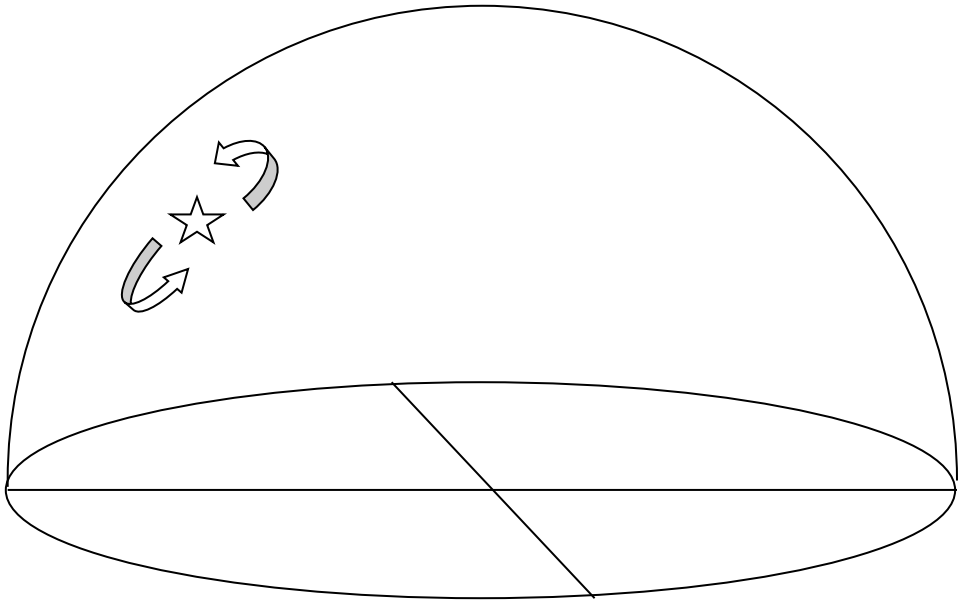
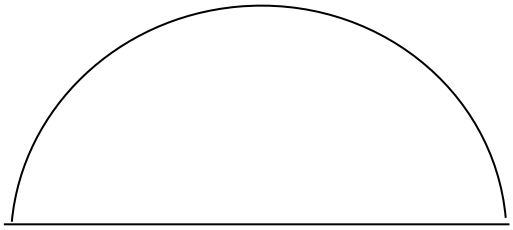
Topic 4: Motions of Earth, Moon, and Sun

I. Apparent Motions of celestial objects
Definition:_____

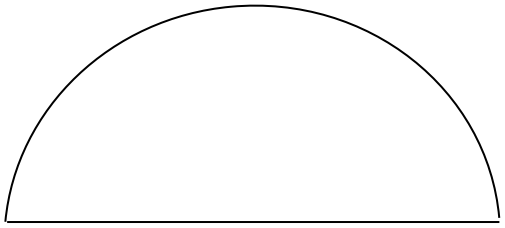
_____

Daily motions

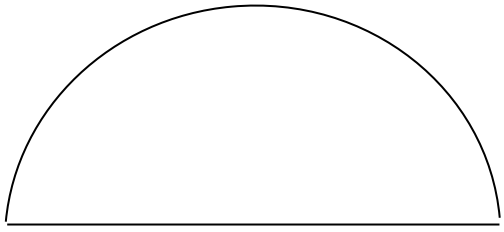




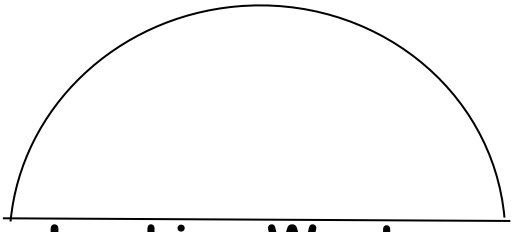
Looking North



Looking South



Looking East



Looking West

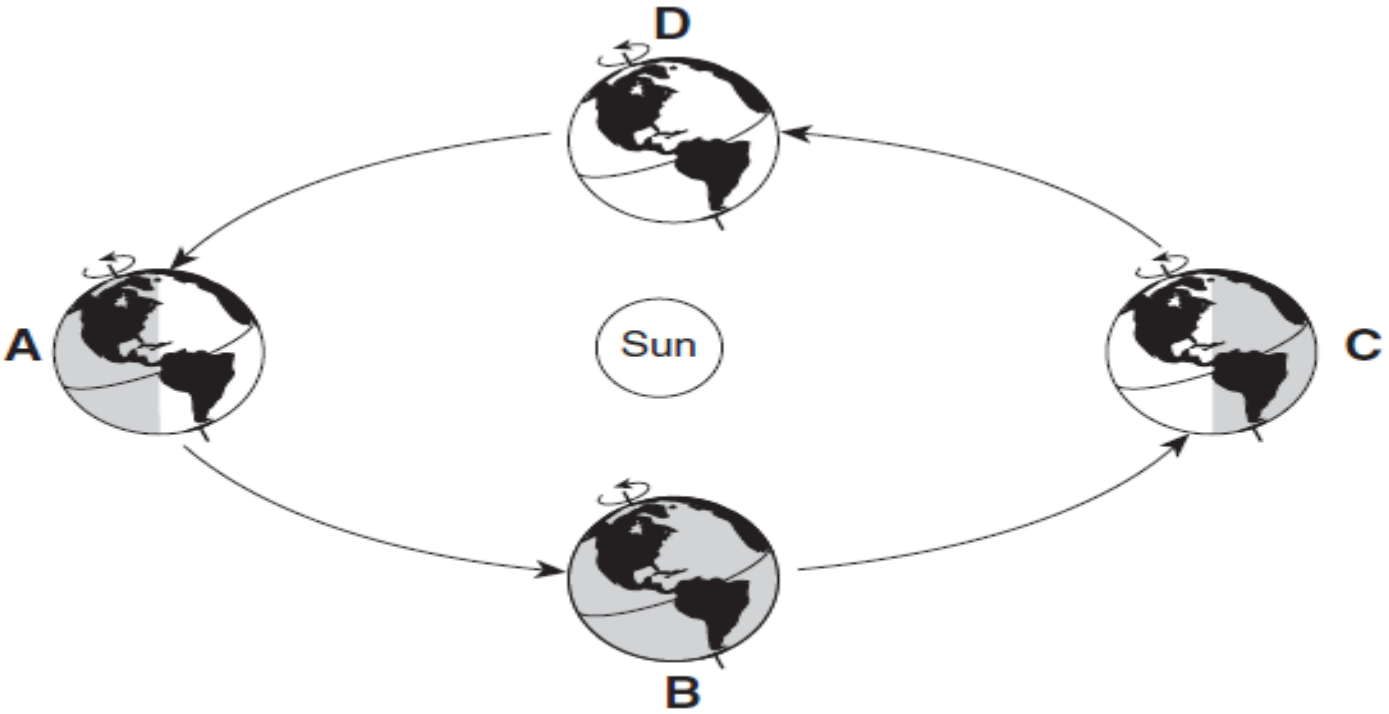
II. Apparent motions of Planets

Some of our planets are visible with the unaided eye.

The planets outside our orbit show retrograde motion (Lab on retrograde motion of Mars)

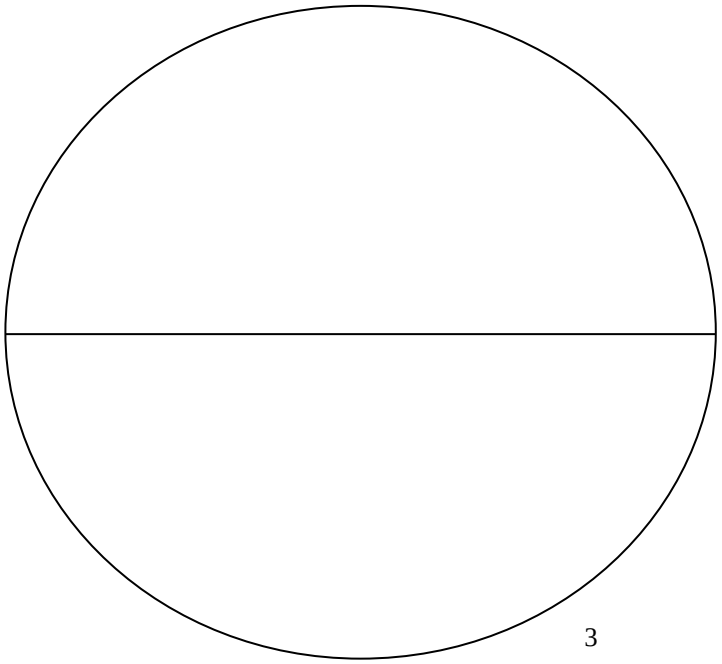
III. Apparent motions of the Sun

In order to understand how the sun changes through the day or the year you must understand the motion of the Earth around the Sun.



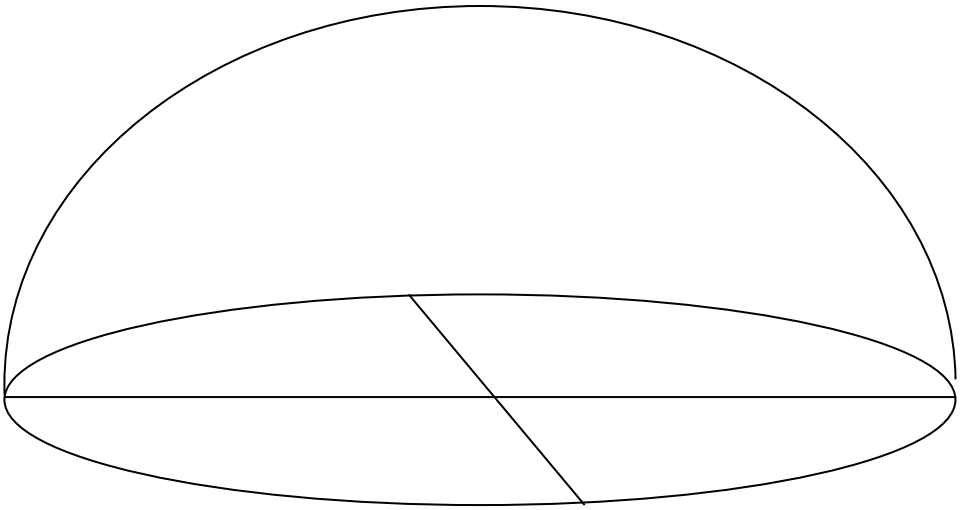
(Not drawn to scale)

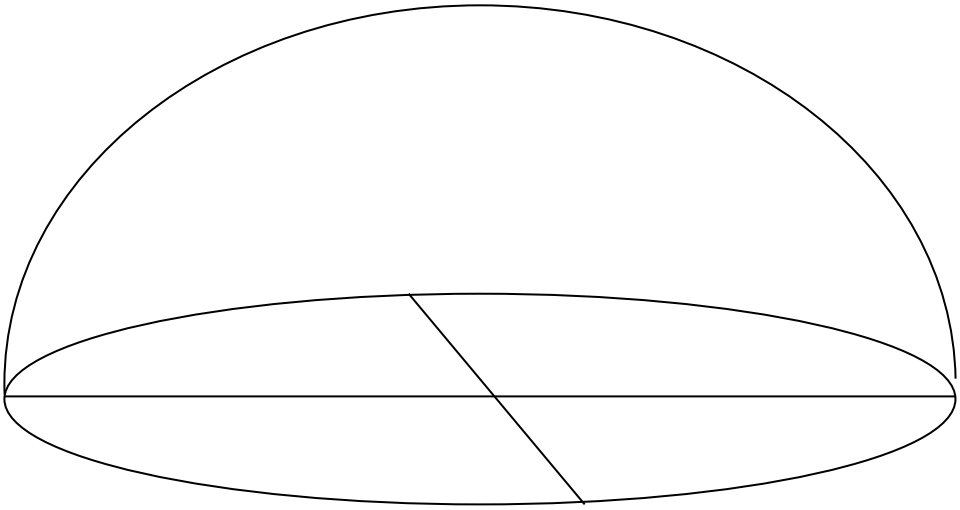
The changes in the direct rays of the sun during the year put the intensity of the sun rays at the tropics

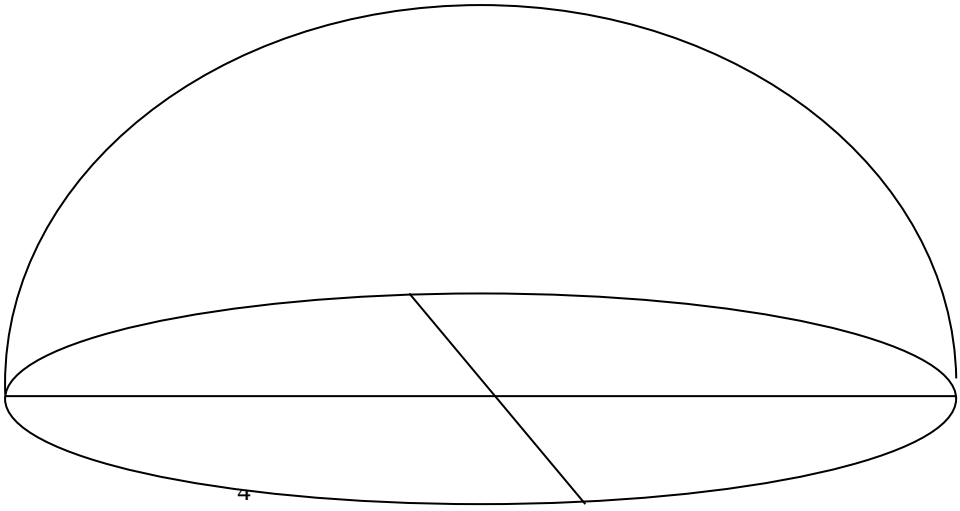


This affects the Path of the sun taken during the day throughout the year
Below is a diagram for four main days throughout the year.

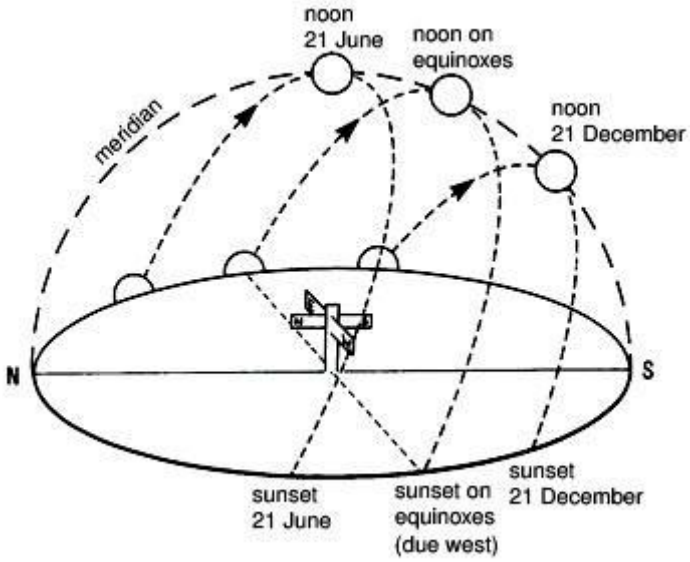
- **The sun will have different paths through the sky during the year**
- **It will have different angles**
- **It will rise and set at different locations**

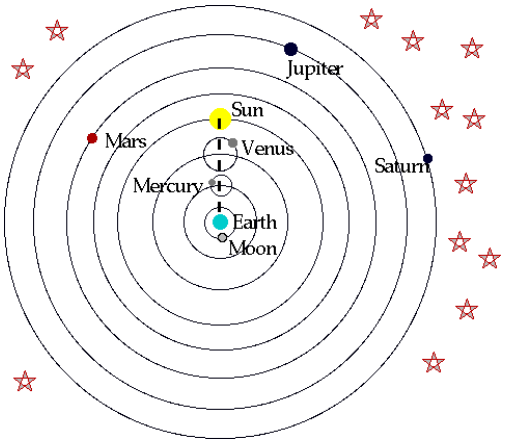






The diagram below shows the combinations of all four dates discussed on the previous page

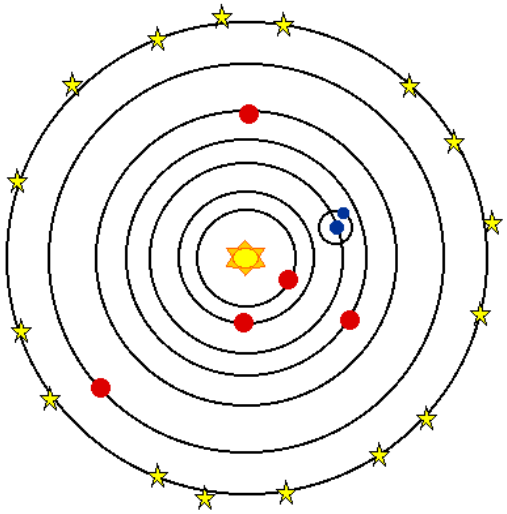




IV. Heliocentric vs. geocentric

1. The geocentric Model- the Earth does not move (rotate or revolve). It is complicated with the motions of celestial bodies.

2. The Heliocentric Model - Does account for the Earth's rotation and revolution, and is simpler



V. Actual Motions of the Earth

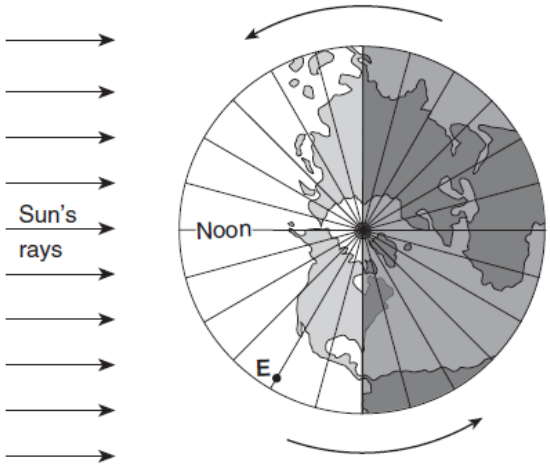
A. Today we know that the Earth is orbiting around the sun in a solar system and that the earth rotates on an axis that is tilted 23.5 degrees.

Rotation: _____

a. Earth's Direction of rotation _____ to _____.

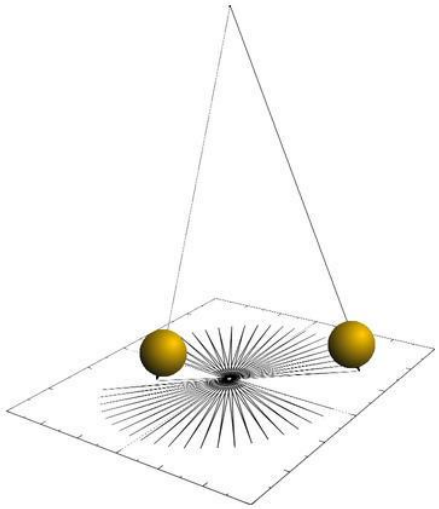
b. Angular rate of rotation: _____degrees per hour

Effects of Earth's Rotation
1. Day and Night



2. Star Trails.

B. Evidence for the Earth's rotation *****
The Foucault Pendulum

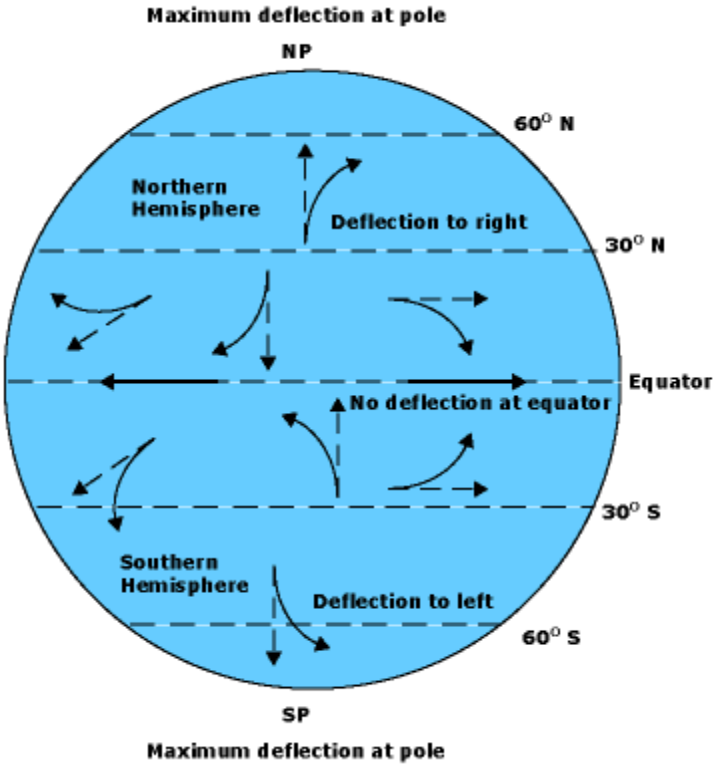


At the top is a swivel that makes the motion of the pendulum independent of earth's movements

The Coriolis effect: Define-

_____

_____



This is why planes cannot fly on a straight path, they must compensate for the Earth's rotation.

Also why wind and water turns as it flows.
Ex. Flushing a toilet

VII. Evidence of the Earth's revolution around the sun

A. Earth's Angular Rate of Revolution

One complete Revolution equals how many days?

_____

What is the Number of degrees in the Earth's Orbit?

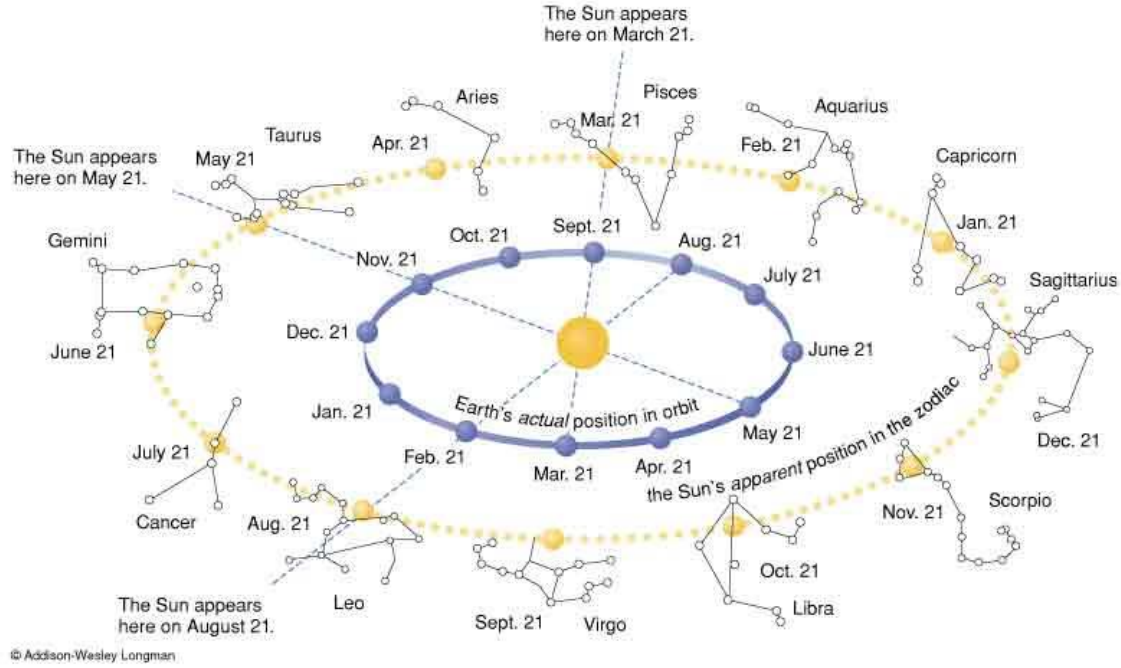
_____

How many degrees does the Earth cover per day?

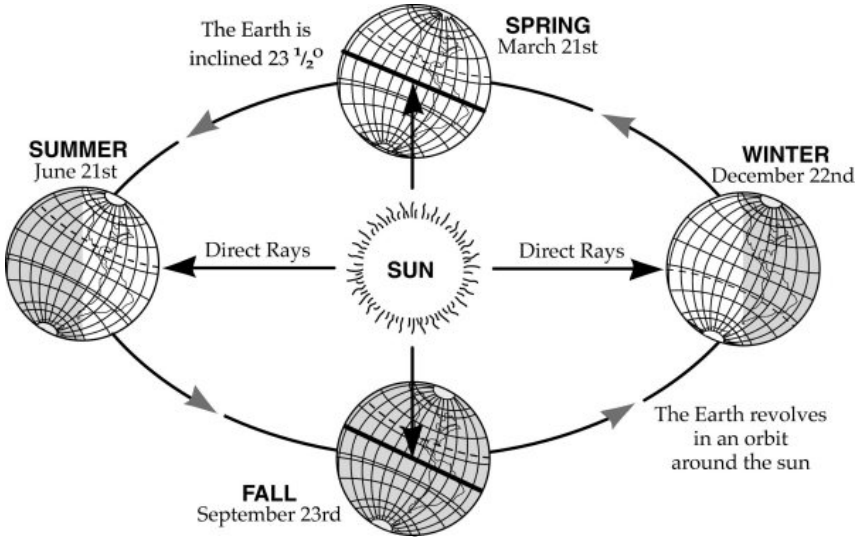
_____

B. Effects of Earth's Revolution.

1. Nighttime constellations change in a yearly cycle.



c. Seasons on a yearly cycle.



VIII. Moon

Earth's only natural satellite the _____

1. _____- Latin word for the moon

2. _____- Roman goddess of the moon

B. Physical Properties of the Moon

1. Size

a. Diameter

2. Gravity

Compared to the Earth the moon's gravity is _____

If you weigh _____divide by _____

What is your weight on the moon? _____

3. Atmosphere

Temperatures of the light-side _____

Temperatures of the dark-side _____

Lunar topography – Surface features of the moon

1. Bowl shaped features called _____ is

made from what? _____

There are more craters on the moon than on the Earth because? _____

2. _____ - Appear as the dark areas on the

moon's surface; once thought to be "_____"

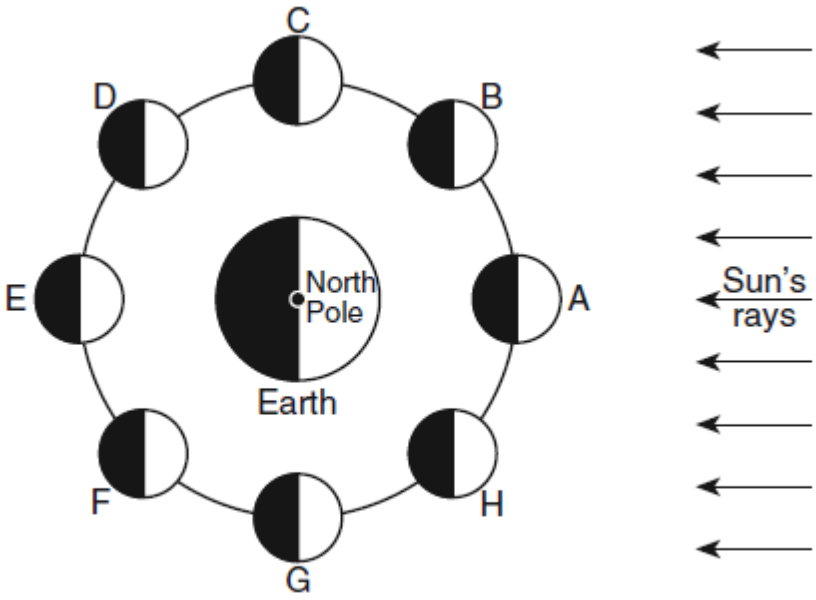
Moon's Revolution

Period of revolution

It has a _____ orbit

Phases of the Moon

1. **These are caused by**
   _____
   _____.



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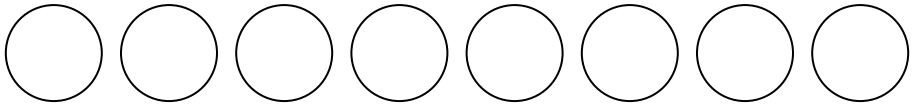


2. **_____ is the word used to describe the phases in which it looks like its gaining amount of light**

3. **_____ is the word used to describe the phases in which it looks like its losing its illuminating light**

The Earth, Moon and Sun working together on Phenomenon

1. Tides --

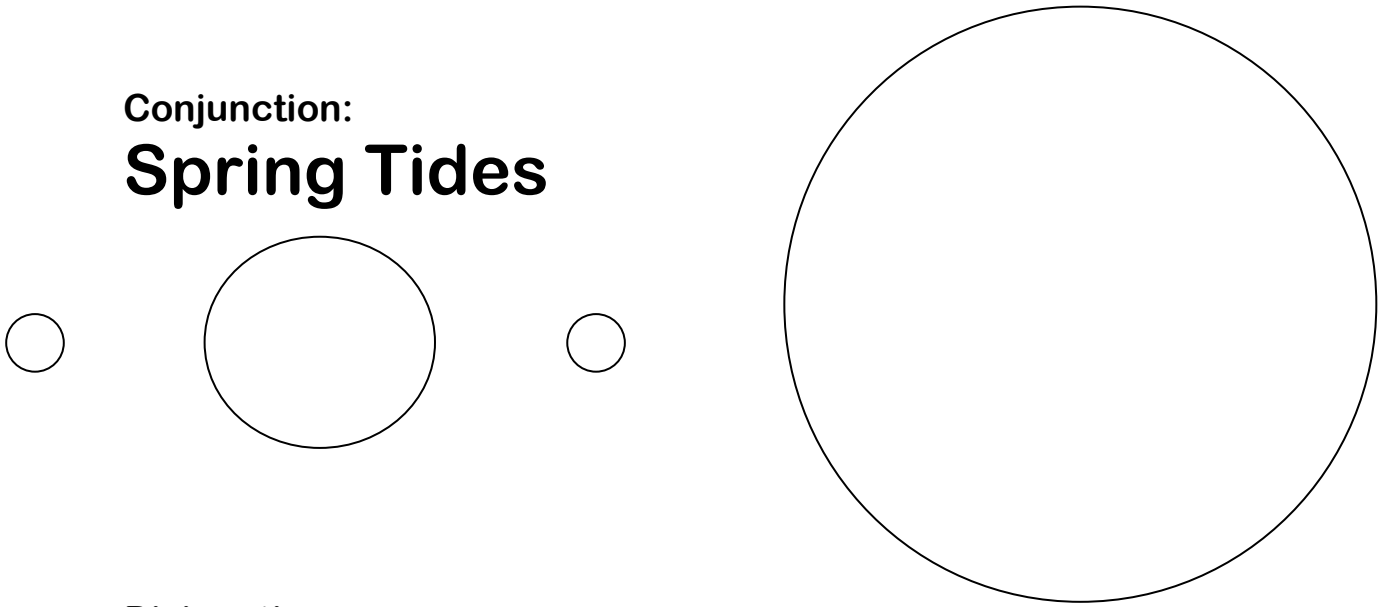
What are they?

What causes the tidal shifts?

Do the Great Lakes have tides?

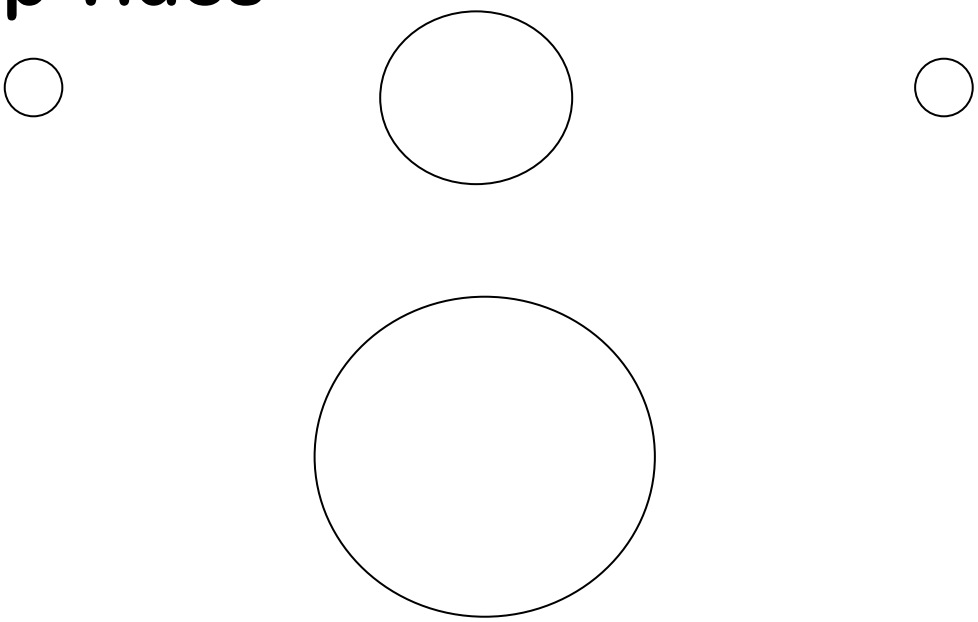
Conjunction:

Spring Tides



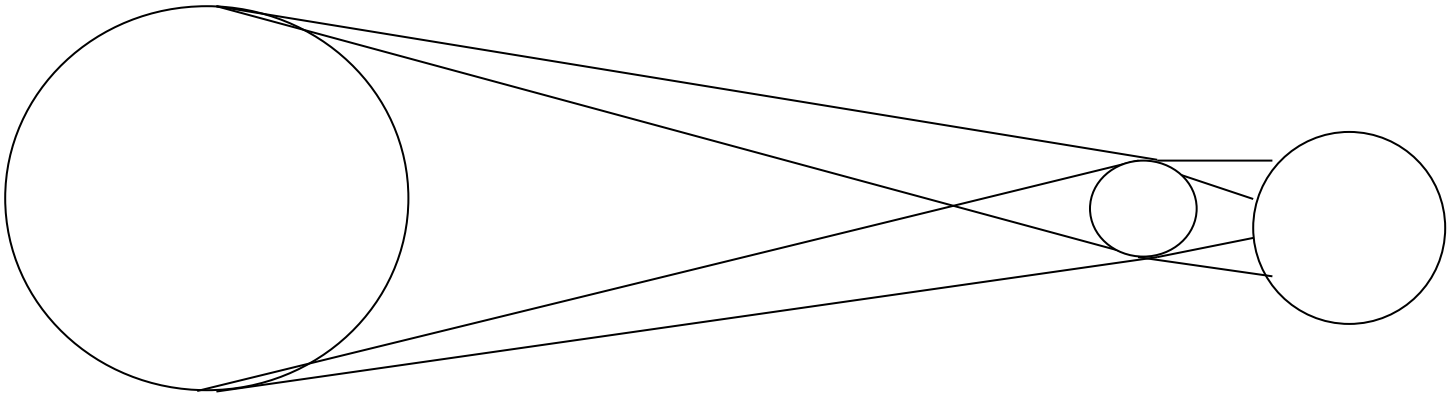
Disjunction:

Neap Tides

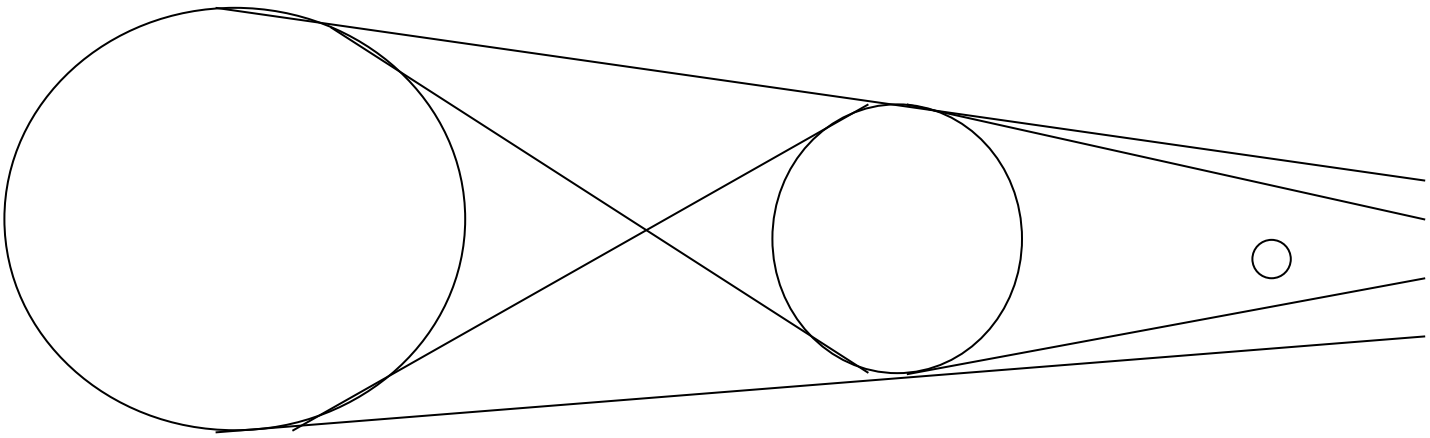


d. Eclipses

Solar eclipse



Lunar eclipses



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Eclipses of the Sun: 2001 - 2020

Calendar Date	Eclipse Type	Eclipse Magnitude	Central Duration	Geographic Region of Eclipse Visibility
2017 Feb 26	Annular	0.992	00m44s	s S. America, Atlantic, Africa, Antarctica **[Annular: Pacific, Chile, Argentina, Atlantic, Africa]**
2017 Aug 21	Total	1.031	02m40s	N. America, n S. America **[Total: n Pacific, U.S., s Atlantic]**
2018 Feb 15	Partial	0.599	-	Antarctica, s S. America
2018 Jul 13	Partial	0.337	-	s Australia
2018 Aug 11	Partial	0.737	-	n Europe, ne Asia
2019 Jan 06	Partial	0.715	-	ne Asia, n Pacific
2019 Jul 02	Total	1.046	04m33s	s Pacific, S. America **[Total: s Pacific, Chile, Argentina]**
2019 Dec 26	Annular	0.970	03m40s	Asia, Australia **[Annular: Saudi Arabia, India, Sumatra, Borneo]**
2020 Jun 21	Annular	0.994	00m38s	Africa, se Europe, Asia **[Annular: c Africa, s Asia, China, Pacific]**
2020 Dec 14	Total	1.025	02m10s	Pacific, s S. America, Antarctica **[Total: s Pacific, Chile, Argentina, s Atlantic]**

018 Jan 31	13:31:00	Total	124	1.315	03h23m **01h16m**	Asia, Aus., Pacific, w N.America
2018 Jul 27	20:22:54	Total	129	1.609	03h55m **01h43m**	S.America, Europe, Africa, Asia, Aus.
2019 Jan 21	05:13:27	Total	134	1.195	03h17m **01h02m**	c Pacific, Americas, Europe, Africa
2019 Jul 16	21:31:55	Partial	139	0.653	02h58m	S.America, Europe, Africa, Asia, Aus.
2020 Jan 10	19:11:11	Penumbral	144	-0.116	-	Europe, Africa, Asia, Aus.
2020 Jun 05	19:26:14	Penumbral	111	-0.405	-	Europe, Africa, Asia, Aus.
2020 Jul 05	04:31:12	Penumbral	149	-0.644	-	Americas, sw Europe, Africa
2020 Nov 30	09:44:01	Penumbral	116	-0.262	-	Asia, Aus., Pacific, Americas