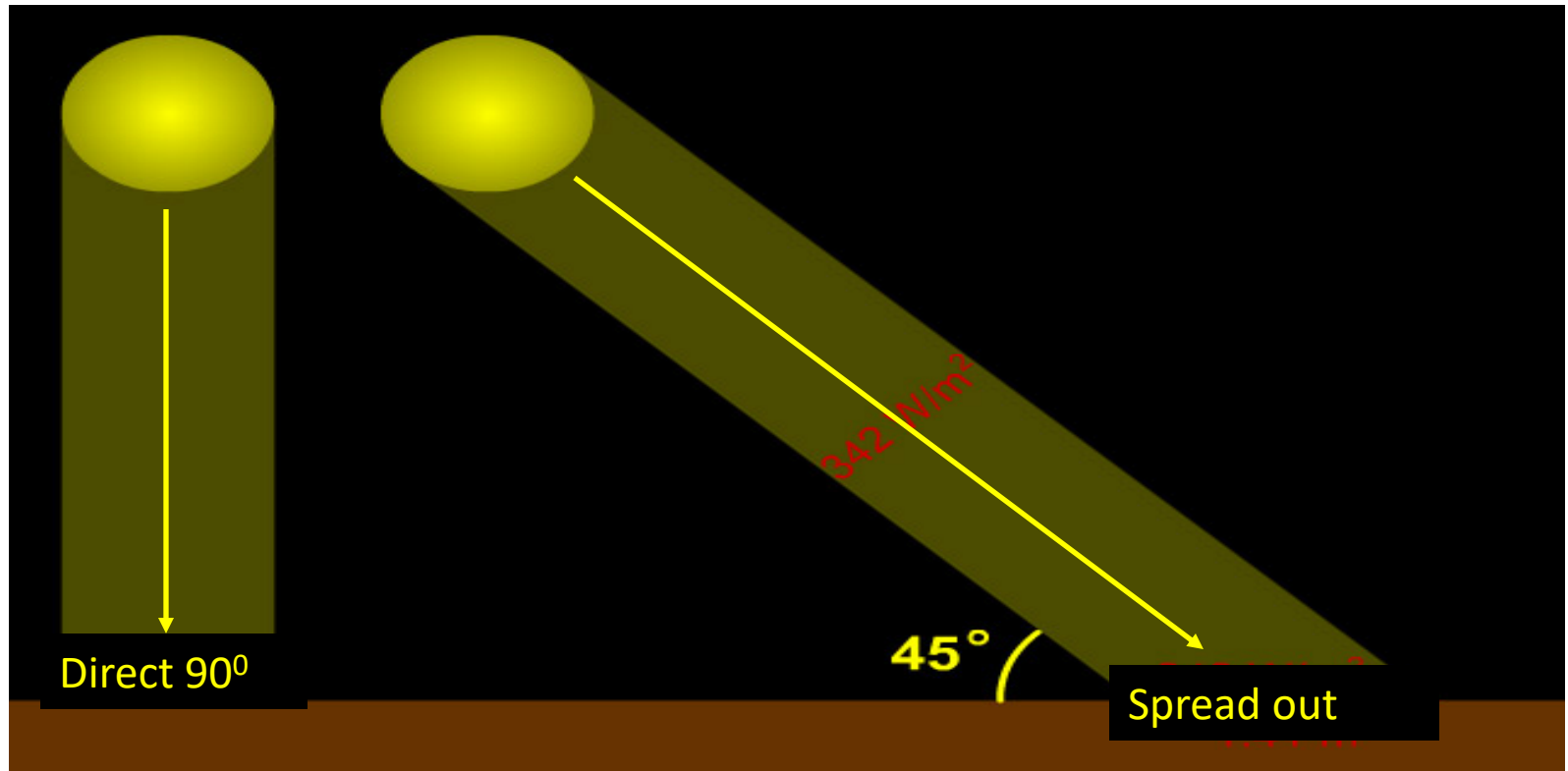
Earth during our winter. What do you notice about the South Pole as the Earth rotates?

The northern hemisphere will have colder temperatures and now everyone above the Antarctic circle including the south pole has 24 hours of daylight while everyone above the arctic circle including the north pole is having 24 hours of night.

Direct vs. Indirect Solar Energy

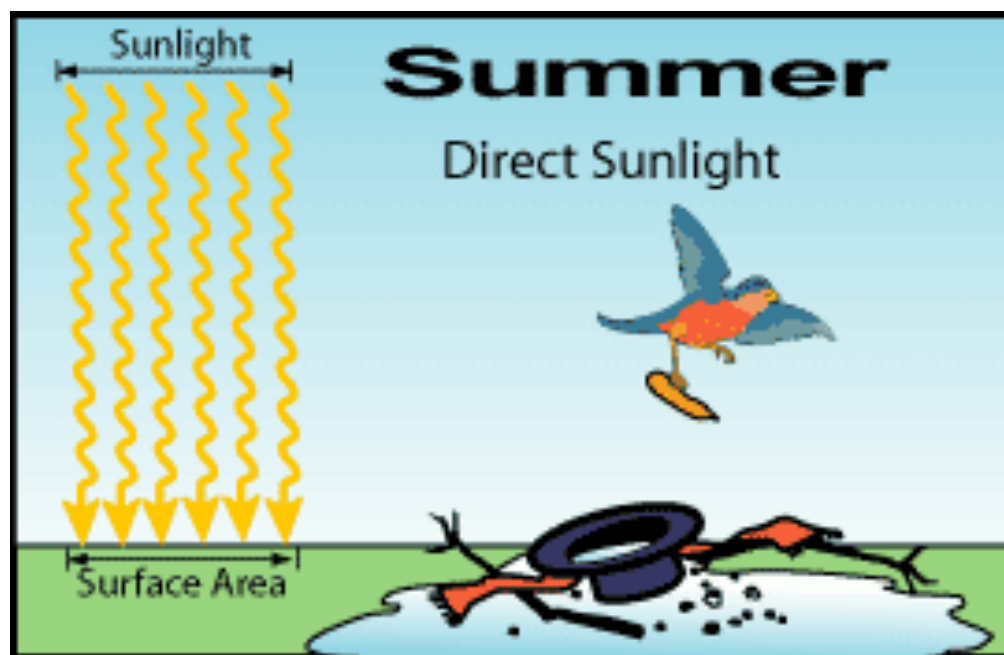
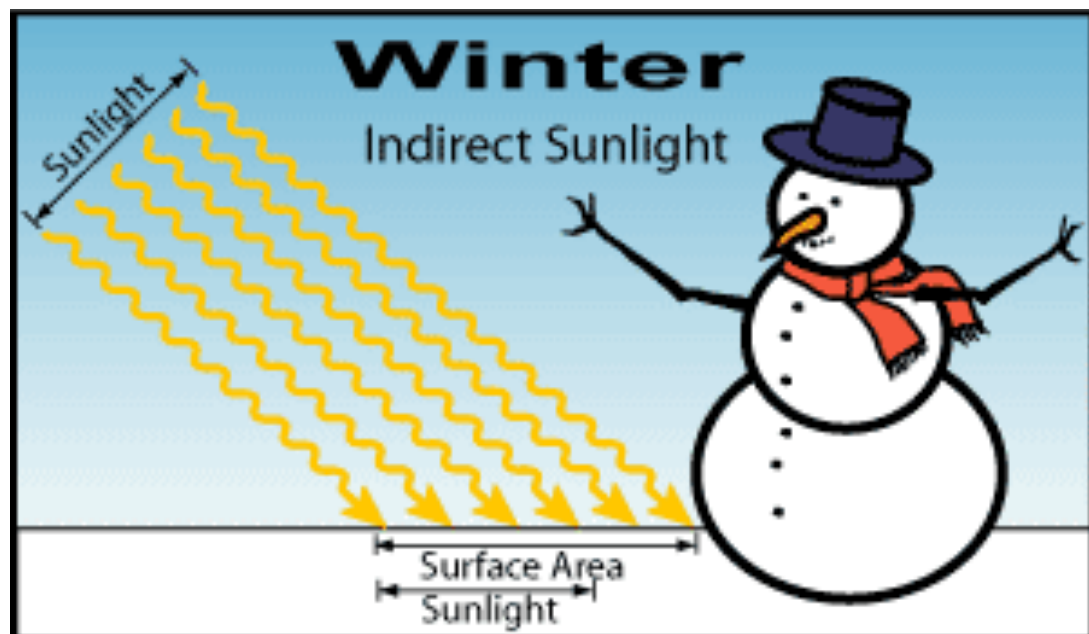
- **Solar Energy**= energy from sun's rays
- When the sun is straight overhead it makes the rays more concentrated and therefore hotter. The more spread out the rays the less concentrated and so the colder the temperatures.

Angle of insolation (sun's incoming rays)



- Higher angle
- More intense heat
- Shorter shadow

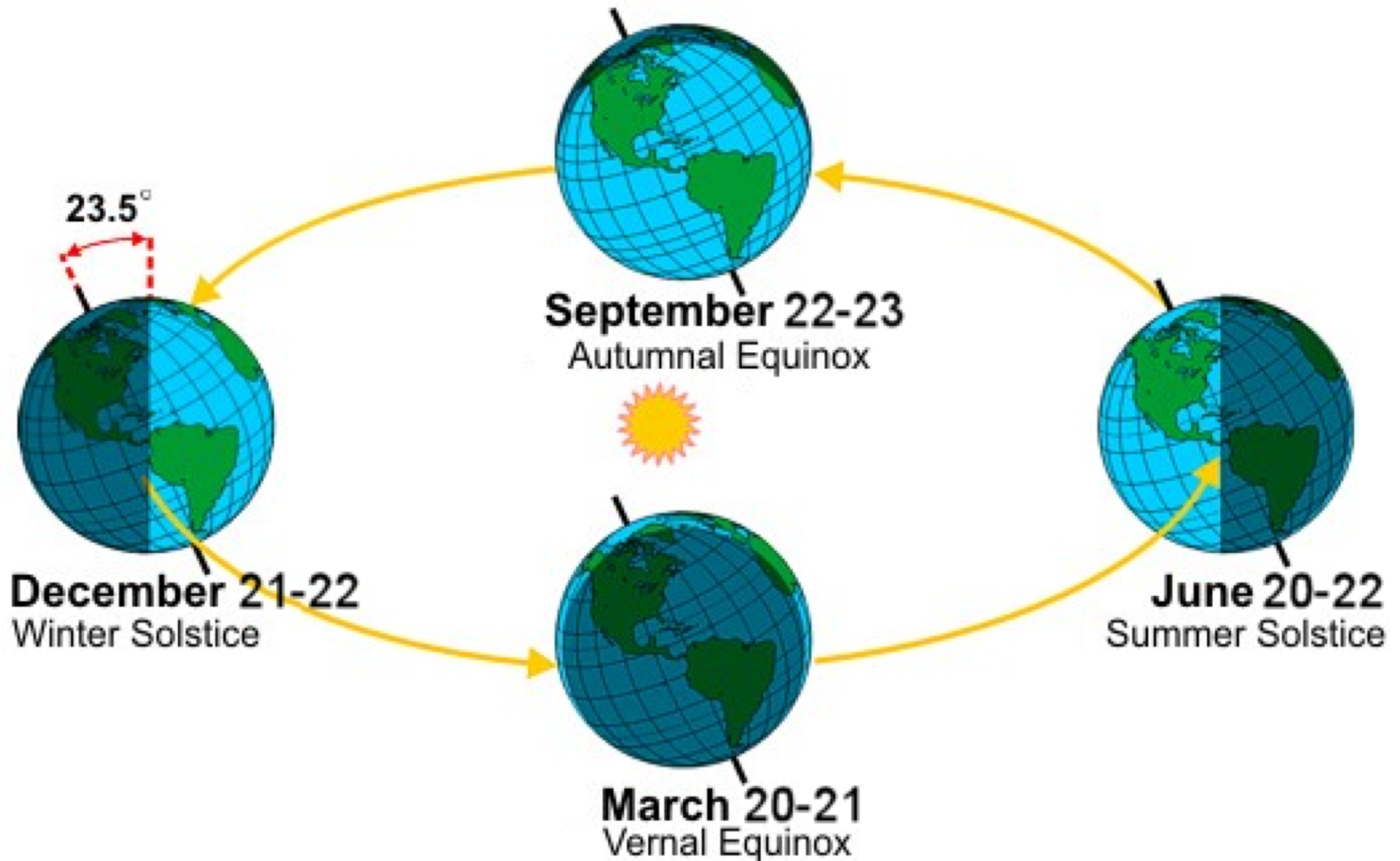
- * Lower angle
- * Less intense heat
- * Longer shadow



2. Revolution

- The earth does NOT stay in one place, but the tilt (23.5°) ALWAYS stays the same.
- This means that different places on Earth will receive direct or indirect rays of sun depending on the time of year.

Tilt of Earth stays same direction as earth
revolves in orbit



Who receives the direct ray (90° angle of insolation) on the following days?

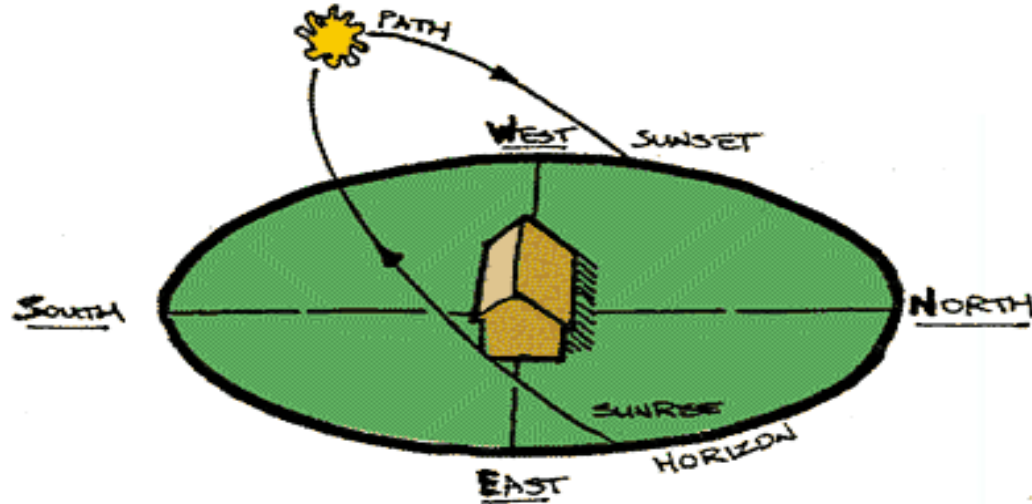
June 21st (summer solstice) Tropic of Cancer – 23.5°N

Sept 21st (or 23rd – fall equinox) Equator

Dec 21st (winter solstice) Tropic of Capricorn – 23.5°S

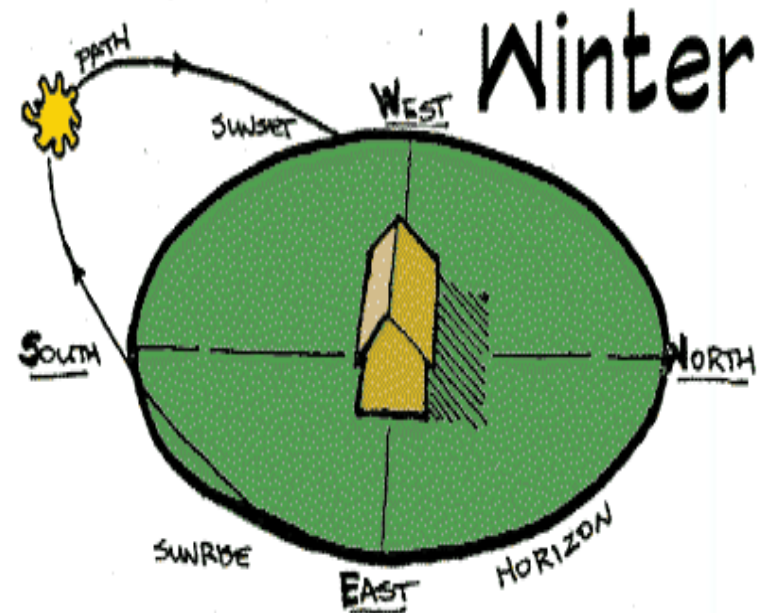
March 20 (or 21st – spring equinox) Equator

- Local solar noon occurs when the sun reaches its highest point in the sky.
- In the Northern Hemisphere, at solar noon the sun reaches its highest point when it is due south.

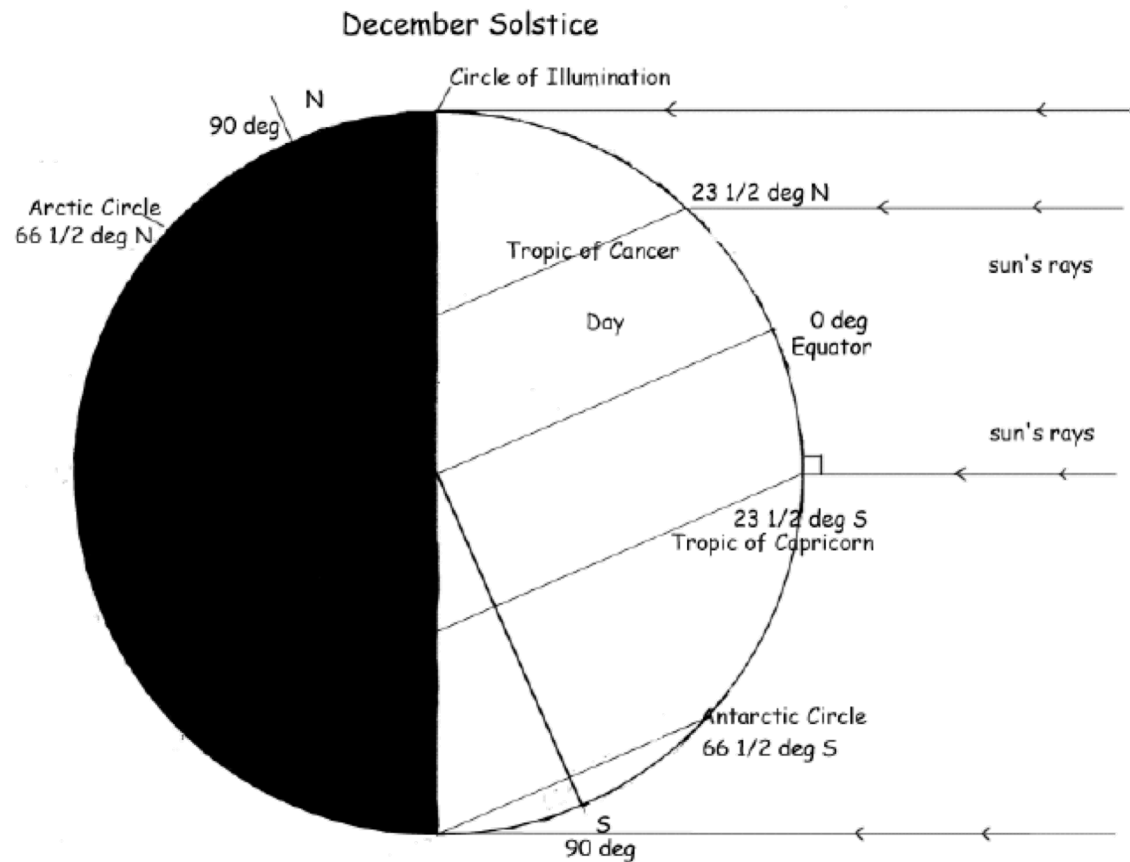


Winter Solstice

- December 21st - 23rd
- Sun has the shortest path in the sky
- The sun is never very high in the sky, even at noon.
- Shortest day of the year!
- Earth's axis is tilted away from the sun

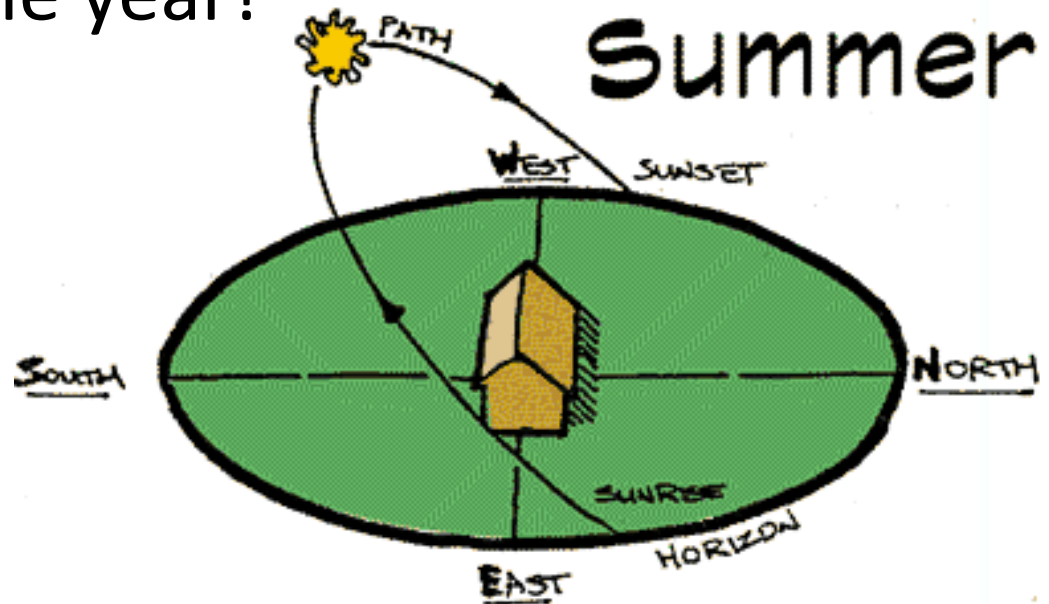


- Sun rises in the SE and sets in the SW
- Sun's direct rays hit the Tropic of Capricorn (23.5 °S)
- Longest shadows

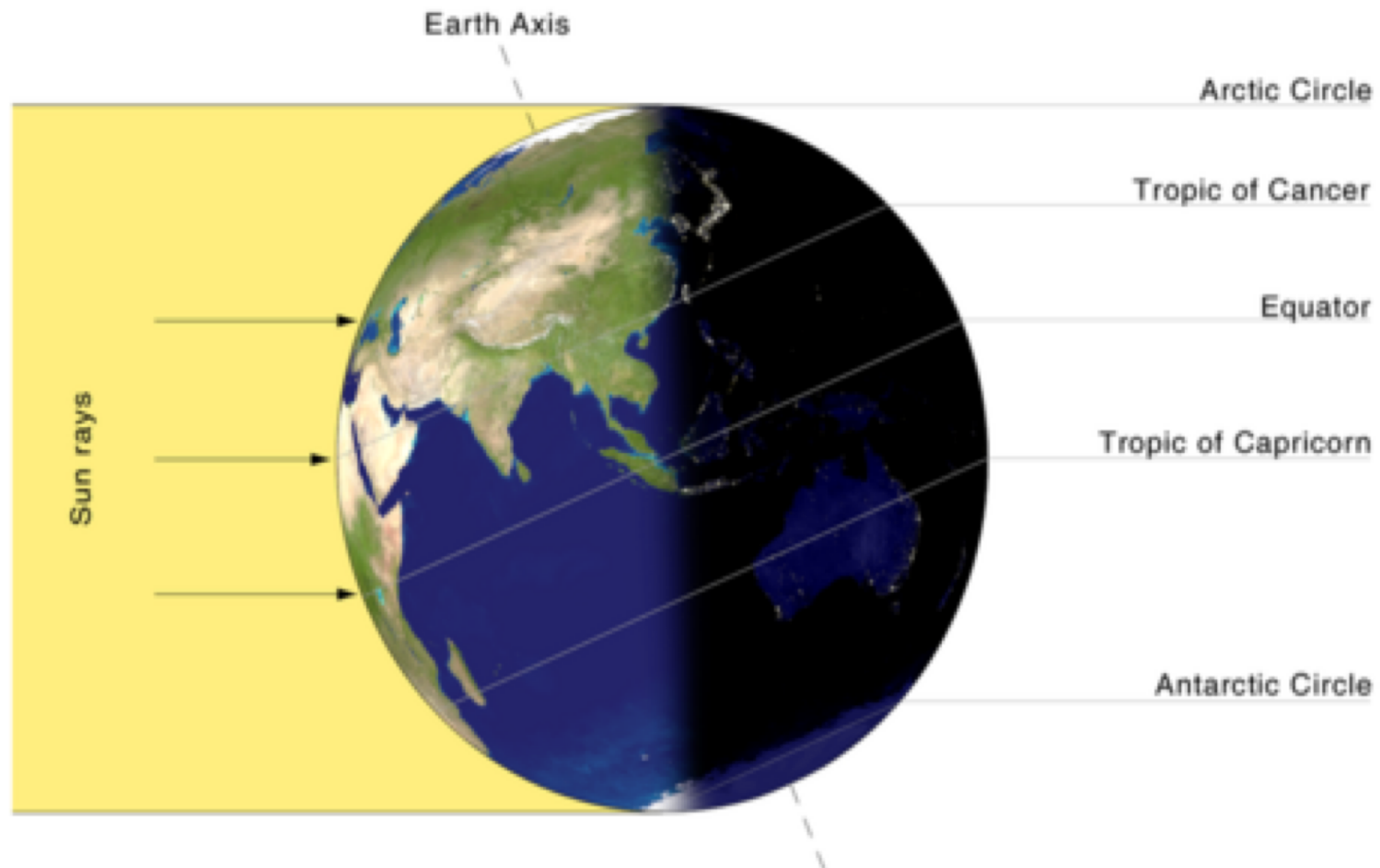


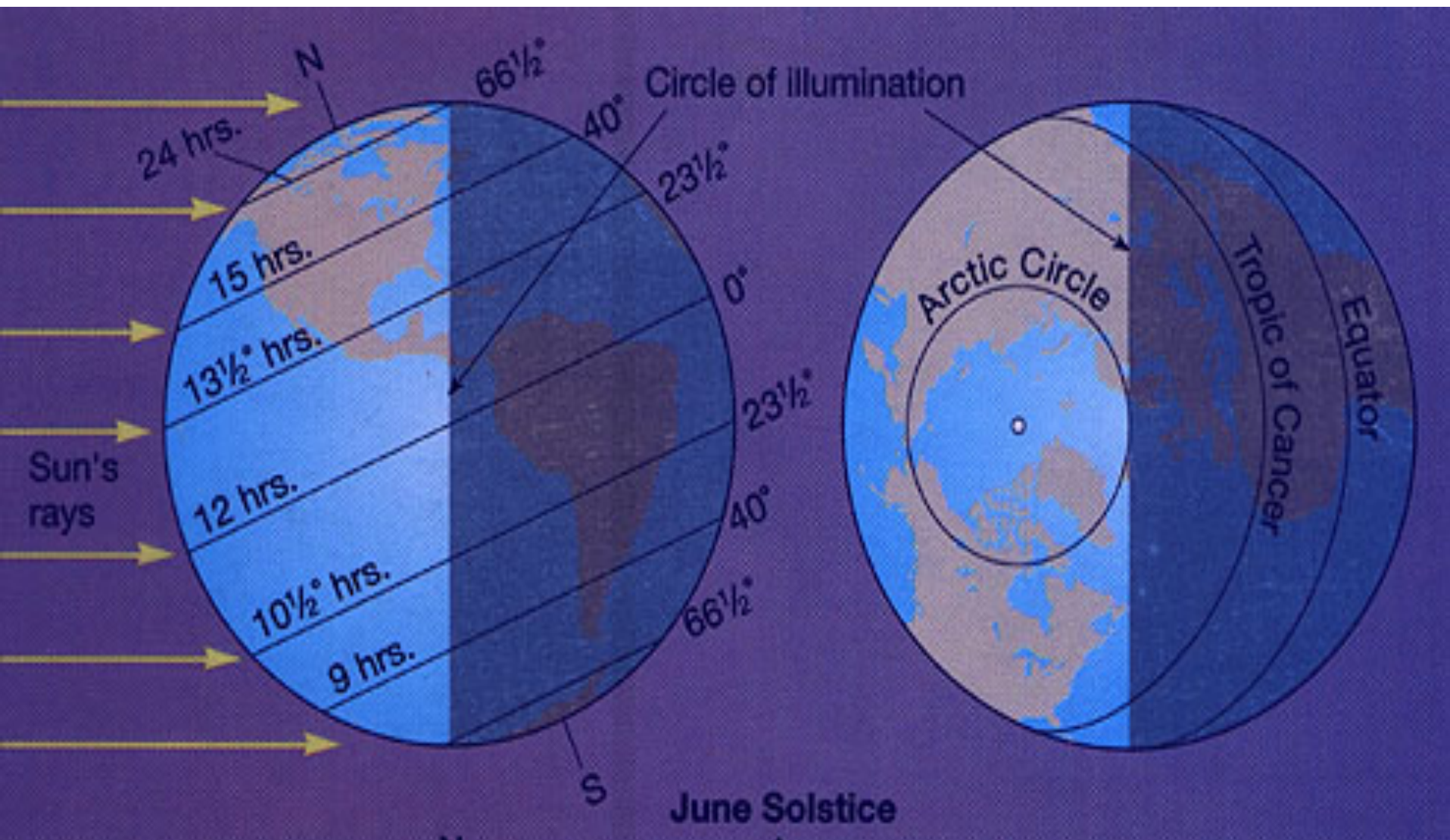
Summer Solstice

- June 21st
- Insolation is strongest at this time of the year
- Sun has the longest path in the sky.
- Longest day of the year!

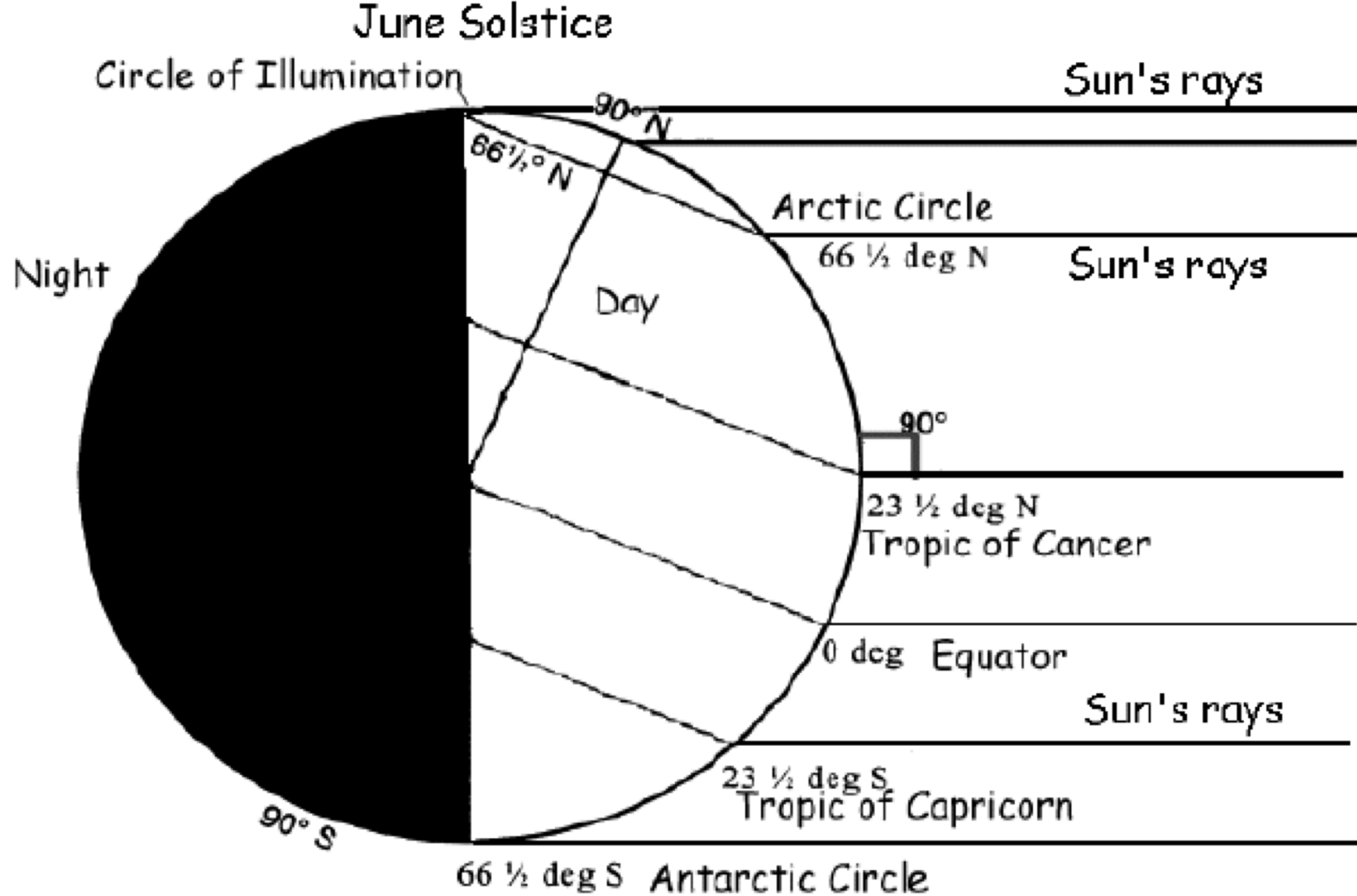


- Sun rises in the NE and sets in the NW
- Sun's direct rays hit the Tropic of Cancer (23.5 °N)
- Shortest shadows





Notice how the number of hours of daylight increases as you go higher in latitude. The Arctic Circle is experiencing 24 hours of daylight.

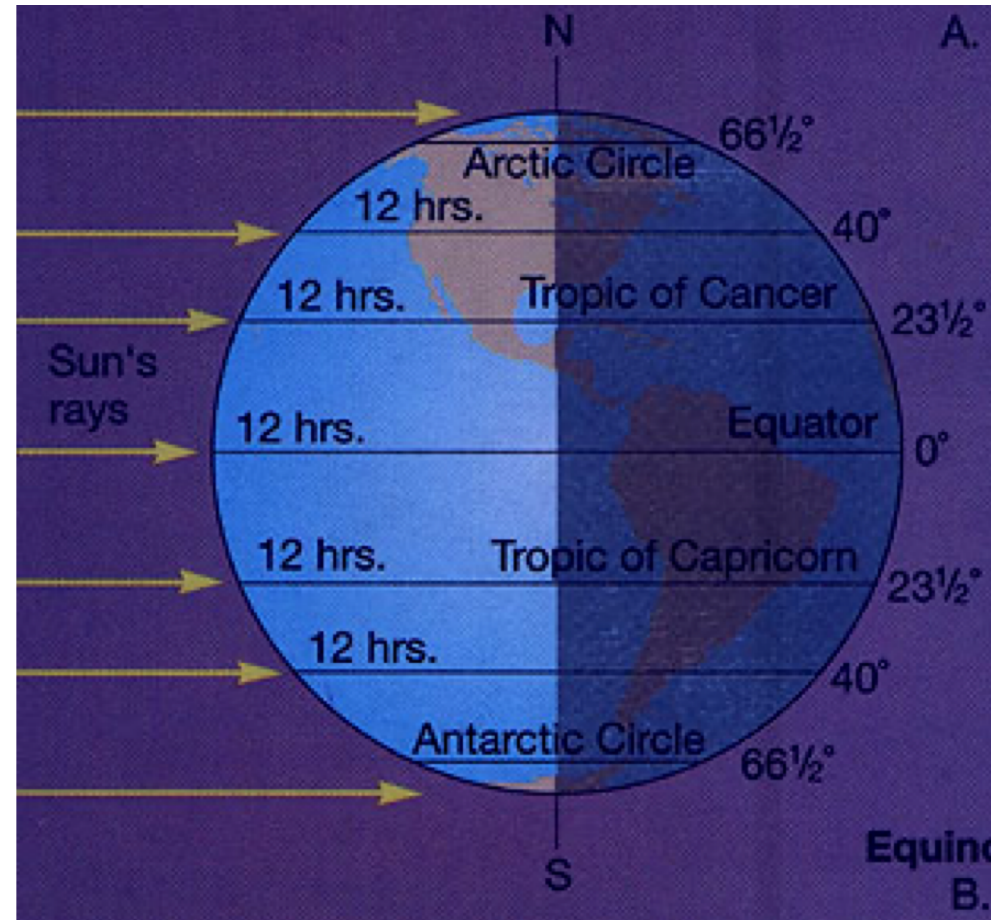


How many hours of daylight is the Antarctic Circle experiencing on the summer solstice?

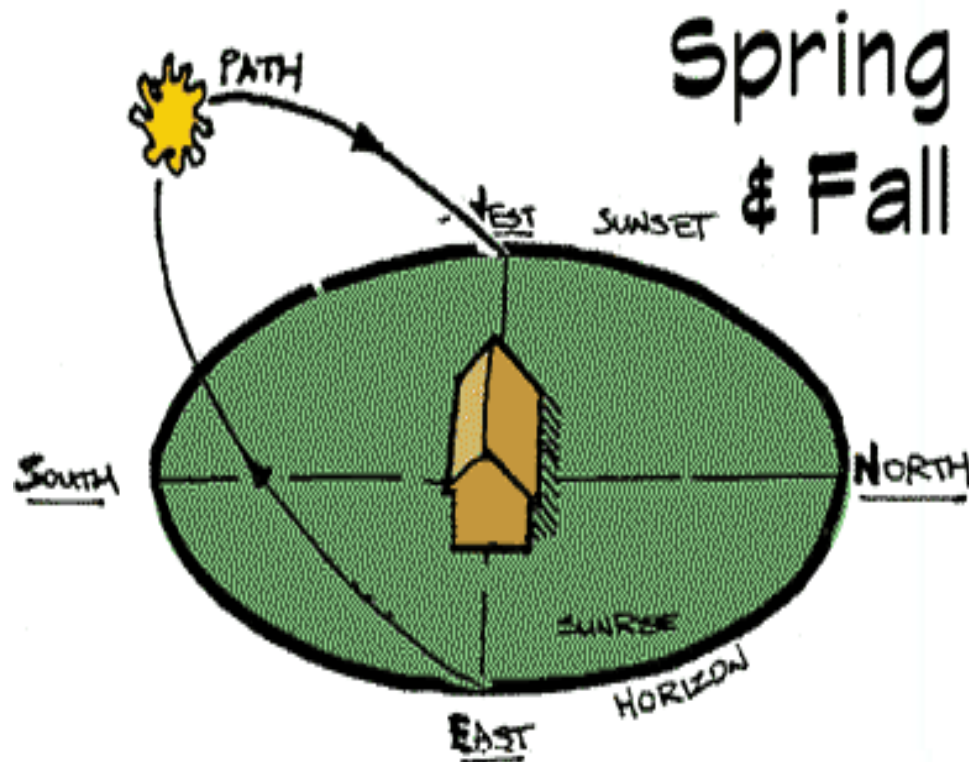
0 hours – it experiences 24 hours of darkness.

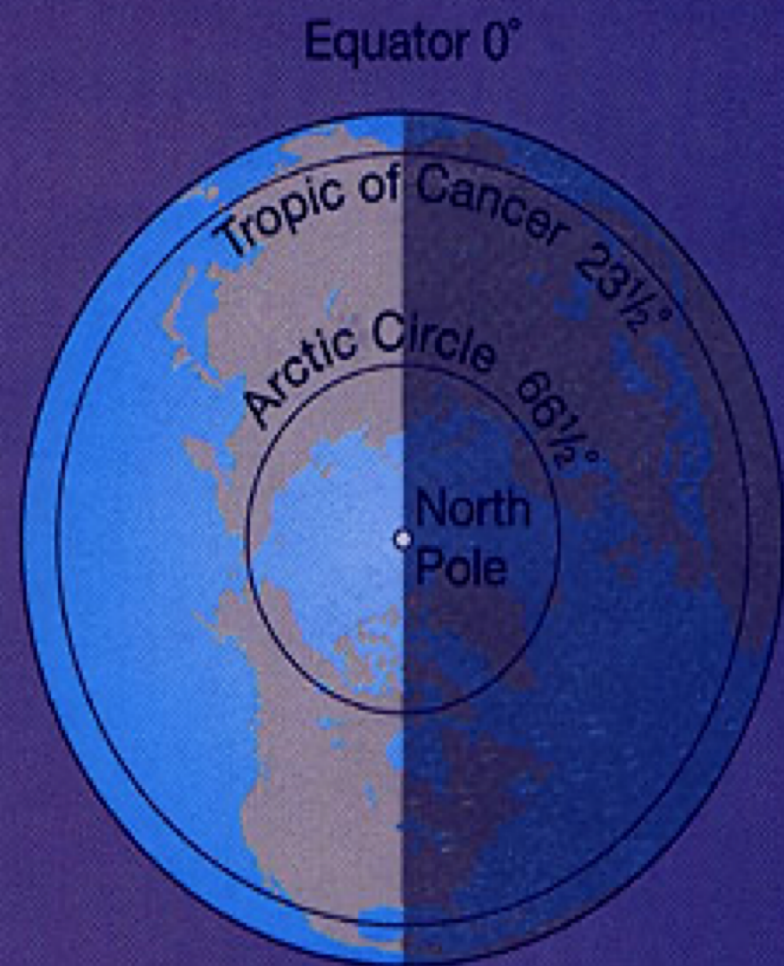
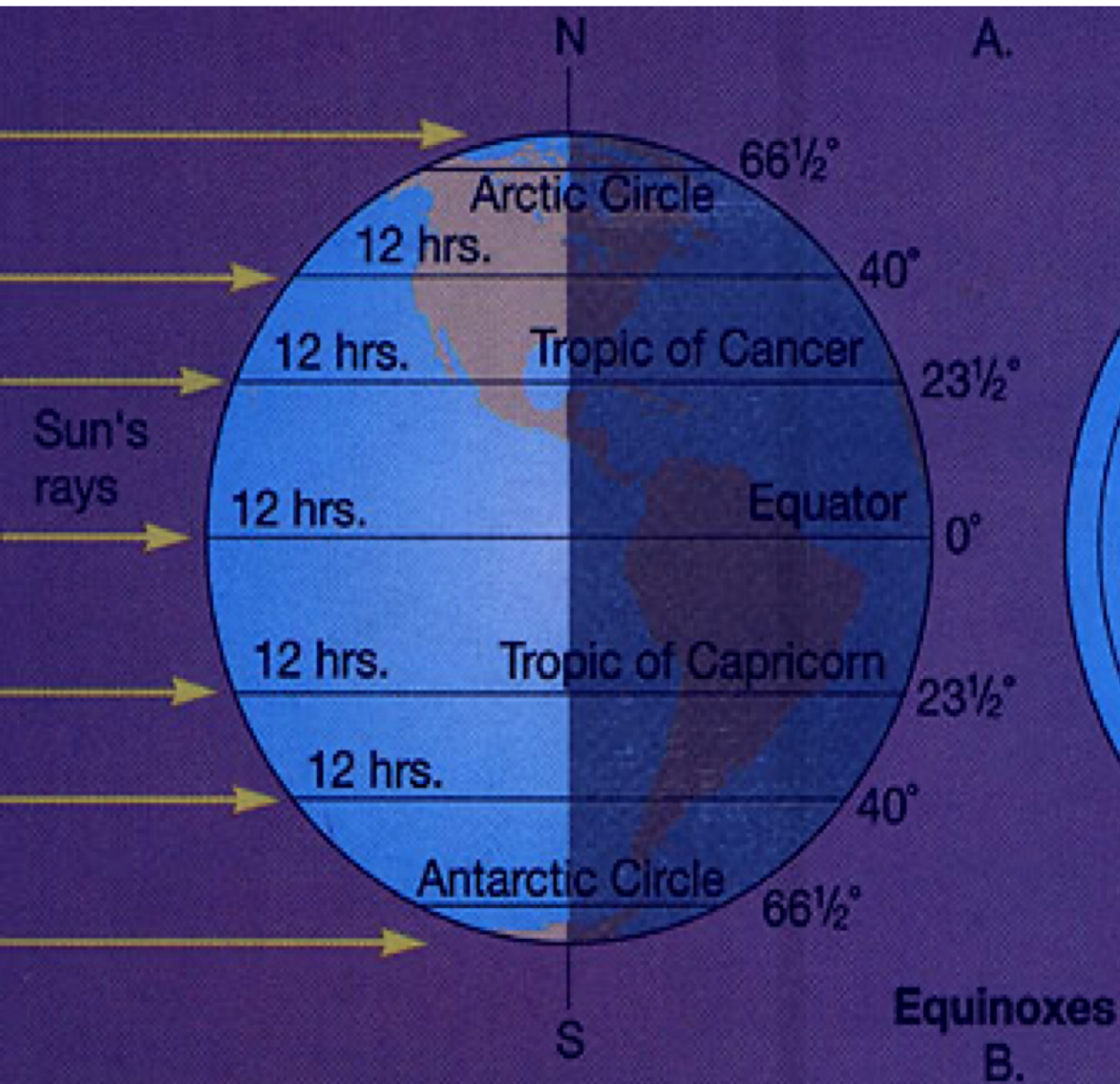
Equinoxes

- March 21st and September 23rd
- 12 hours of daylight and 12 hours of darkness (equal)



- Sun rises exactly due east and sets exactly due west
- Sun's direct rays hit the equator





Summary of the causes of the seasons:

- **TILT OF EARTH'S AXIS:**

The Earth's axis is tilted 23.5° , causing parts of the Earth to be tilted towards or away from the sun.

- The Earth's axis does not change – parallelism (the axis remains parallel to its previous position as Earth revolves around the Sun).

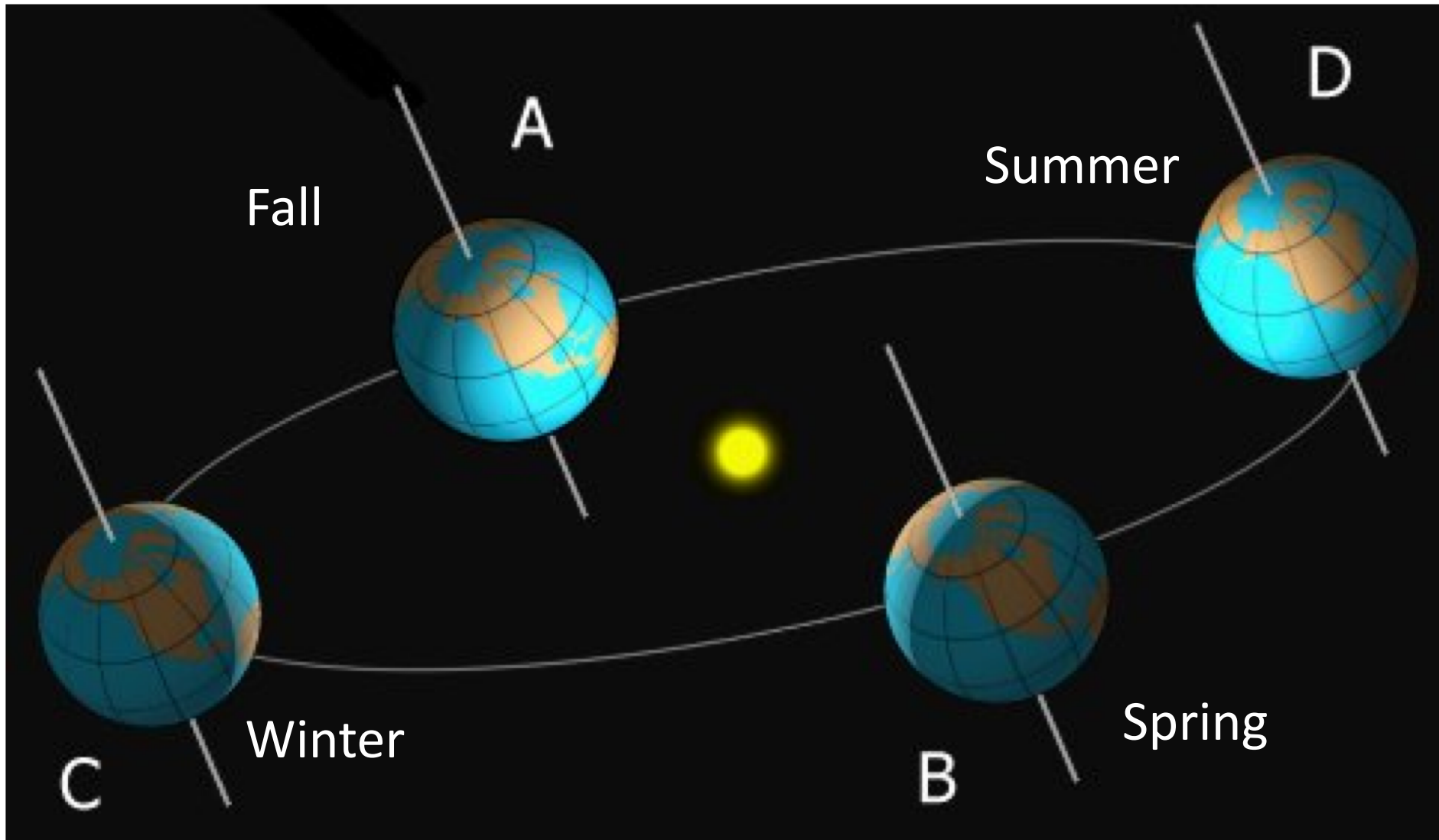
- **EARTH'S REVOLUTION AROUND SUN**

Earth revolves around the sun changing its position in orbit.

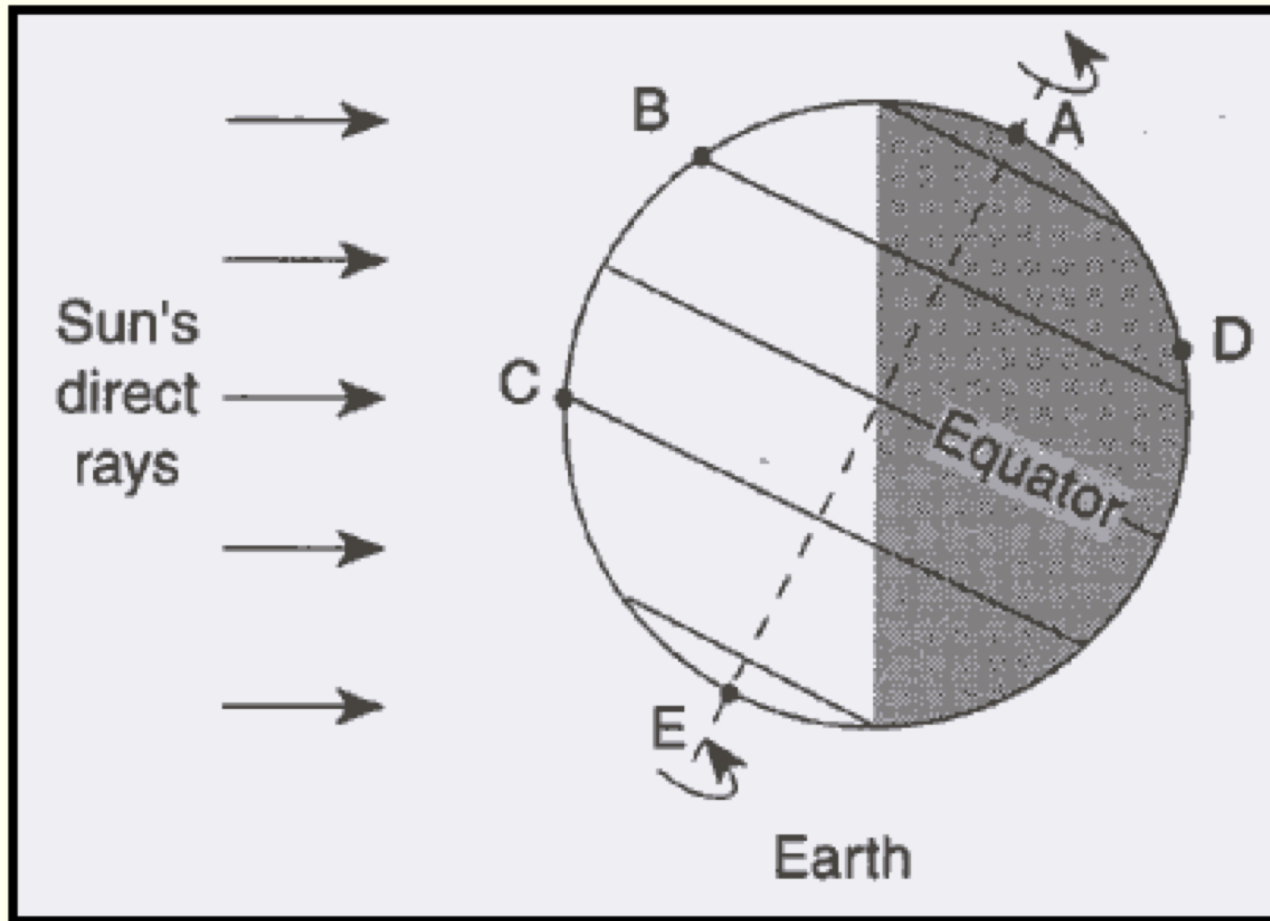
THINK ABOUT IT...

- Does the *distance* between the *Earth* and the *Sun* cause the seasons?
- **NO!** We are actually closer to the sun in the winter!!

Can you identify which letter represents which season?



Which season is represented by this diagram in the northern hemisphere?



Winter - Earth's axis is pointed *away* from the sun