

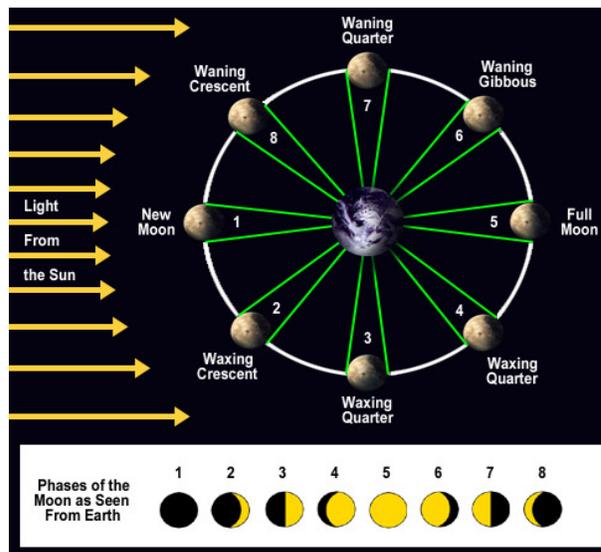
Name _____

HR _____

Earth's Moon and Solar System Outline

Phases of the Moon

- The apparent shape of the _____ depends upon the changing relative positions of _____
- As the _____ completes one revolution around _____ each _____, the growing and shrinking _____ area makes the _____ appear to change in _____
- The _____ periods of rotation and revolution are _____
 - Because of this, the _____ side of the moon always faces _____
- One complete _____ of the moon around Earth takes about _____ days
- A complete cycle of the moon's _____ takes _____ days
 - This _____ day difference occurs because as the _____ orbits _____, _____ orbits the _____
 - When the _____ gets back to its original position, it must move through an extra angle of about _____° to compensate for _____ orbital motion around the _____



Eclipse of the Moon

- An _____ of the _____ occurs when the _____ moon moves into Earth's _____
- During a _____ eclipse, the _____ turns a coppery _____

- You can still _____ the moon because _____ is bent by Earth's _____, which causes a weak _____ of the _____

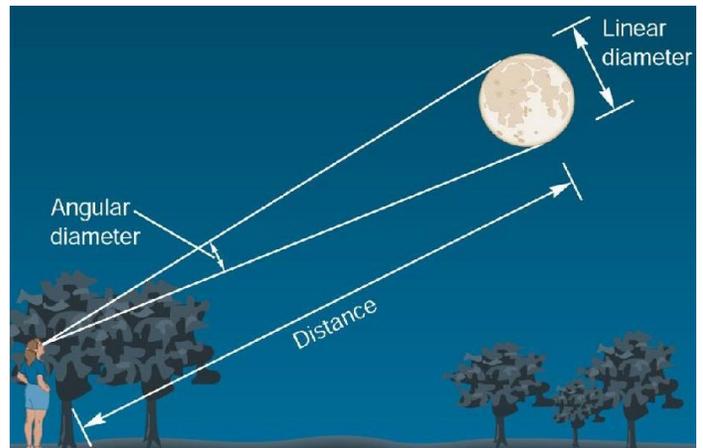
Eclipse of the Sun

- An _____ of the _____ occurs when the _____ moon briefly moves in _____ of the _____
- At this time the _____ casts its _____ on _____

Angular Diameter

- Angular diameter is the _____ formed between the _____ of an _____ and your _____
- The angular diameter of any _____ depends upon the actual _____ of the object and how _____ it is from the _____

$$\tan(\text{angular width}) = \frac{\text{diameter}}{\text{distance}}$$



Angular Diameter of the Sun

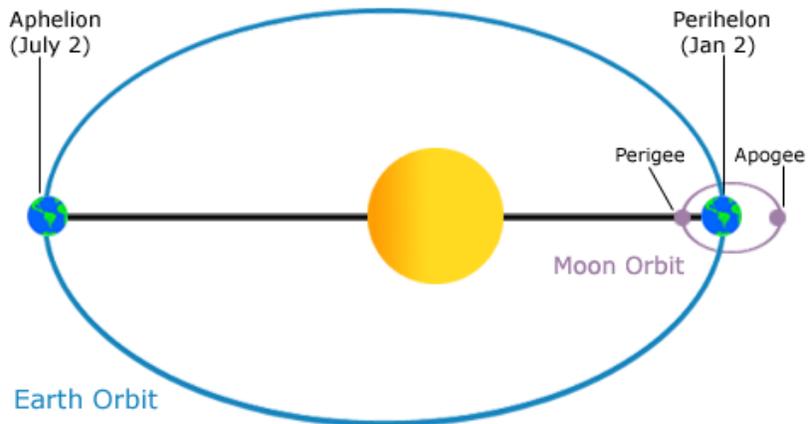
- Observations of the sun's angular _____ tell us that _____ is closest to the sun in _____ and _____ from the sun in _____
- _____ variations result from the _____ of the Earth's _____ and Earth's shape _____ from Earth-sun _____
- The sun's angular diameter is _____ in winter and _____ in summer

Angular Size and Shape of Orbit

- Because the _____ seems to change size more than the _____, we can infer that changes in the relative _____ between the moon and Earth are _____ than changes in the relative _____ between the _____ and Earth

- Since both changes are small compared to the magnitude of the average distance, we can infer that the _____ of the moon around Earth and the _____ of Earth around the sun are nearly _____

Earth-Moon Orbit

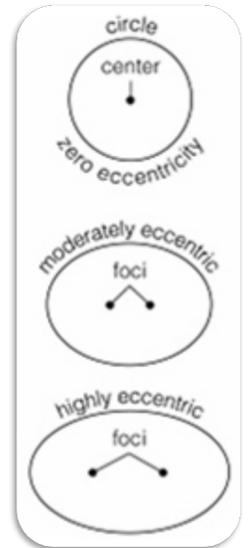
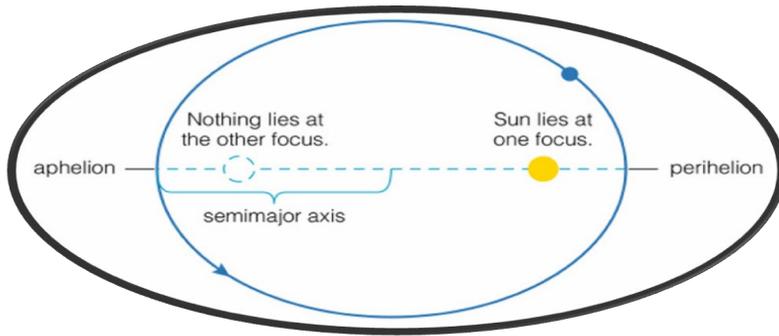


The Tides

- Every point along the _____ experiences _____ low tides and _____ high tides per _____
- The _____ between _____ tide and _____ tide is usually less than a _____ (_____)
- The cause of tides is _____ attraction off the moon and the sun
 - The _____ and _____ pull on the _____ in the oceans and on the _____ part of Earth
- The _____ of the oceans is pulled _____ the moon, which causes _____ tide
- Another high _____ occurs on the opposite side of Earth, where the _____ part of Earth is pulled _____ from the _____
- The _____ high tides and the _____ low tides occur about _____ a _____ near the _____ and _____ moon phases

The Geometry of Orbits

- Planets revolve in an _____ around the _____
 - An ellipse has _____ fixed _____ called _____ that are on either side of the center of the _____
 - The _____ lies at one _____ and is not the _____ of Earth's orbit



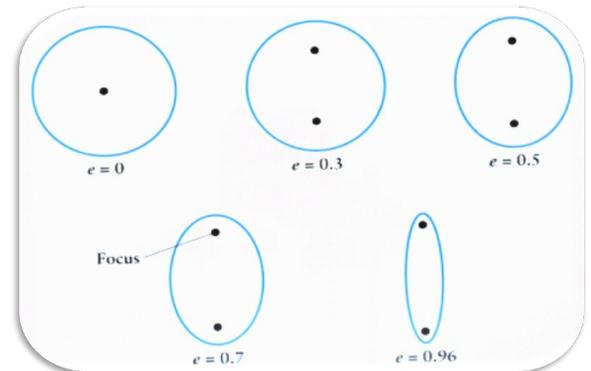
The Geometry of Orbits

- If the two _____ are located near the _____ of the axis, an ellipse is _____ and _____
- Many _____ have this type of path
- If the foci move _____ together, the shape of the ellipse becomes _____

Calculating Eccentricity (elongation) of an ellipse

Eccentricity = _____

$e =$ _____

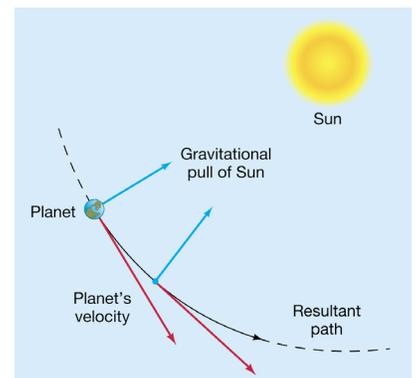


The Force of Gravity

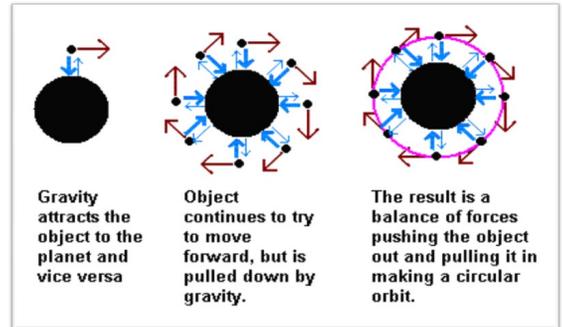
- _____ is a force of _____ between objects that is dependent on the _____ of the objects and the _____ between them

Gravity and the Planets

- _____ is the force that holds the _____ and other objects in the solar system in their _____
- Any object that _____ another object in space is known as a _____
 - _____ is a satellite of the sun
 - The _____ is Earth's satellite

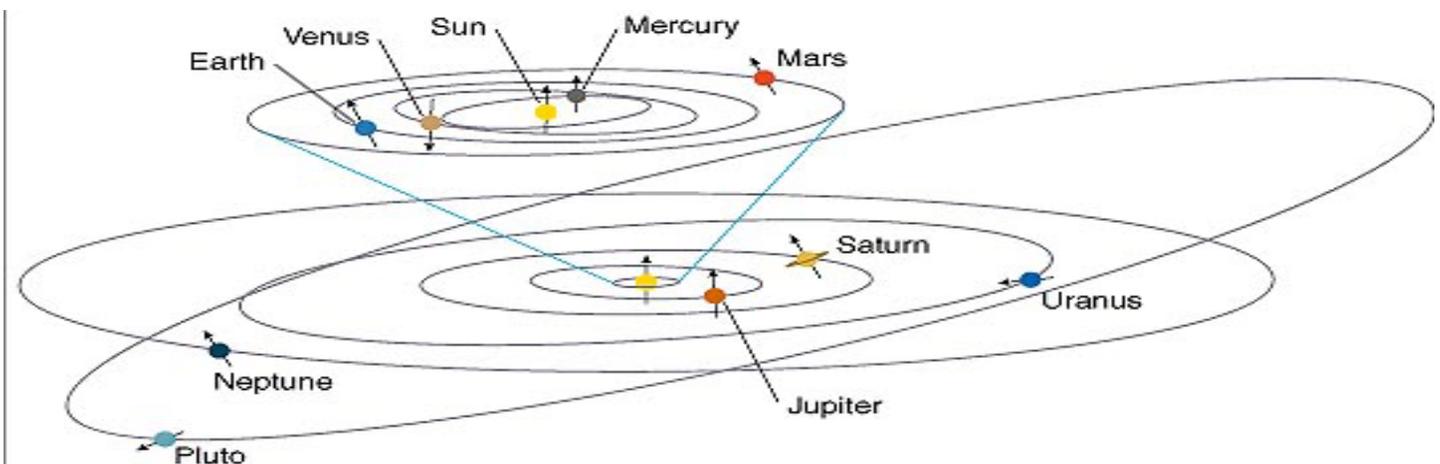


- The _____ path of any satellite is a result of _____ and _____
 - _____ is the tendency of an object to remain at _____, or, if it is moving, to move with the same _____ in the same direction
- If a satellite has a _____ orbit, inertia and the force of gravity are _____
 - There is no change in _____, but there is a constant change in _____, producing a _____ path
- If a satellite has an _____ orbit, _____ causes the speed to change
 - The satellite will move _____ when it's near its primary and _____ when it's farther away
- The _____ a planet is to the _____, the _____ it moves in its orbit
 - _____, the planet closest to the sun, travels about 1.6 times as fast as _____ and 10 times the speed of _____



Planets of our Solar System

- The planets can be divided into _____ groups
- _____ (_____)
- _____ (density = 5.5 g/cm³)
- _____ giants



Similarities between Mercury and Earth's Moon

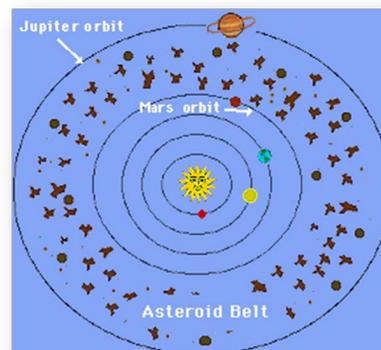
- Both the moon and Mercury are _____ than Earth
- Both have a dark surface covered with _____ from _____
- Neither have a significant _____
 - They are _____ protected from _____ impacts and their _____ do not _____ quickly
 - _____ samples would show no _____ weathering
 - They both have extreme _____
- Both have very slow _____ making days and nights _____ than on Earth

Planet Surface Temperatures

- Are a result of the _____ from the _____
 - _____ Planets are _____ and _____
- _____ is a little hotter due to a very dense _____ of carbon dioxide producing a "_____"
- Earth and Mars are _____ because of the greater _____ from the sun
 - _____ has a very thin _____ of mostly _____ with minimal "greenhouse effect"
- The _____ giant planets do not have "_____ temperatures" as they are composed of _____ that increase in _____ with depth and pressure

Earth is Unique

- _____ is the only planet that has abundant liquid _____
- The presence of liquid _____ on Earth may be the reason why _____ organisms have not been detected elsewhere in the solar system
- The Earth's _____ is the only planet that has an atmosphere with abundant free _____ that is released when _____ extract carbon from carbon dioxide by _____



Asteroids

- Located mostly between _____ and _____ in a belt of thousands of rocky objects

- They range from the size of _____ to 600 _____ in diameter
- A few have _____ that can cross Earth's orbit

Meteors

- Small solid particles from _____ can be caught by Earth's _____ and dragged down through the _____
- As the objects _____, they are heated by _____ with the Earth atmosphere and _____, producing streaks of _____ ("shooting stars") visible at night
- Meteors that _____ their fall and hit the ground are called _____

Comets

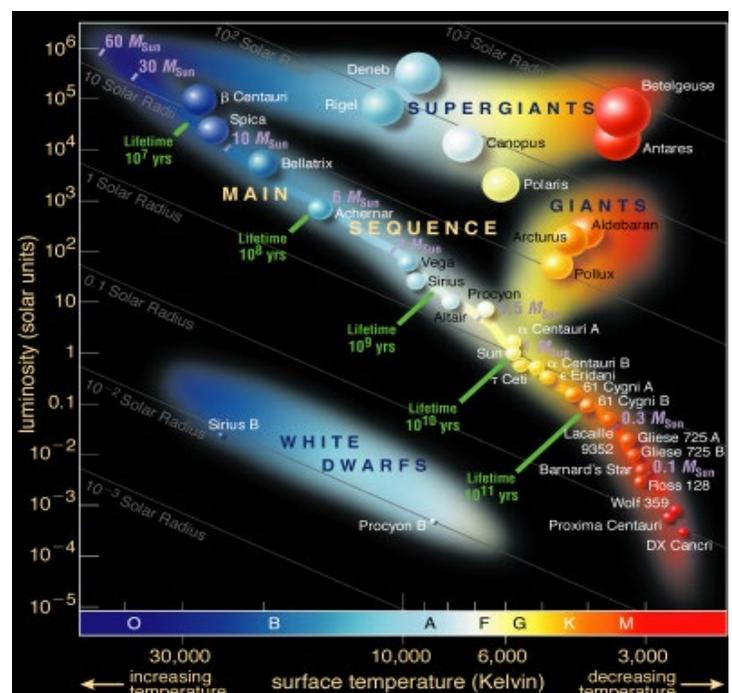
- _____ objects which usually originate in a region _____ of the planets
- Some of them come close to the _____ in very _____ orbits
 - Heating by the _____ causes them to partially _____ producing a tail
- Comets are visible for _____ and do not streak across the night sky

The Sun

- The nearest star to Earth
 - A _____ is a large, self-luminous body in space that creates its own _____
- The sun gets its _____ from _____
- Dark spots on the sun's surface are known as _____
 - Sunspots are temporary _____ visible on the surface of the sun
 - Sunspots come and go in _____ of about 11 years

Classifying Stars

- The Hertzsprung-Russell diagram is used to _____ stars by _____ and _____
- Our sun is a fairly typical star



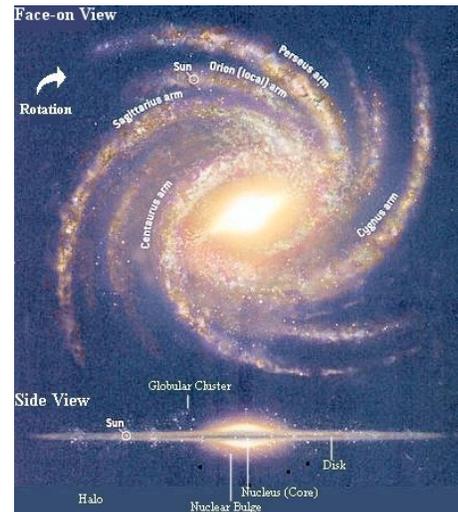
- Although the sun is brighter than most of the nearest stars, it is _____ compared with most of the stars we see at night

Galaxies

- A galaxy is a huge body of _____ and other matter in space
- Our own galaxy is called the _____ named for its faint white color
- The sun is one of about _____ stars in the Milky Way

The Milky Way

- The Milky Way is a _____ galaxy
- Our solar system is located in a spiral _____ well away from the galactic _____
- The Earth and sun and other nearby stars _____ around the _____ of the Milky Way galaxy
 - It takes about _____ million years to complete this _____

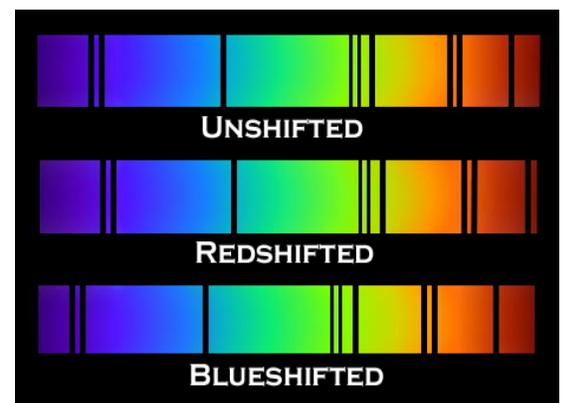


Spectroscopes

- The _____ given off by stars is marked by dark lines in certain _____
- A _____ is an instrument that _____ light into its component _____
- Since _____ are primarily _____ and _____, the lines we usually see are in the orange, yellow, green and blue areas

Edwin Hubble

- In the early part of the 20th century, Edwin Hubble discovered that light that reached _____ from distant _____ shows special lines that are shifted toward the _____ end of the spectrum
- He suggested that the _____ lines are evidence that distant _____ are moving _____ from us



- Observations of distant galaxies in all directions showed the _____ shift

- The more _____ the galaxy, the _____ the _____ shift

Evolution of the Universe

- The _____ and other observations led scientists to the conclusion that the universe is _____
- Computer models that _____ the expansion, lead to the idea that at one time the universe was a _____ object of incredible mass and density that _____
- This theory of the origin of the universe is known as the “_____”
 - Scientists can detect _____ remaining from the big bang
- Scientists currently believe the universe is about _____ to _____ billion years old

The Size of the Universe

- The distance _____ can travel in one year is called a _____, which is about _____ trillion _____
 - Light could circle _____ seven times in one _____
 - Light takes about one and a half seconds to get to the _____
 - Light from the _____ takes about _____ minutes to reach earth
 - Light from the nearest _____ (not our sun) takes about _____ years to reach us
- _____
- The _____ is thought to be about _____ billion light-years in diameter

The Future of the Universe

- Some astronomers think that the _____ of the universe will continue _____
- Some astronomers believe the force of _____ will eventually reverse the _____ and the universe will fall back together in the “_____”
- Some astronomers think it is possible that the universe will _____ between _____ and _____