Astronomy

Semester 1

Weeks 3 – 4

August 25 – September 5

Monday / Tuesday (8/25 – 26)

Journal 1.1

- What are my strategies to succeed this school year?
- For each journal, you will need three things:
  - 1) write the date
  - 2) write the prompt (the question)
  - 3) write AT LEAST 4 sentences in response to the prompt.

- T: **5A** evaluate and communicate how ancient civilizations developed models of the universe using astronomical structures, instruments, and tools such as the astrolabe, gnomons, and charts and how those models influenced society, time keeping, and navigation;
- **5C** describe and explain the historical origins of the perceived patterns of constellations and the role of constellations in ancient and modern navigation.
- O: I will be able to demonstrate my understanding of the rotation of the Earth and how it affects celestial bodies
- D: by completing 3 Page Keeleys and a Stellarium simulation.
- A: constellations, azimuth
- Y: How do the starts change as the year progresses?

Wednesday / Thursday (8/27 – 28)

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- O: I will be able to understand yearly motion of Earth and how constellations are viewed based on this movement
- D: by taking notes, participating in class discussion, and beginning the Yearly Motion Assignment.
- A: revolution, rotation, solstice, equinox, constellations
- Y: How does the position of the Earth affect the viewability of the constellations?

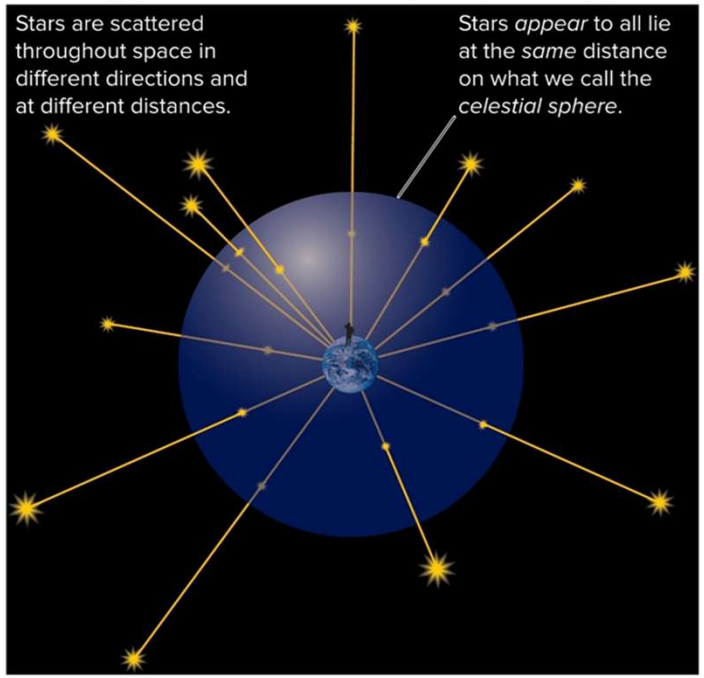
Chapter 1

Cycles of the Sky

Cycles of the Sky

- © Stocktrek Images/Getty Images

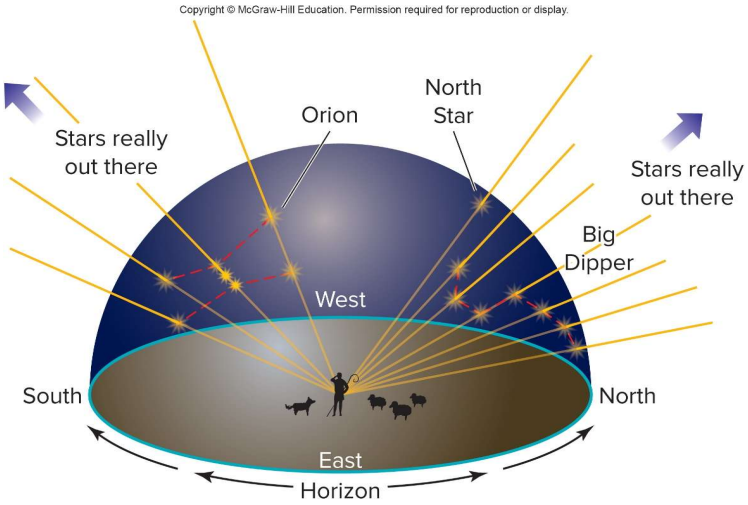
The Celestial Sphere



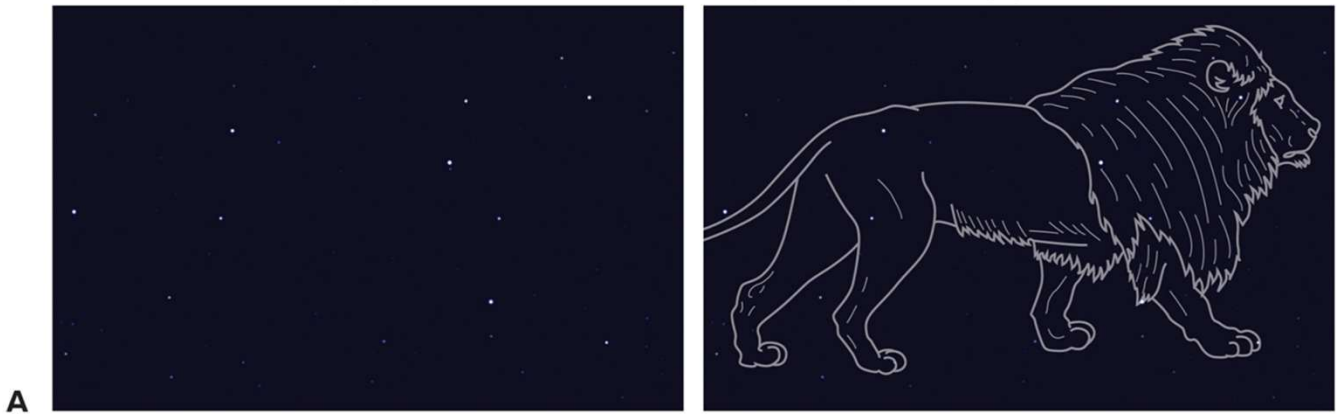
- Naked eye observations treat all stars at the same distance, on a giant ***celestial sphere*** with Earth at its center.

Models and Science

- The celestial sphere is a ***model,*** which does not necessarily match physical reality.



Constellations



A

- ***Constellations*** are fixed arrangements of stars that resemble animals, objects, and mythological figures.
- Stars in a constellation are not physically related.

- The background images are from the free sky-viewing program stellarium (*www.stellarium.org*)

Appearance of Constellations over Time

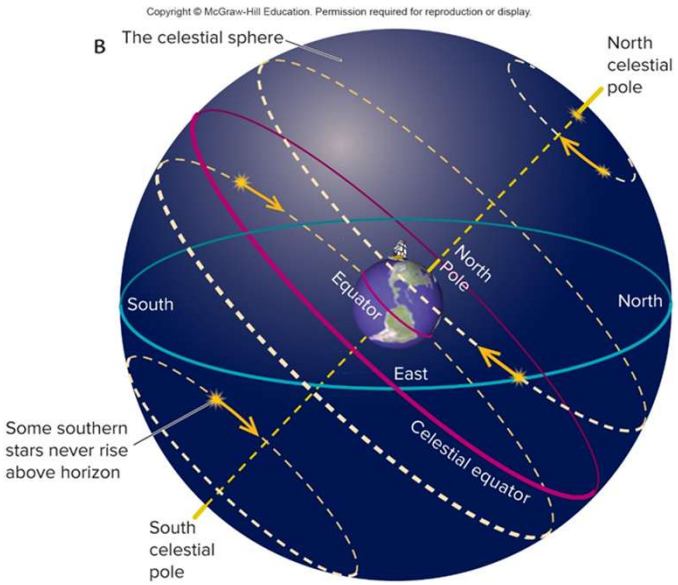
B

- Positions of stars change very slowly; constellations will look the same for thousands of years.
- Origin unknown but were probably used for navigation and season tracking

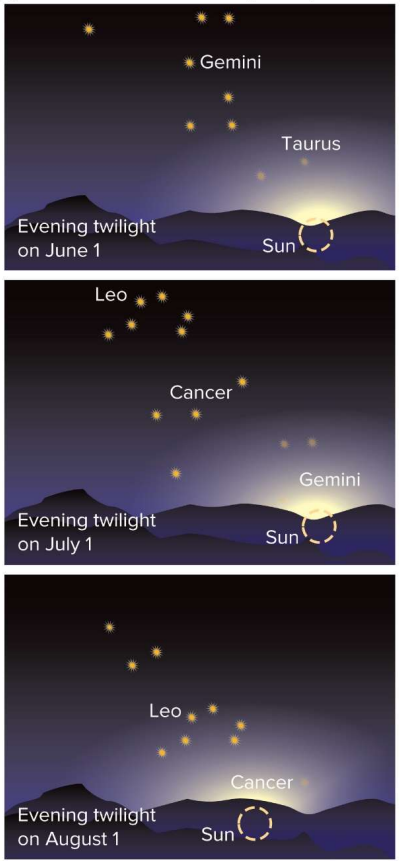
- The background images are from the free sky-viewing program stellarium (*www.stellarium.org)*

Daily Motion

- ***Celestial poles*** located directly above Earth's north and south poles.
- The ***celestial equator,*** which lies directly above Earth's equator



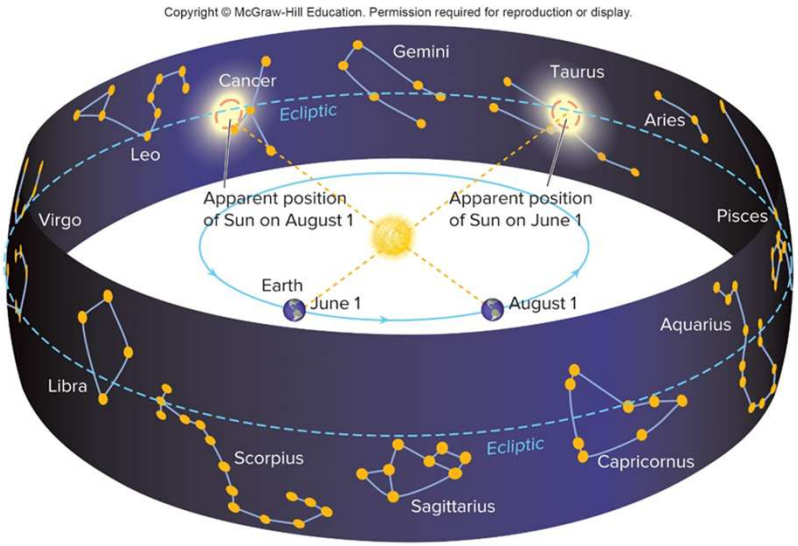
Motion of Constellations



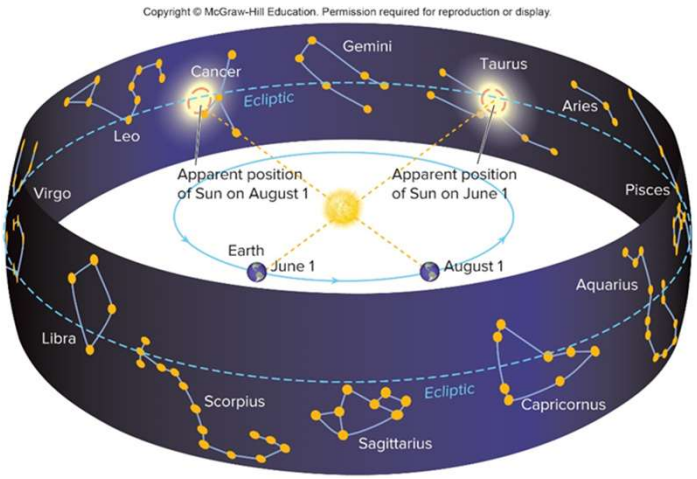
- Constellations seem to change location based on the month?
- Why do you think this occurs?

Annual Motion

- A given star rises 3 minutes 56 seconds earlier each night.
- Caused by Earth's orbit
- Ancients used this to mark seasons

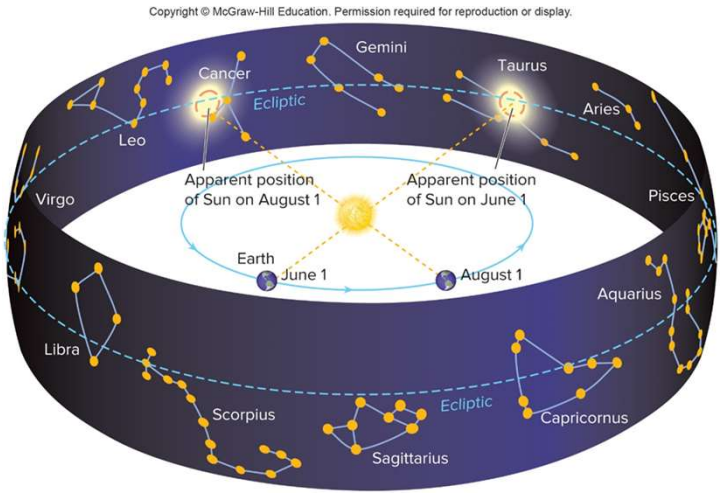


The Ecliptic



- The path of the Sun is called the ***ecliptic.***

The Zodiac



- The twelve constellations called the **zodiac** are the ribbon of sky the sun passes through
- Ophiuchus, the snake charmer is number 13.

Friday (8/29)

- C-day
- Finish Yearly motion or any other missing work
- Copy down notes for next week.

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- O: I will ensure my understanding of the topics we have discussed thus far
- D: by reviewing and studying for my quiz on Thursday / Friday next week.
- A: revolution, rotation, solstice, equinox, constellations
- Y: How does the position of the Earth affect the viewability of the constellations?

Tuesday / Wednesday (9/2 – 3)

- SmartBook Celestial Sphere
- Research paper intro to Astronomy

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Thursday / Friday (9/4 – 5)

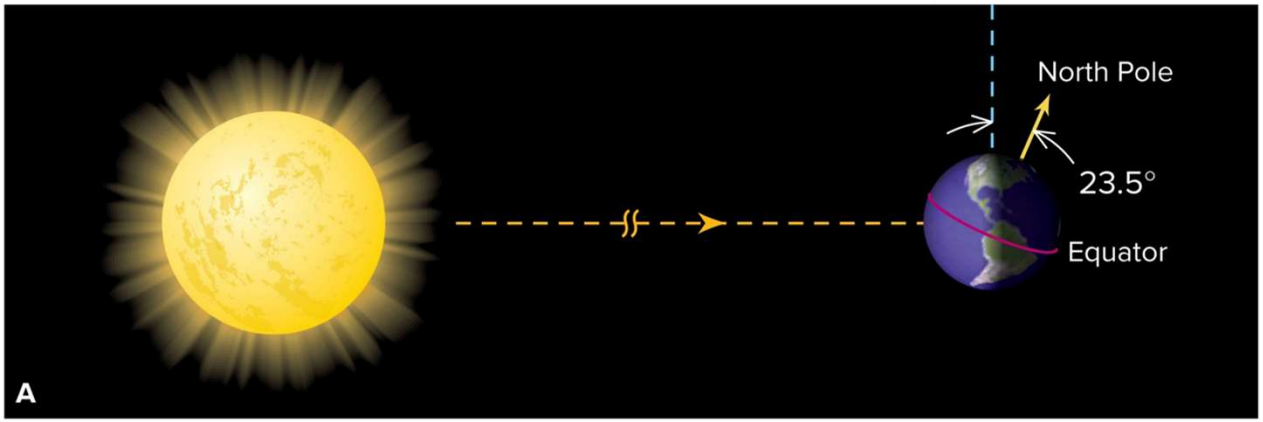
- Quiz on Celestial Sphere

Good Things

- What kind of shoes to frogs wear? Open-toad sandals.

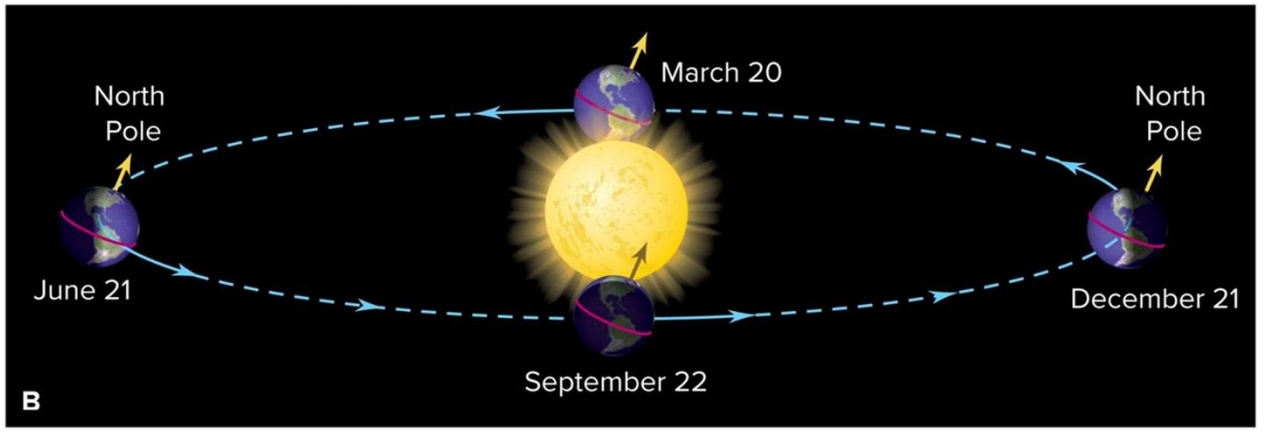
- T: **9D** explain the significance of Earth's solstices and equinoxes.
- O: I will be able to explain why the tilt of Earth's axis leads to seasonal changes of temperature on Earth, and how the effects differ on different parts of Earth.
- D: by taking notes, participating in a class discussion and completing a Stellarium project.
- A: rotation axis
- Y: What are the primary factors that affect the seasons based on one's location on Earth?

What Causes Seasons?



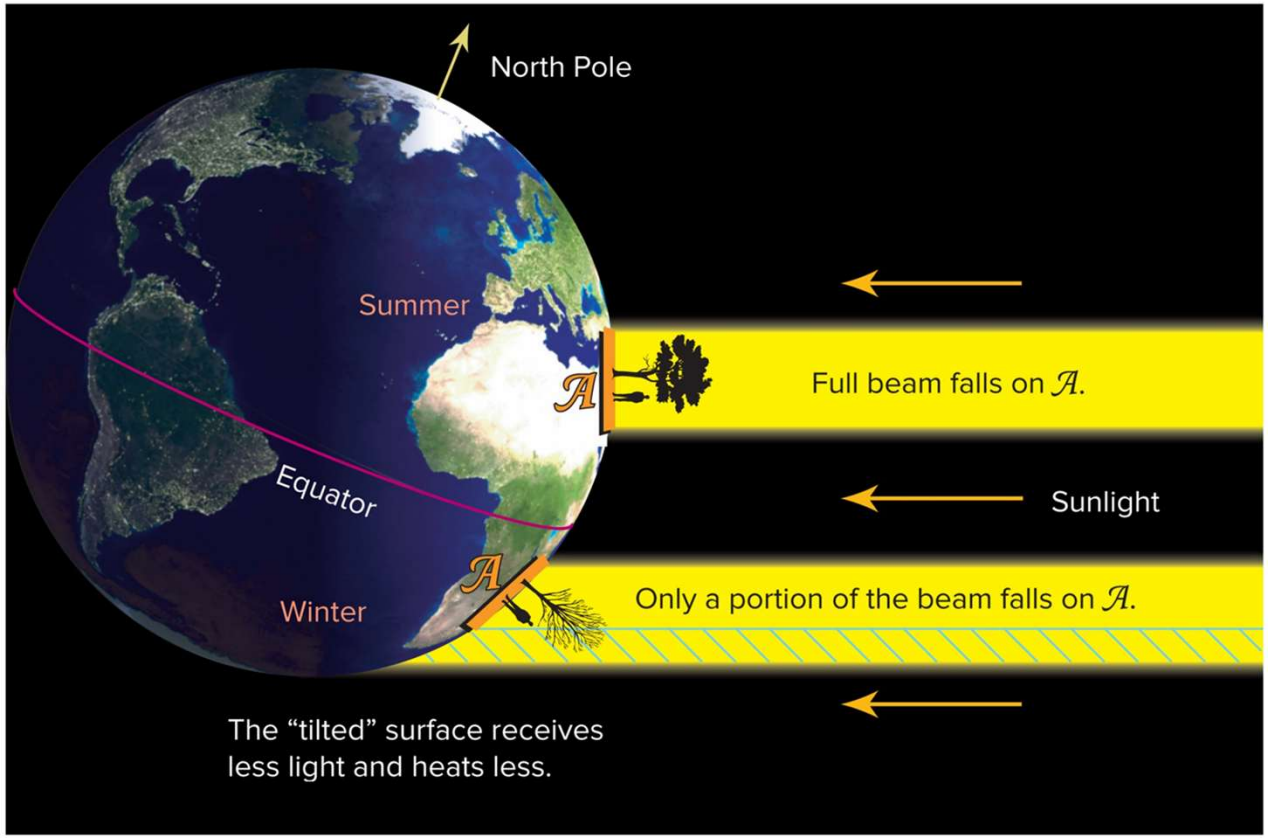
- Earth is closest to the Sun in January, which is winter in the northern hemisphere.
- Therefore, the seasons cannot be caused by the Sun's proximity to Earth.
- Earth's ***rotation axis*** is tilted 23.5º from a line perpendicular to Earth's orbital plane.

Axial Tilt Causes Seasons



- The rotation axis of Earth maintains nearly the same tilt (23.5 degrees) and direction from year to year.
- The northern and southern hemispheres alternate receiving (on a yearly cycle) the majority of direct light from the Sun, and longer days.
- This leads to the seasons!

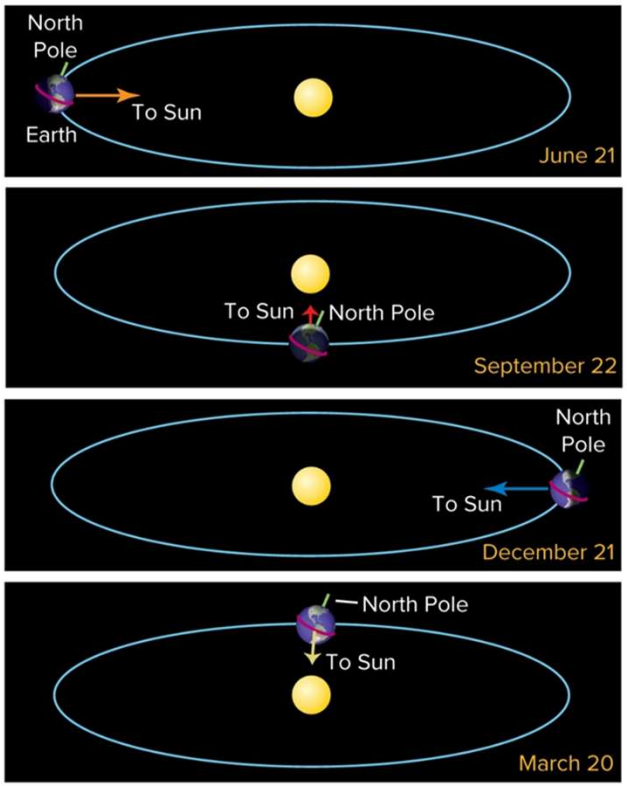
The Seasons

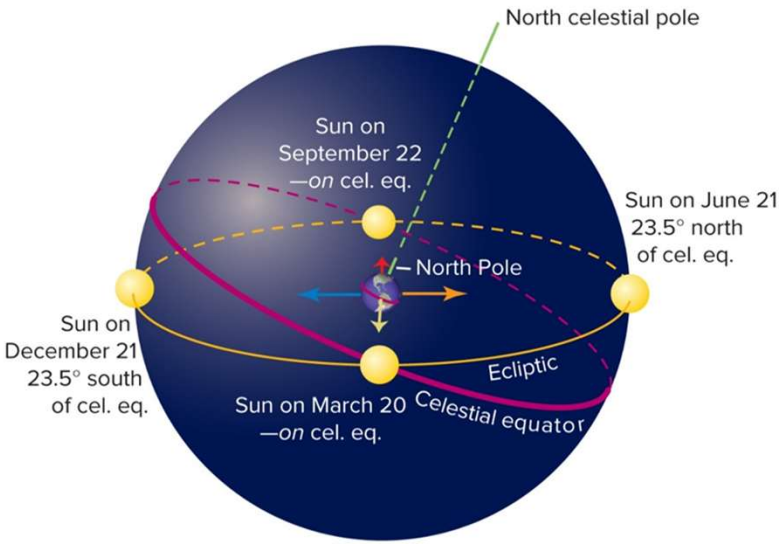


Seasons and the Ecliptic

- The tilt of Earth's rotation axis causes the ecliptic not to be aligned with the celestial equator.
- Sun is above celestial equator in June when the Northern Hemisphere is tipped toward the Sun, and is below the equator in December when tipped away.
- Tilting explains seasonal ***altitude*** of Sun at noon, highest in summer and lowest in winter.

The Ecliptic's Tilt

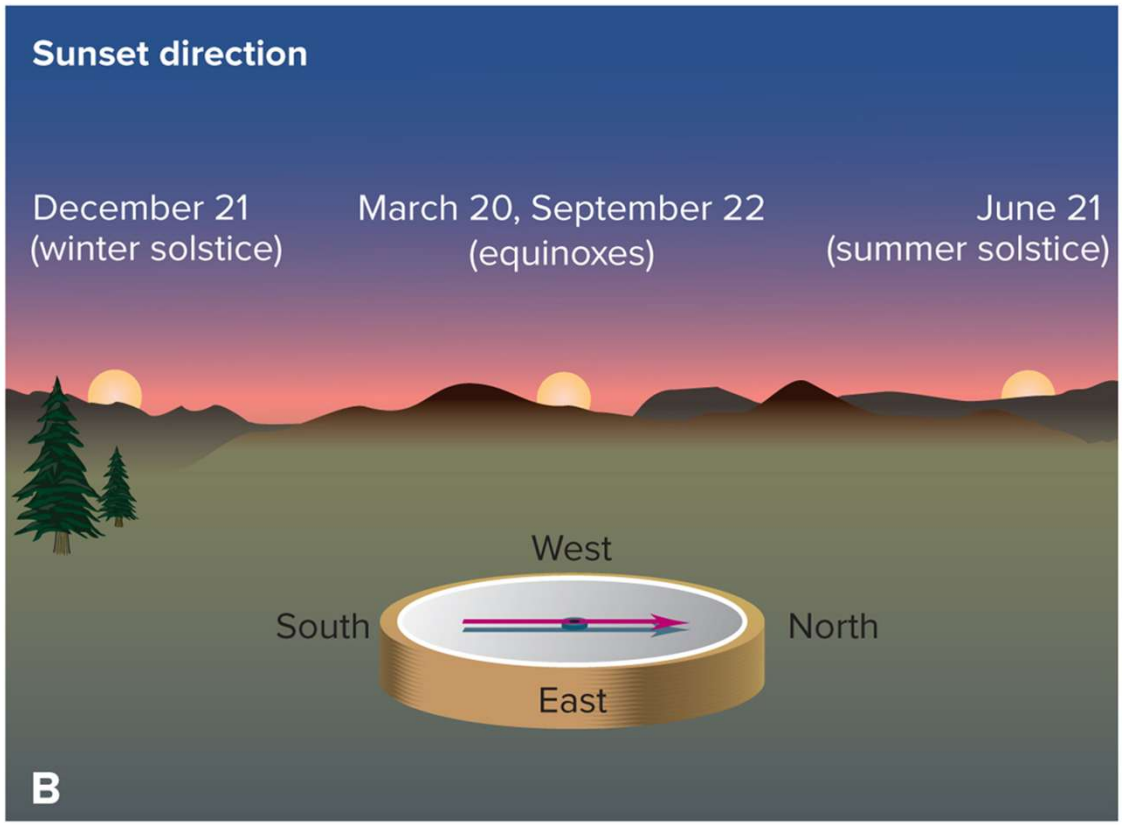




Solstices and Equinoxes

- Points on horizon where Sun rises and sets changes periodically throughout year.
- In summer months of Northern hemisphere, the Sun rises north of east and sets north of west.
- In winter months of Northern hemisphere, the Sun rises south of east and sets south of west.
- The ***solstices*** (about June 21 and December 21) are when the Sun rises at the most extreme north and south points.
- The ***equinoxes*** (equal day and night and about March 21 and September 23) are when the Sun rises directly east.
- Ancients marked position of Sun rising and setting to determine the seasons (e.g., Stonehenge).

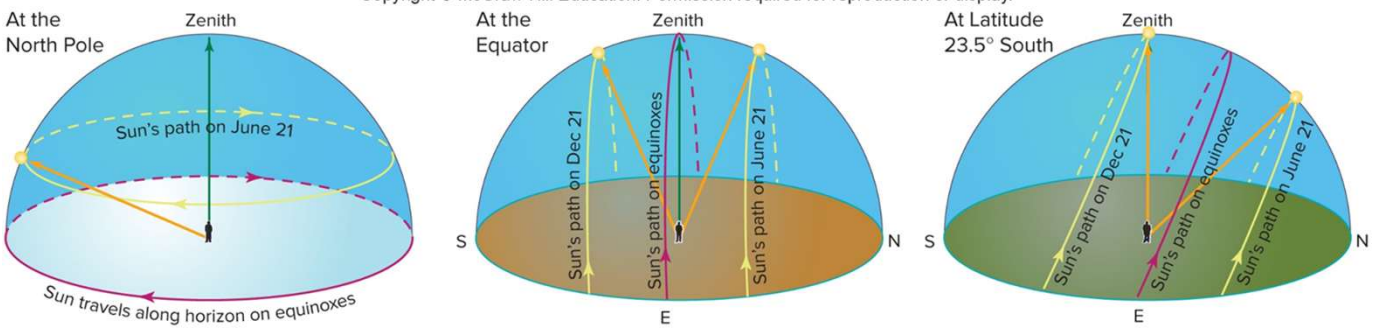
Sunset Directions through the Seasons



The Sun's Changing Position

- Because the Sun moves north and south of the celestial equator during the year, the Sun does *not* rise due east or set due west on most days.
- The shift of the Sun's position is particularly obvious near the equinoxes, when the Sun's position on the horizon shifts by almost its own diameter each day.

The Path of the Sun Changes with Latitude



- The motion of the Sun north and south in the sky over the course of the year causes the Sun to follow different paths through the sky each day as Earth rotates.
- The path the Sun follows each day can be quite different at different latitudes.