Topic 3: Earth in the Universe

I. Celestial object:

Definition

____

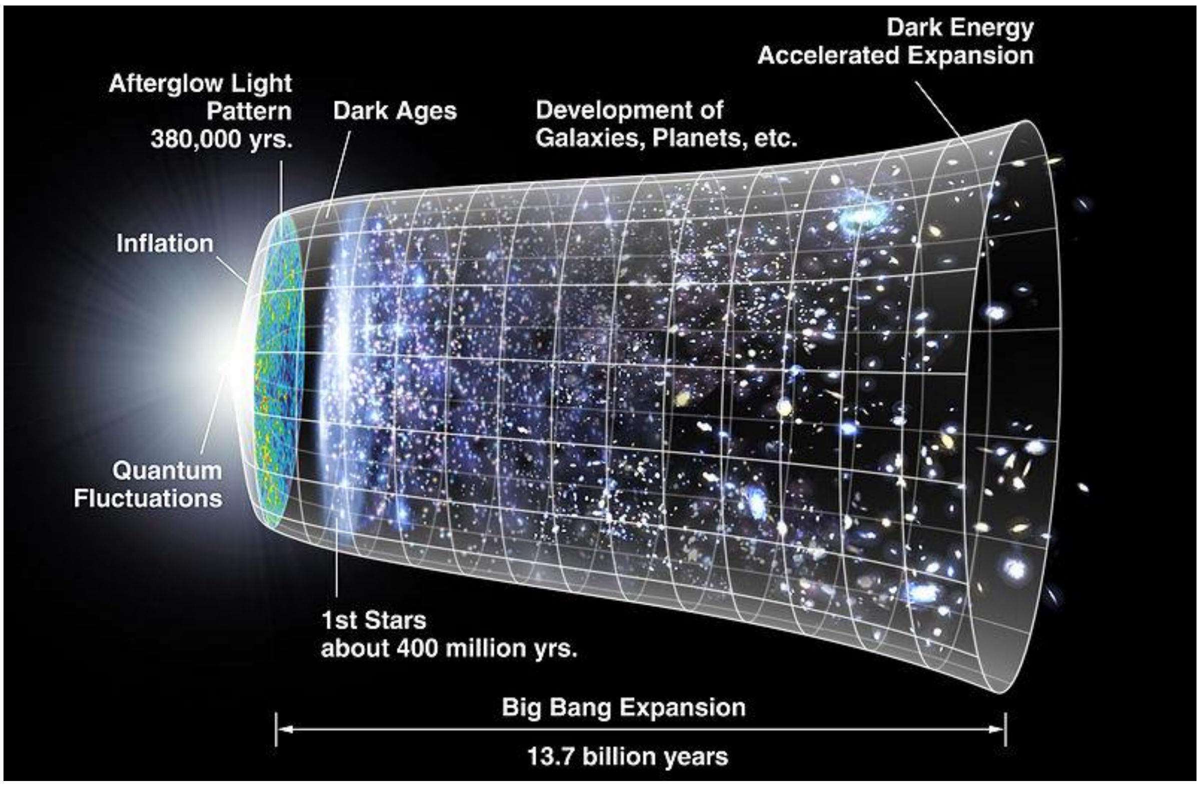
Examples of celestial objects

II. Origin and age of the Universe

a. Universe
Definition:

____

b. Big Bang theory
One of the theories on the creation of the Universe



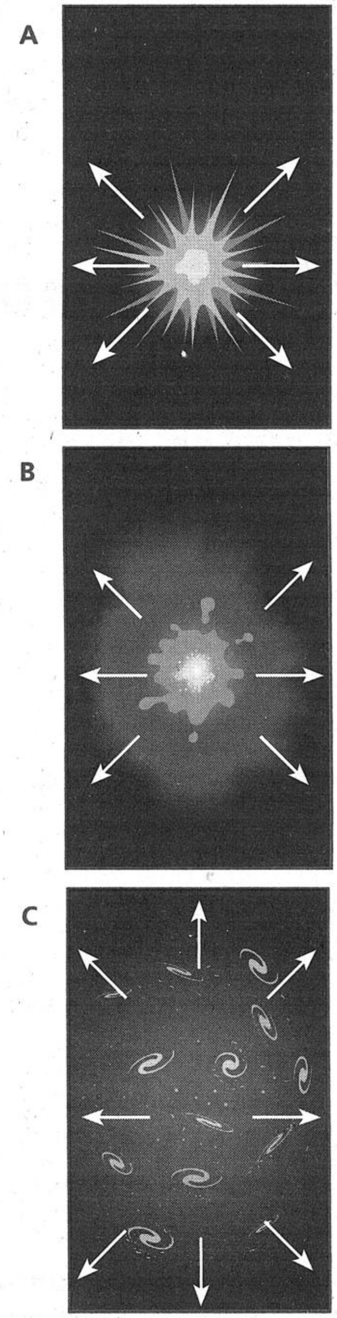
c. Evidence for the Big Bang

1.____________________________--

2.____________________________--

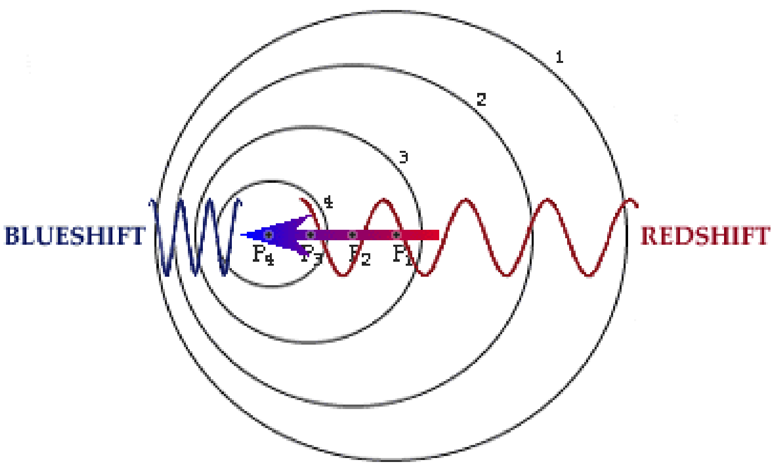
3.____________________________--

(Look in reference tables on page 15)



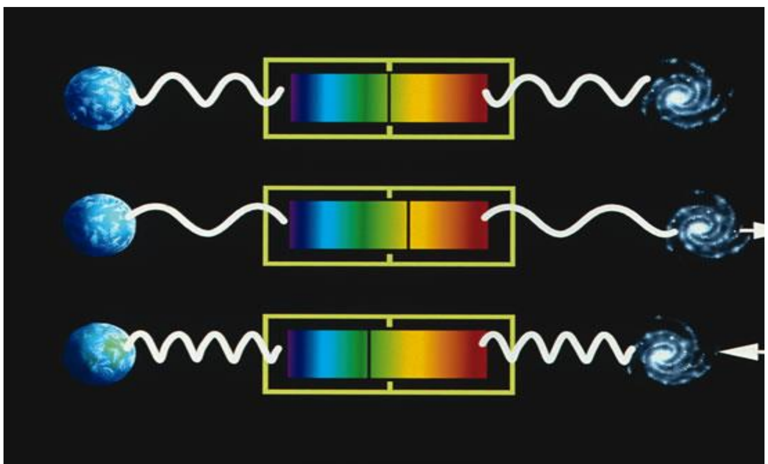
4. ***Red-shift in other galaxies***-

Hubble discovered the Red-shift in the Universe's Galaxies



Doppler effect

Redshift in other Galaxies:



Stars give off many different types of energy. The energy is organized by the wavelength. The electromagnetic spectrum is a chart that shows the different wavelengths of different forms of energy. Turn to your Electromagnetic Spectrum in your reference table. Shorter wave energy is more powerful than the longer wave energy. Answer the following questions.

Name all the forms of energy that is listed on the Electromagnetic spectrum?

What is the name of the energy of the shortest wavelength on the chart?

What is the name of the energy of the longest wavelength on the chart?

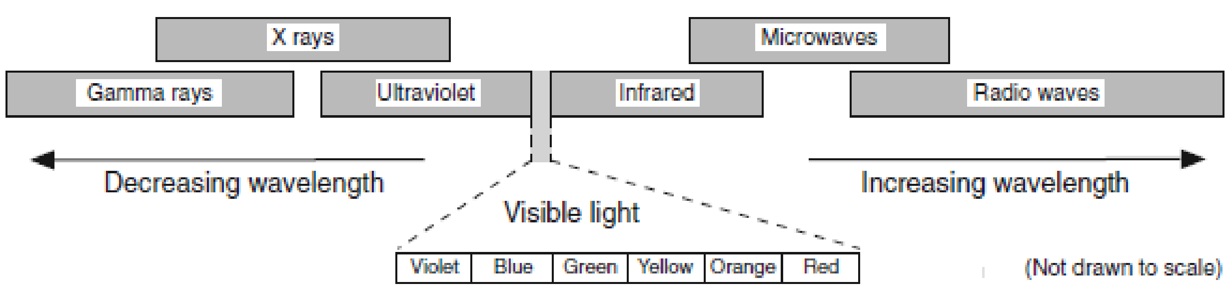
Name the colors that make up visible light (white light)?

What is the longest energy wavelength in visible light?

What is the shortest energy wave energy in visible light?

What is the weakest type of energy on the spectrum?

Electromagnetic Spectrum

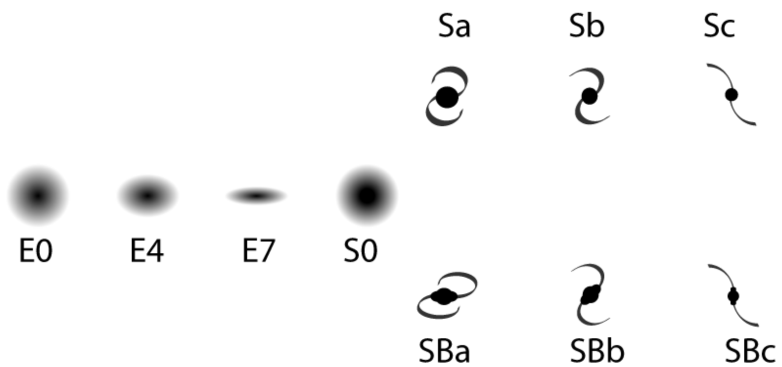


III. Structure of the Universe
Galaxies
Def: ____

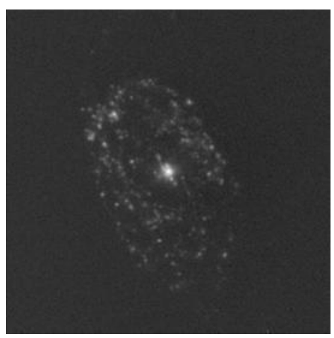
Three general types of galaxies 1. __________ 2. __________ 3.__________

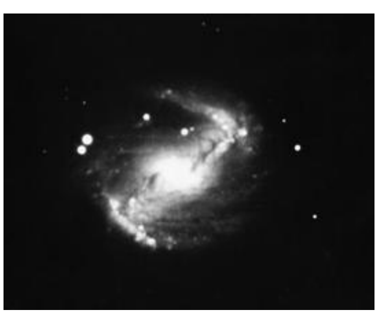
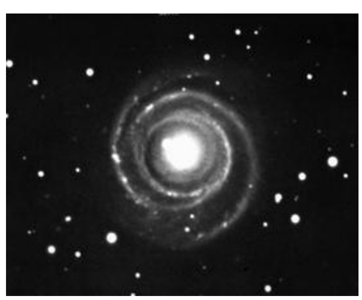
Edwin Hubble constructed a classification chart for the many types of galaxies

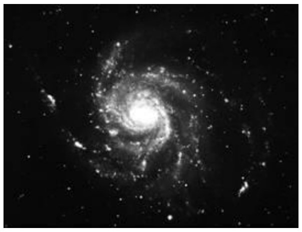
Types of galaxies (Classification)
Using Edwin Hubbles' Classification system Classify the galaxies pictured below



galaxies to be classified

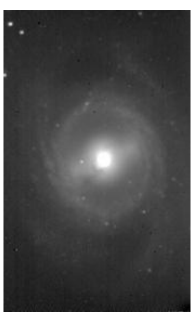



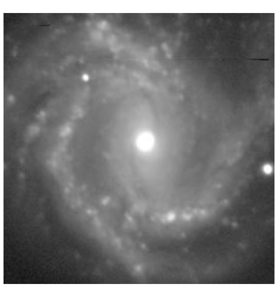









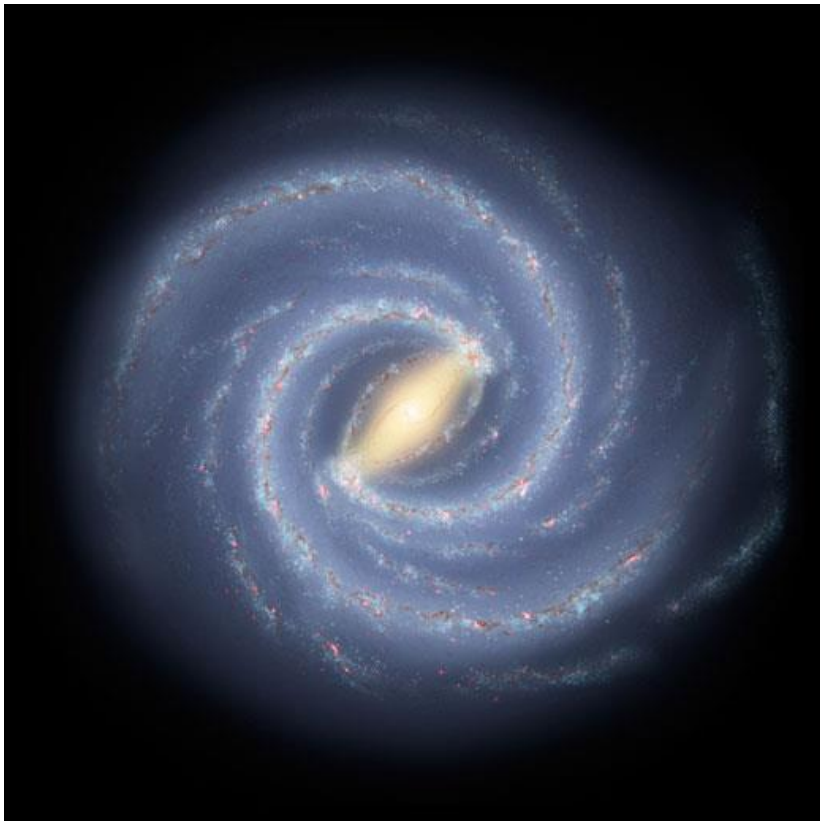



Some Galaxies Accessible to Amateur Astronomers

Name	Constellation	RA (2000)	Dec	Mag	Notes
M31 (NGC 224)	Andromeda	00 42.7	+4116	4	Great spiral
M32 (NGC 221)	Andromeda	00 42.7	+40 52	9	Elliptical companion of M31
M110 (NGC 205)	Andromeda	00 40.4	+41 41	9	Elliptical companion of M31
M81 (NGC 3031)	Ursa Major	09 55.5	+69 04	8	-
M82 (NGC 3034)	Ursa Major	09 55.9	+69 41	9	edge-on dusty starburst galaxy
Centaurus A	Centaurus	13 25.5	-43 01	8	peculiar radio galaxy
LMC	Doradus	05 23	-69 45	2	Large Magellanic Cloud
SMC	Tucana	00 52	-72 50	3	Small Magellanic Cloud
M77 (NGC 1068)	Cetus	02 42.6	-00 01	10	Seyfert nucleus
M87 (NGC 4486)	Virgo	12 30.8	+12 23	9	Center of Virgo cluster
NGC 4565	Coma	12 36.3	+25 59	10	edge-on spiral, dust lane
NGC 3556	Ursa Major	11 11.5	+55 40	11	edge-on spiral
NGC 891	Andromeda	02 22.5	+42 21	10	edge-on spiral
M104 (NGC	Virgo	12 40.0	-11 37	9	Sombrero galaxy
M65 (NGC 3623)	Leo	11 18.9	+13 05	10	-
M66 (NGC 3627)	Leo	11 20.2	+12 59	10	-

c. Our Galaxy

Milky Way Galaxy



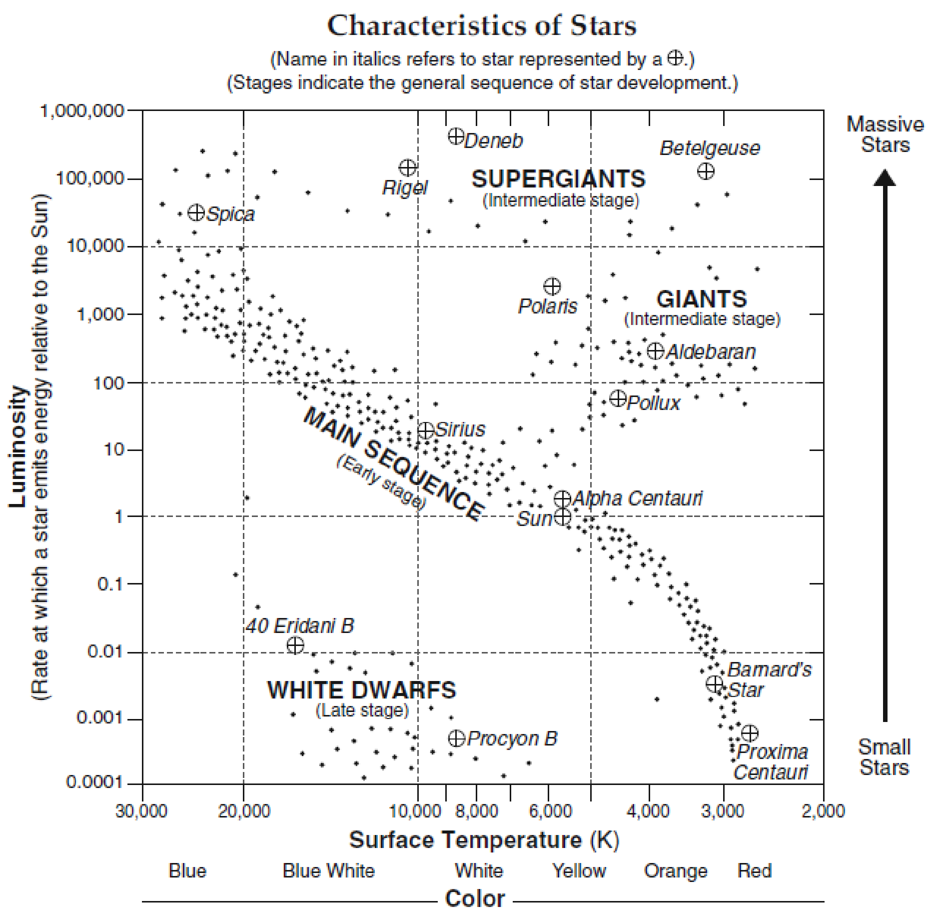
IV. Stars

Define:

Energy production in a star:

- ○ **What happens in Nuclear Fusion?**
- ○ **Where does this Happen?**

- **Luminosity and Temperature of stars diagram.**

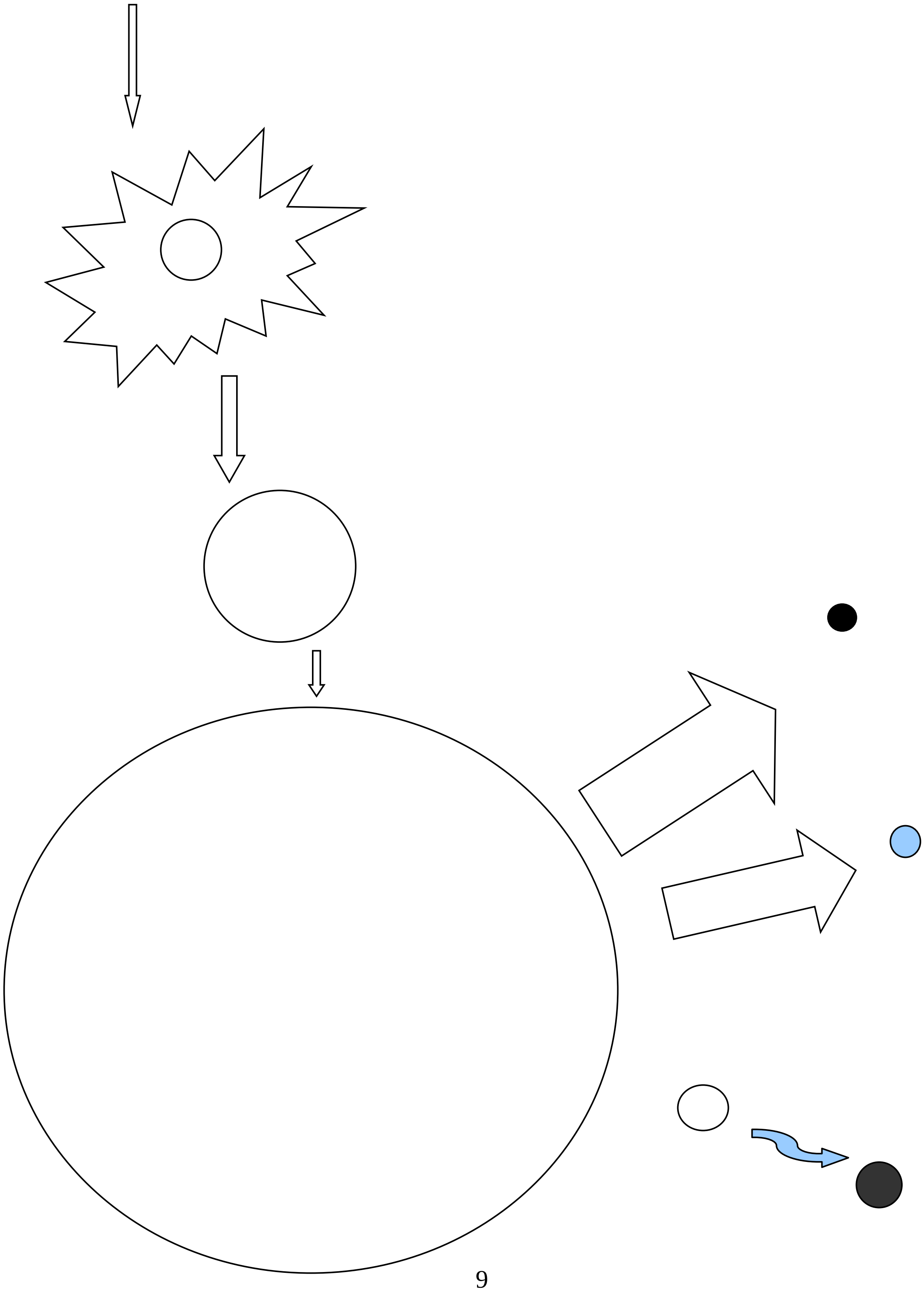


Same as the Diagram on page 15 of the

Reference tables
Use the chart above to fill in the Blanks on the table below.

Star	Luminosity	Temperature	Color
Sun			
Betelgeuse			
Sirius			
Alpha Centauri			
Polaris			
	400		Orange
	.003	8,600	

Stars Origin and Evolution
Star flow chart



c. Star types

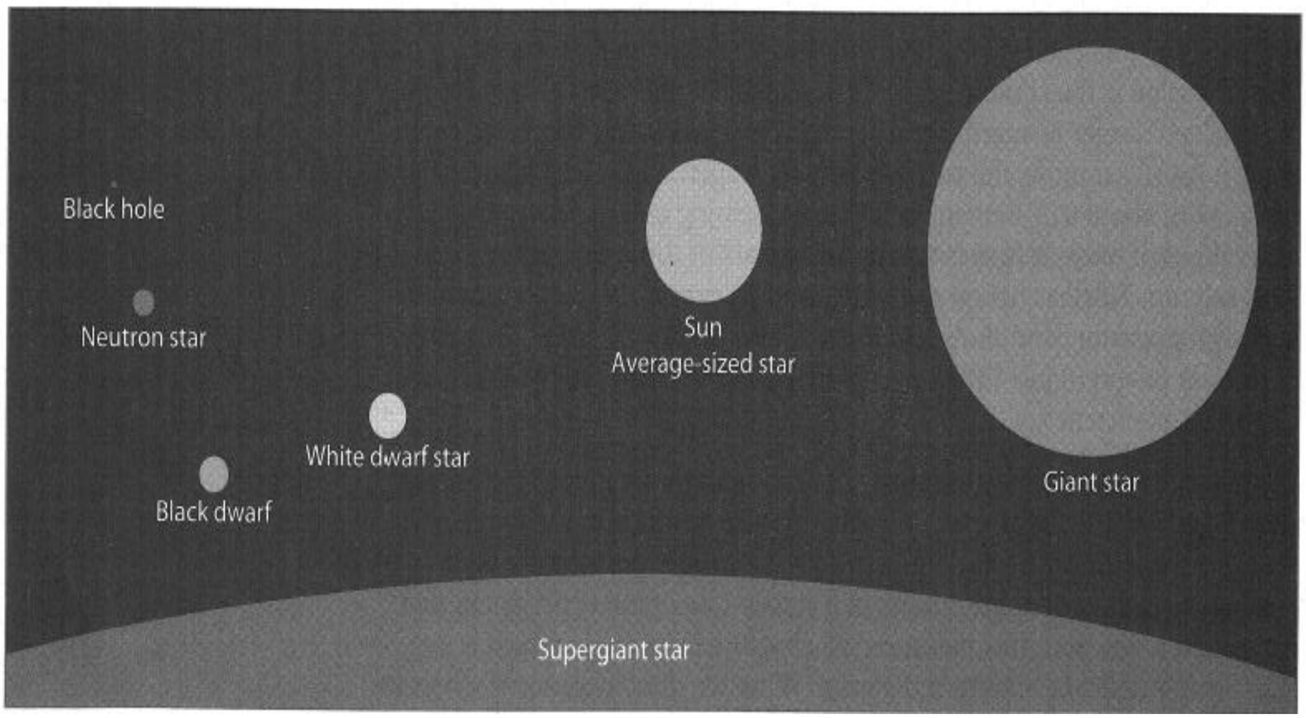
1. Main sequence stars ____

2. Giant stars ____

3. Super-giants ____

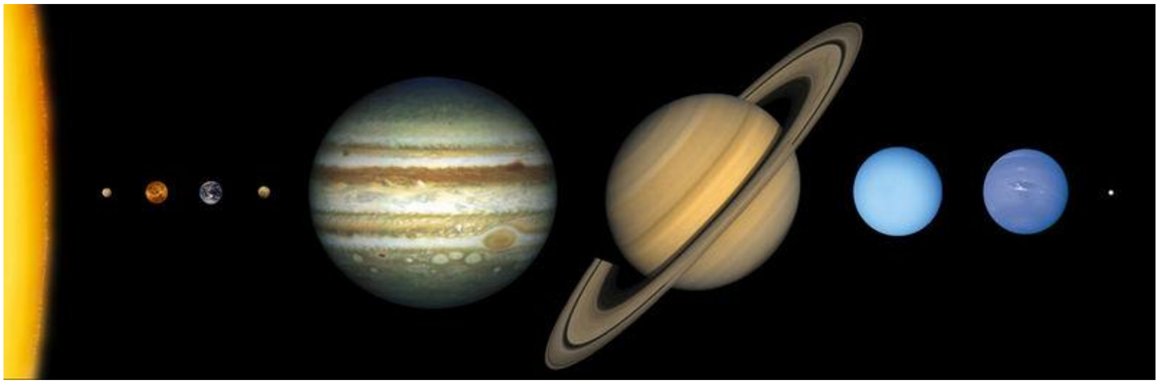
4. White Dwarfs ____

5. Black Dwarfs ____

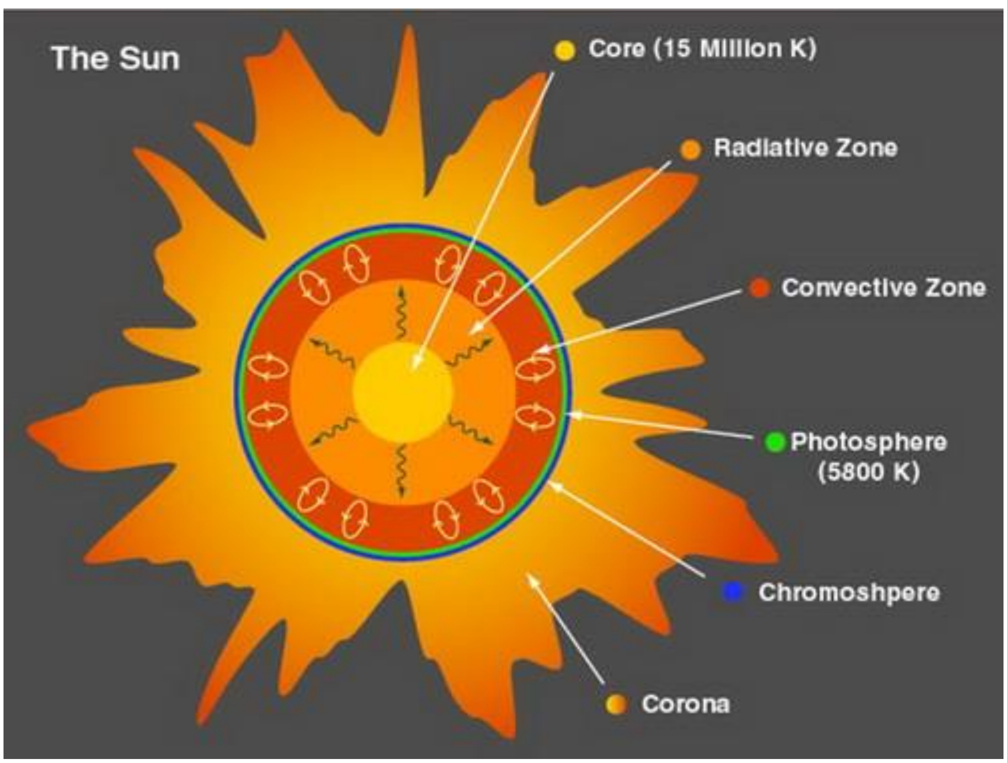


VI. Solar System: you may want to write down notes on the side as you go over the slide show with the teacher.

Parts of the Solar system



The Sun: ____
____
____



Planets
The Terrestrial Planets:
Define terrestrial- ____

Mercury

Venus

Earth

Mars

Jovian Planets or the Gas Giants
Definition of Jovian -
____

Jupiter

Saturn

Uranus

Neptune

c. Moons:

Jupiter's moons—Most popular is The Galilean Satellites

Callisto

Europa

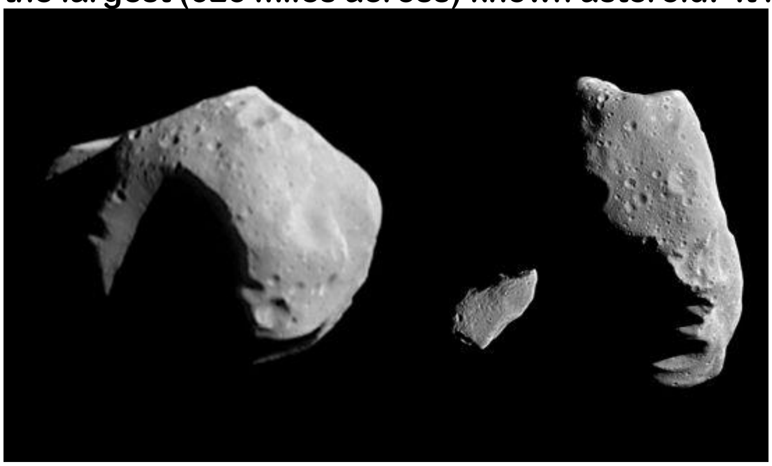
Io

Ganymede

Saturn's moon

Titan

d. <u>Asteroids</u>—
these are mostly containing in the belt between Mars and Jupiter. All the Asteroids in the solar system would not equal the mass of Pluto. Ceres is the largest (623 miles across) known asteroid. It may look like a faint star



Once in a while one of these comes in contact with the earth

Impact Craters--There is one in Quebec that is over 200 million miles old

There is another on the Yucatan Peninsula partly in the ocean and about 65 million years old.

Think!!
Why are there so many more impact craters on the moon than on Earth??

e. Comets—

Not long ago, Many people thought that comets were a sign that something bad was about to happen to them.
People didn't understand how objects in the sky moved, so sight of a comet must have been very disturbing.
There are many historical records and works of art, which record the appearance of comets and link them with terrible events such as wars or plague.
Now we know that comets are lumps of ice and dust that periodically come into center of the solar system from somewhere in its outer reaches and so some comets make repeat trips when comet get close to the sun, heat makes them start to evaporate.
Jets of gas and dust form long tails that we can see from Earth.
These tails con sometimes be millions of miles long.

Halley's Comet – next appearance 2062

Shoemaker-Levy – Plunged into Jupiter 1994

Hale-Bopp – Was seen in the sky for most of the summer and fall of 1997

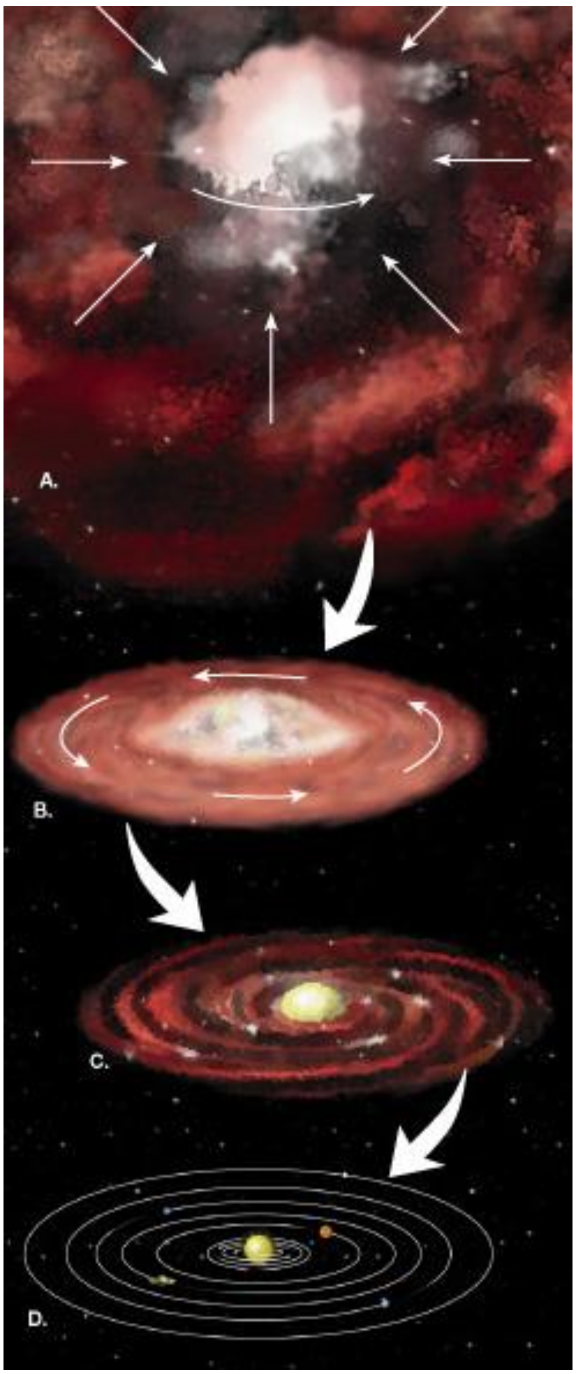
f. Meteoroids

The term meteor comes from the Greek *meteoron*, meaning phenomenon in the sky. It is used to describe the streak of light produced as matter in the solar system falls into Earth's atmosphere creating temporary incandescence resulting from atmospheric friction.
This typically occurs at heights of 80 to 110 kilometers (50 to 68 miles) above Earth's surface.
The term is also used loosely with the word <u>meteoroid</u> referring to the particle itself without relation to the phenomena it produces when entering the Earth's atmosphere.
A meteoroid is matter revolving around the sun or any object in interplanetary space that is too small to be called an asteroid or a comet.
Even smaller particles are called micro meteoroids or cosmic dust grains, which includes any interstellar material that should happen to enter our solar system.
A <u>meteorite</u> is a meteoroid that reaches the surface of the Earth without being completely vaporized.

VII. Evolution of the Solar System:

The modern theories described are:

- **Hoyle's nebula theory, which invokes the transfer of angular momentum by magnetic forces;**
- **the accretion theory, which proposes that planetary material was captured by the Sun from an interstellar cloud;**
- **McCrea's floccule theory, which describes the solar system as having formed from initial condensations of planetary mass;**
- **the capture theory, which proposes that the Sun captured planets from a tidal filament drawn out of a light star;**
- **a nebula theory proposed by Urey based on chemical evidence derived primarily from meteorites**



Nebula starts to spin and some "shock" started a gravitational contraction of the particles

Most of the matter was pulled to the center to form the sun, which started nuclear fusion.

Clumping of gas and dust around the sun occurred at the same time

Larger and larger clumps formed still larger masses forming plants, moons and asteroids

Elements having a small mass were driven out of the inner solar system leaving the terrestrial plants with only small amounts of light elements

The solar system today
VII. Motions of the Planets

1. Rotation

2. Revolution
Eccentricity of a planets orbit

VIII. <u>Ellipses and Eccentricity</u>

Eccentricity of a planets orbit

Revolutions around objects in space are all in a shape we call an ellipse

Ellipses are different than circles they have two foci instead on one as in a circle.

When an object moves around another, for example the Earth moves around the Sun. The Sun is at one of the foci of the ellipses, There is nothing at the other focal point. It is only a point in space.

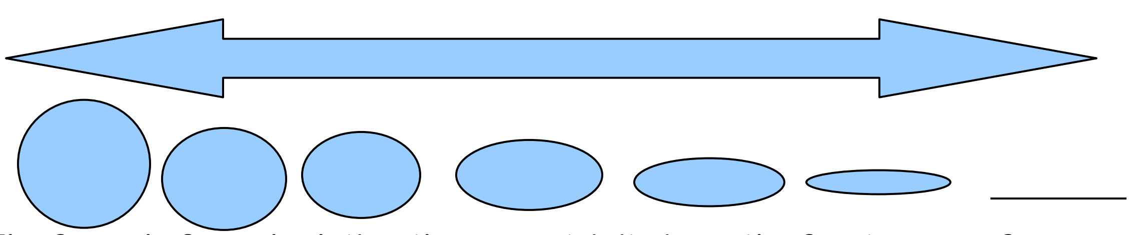
All ellipses have different Eccentricities which means “out of roundness”

Eccentricity has a range that goes from 0 to 1

An ellipse that has 0 is not out of roundness therefore is a perfect circle

An ellipse that is 1 is completely out of round which means it would be a flat line.

Think
0 .1 .2 .3 . 4 .5 .6 .7 .8 .9 1



The formula for calculating the eccentricity is on the front cover of your Earth Science Reference Tables. In order to complete this sheet you will need your reference tables and a calculator.

Each planet has a number to describe its eccentricity of their elliptical orbit.

Which planet has the most eccentric orbit?______________________

Which planet has the least eccentric orbit? _______________________

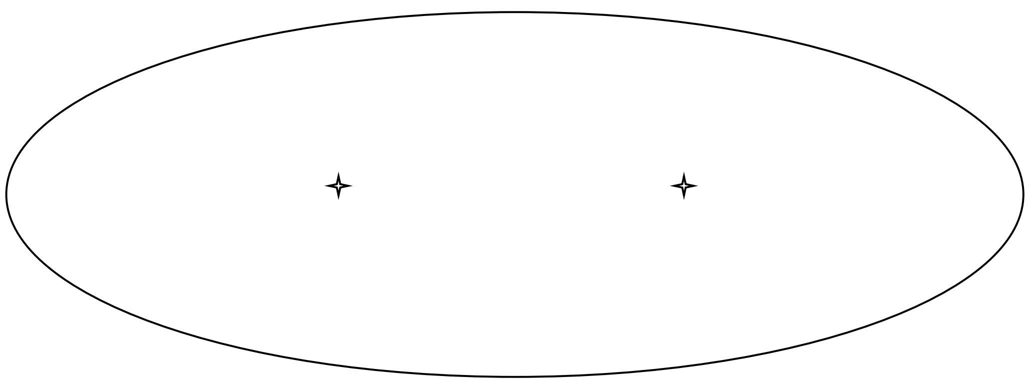
<u>Compare</u> each of these two planets. (I mean subtract the two eccentricities.) _________________________________

Look at Neptune's orbit's eccentricity and mercury's orbit's eccentricity how do these orbits differ?

____

Calculate the Eccentricity of the ellipse below using the formula on the front of the reference table.

Answer _______________



1. List the two pieces of evidence that scientist use to explain the theory of the big bang.

2. What form of energy is background radiation?

Use the Luminosity and Temperature of Stars chart and the Solar System Data table on page 15 in ESRT to answer the following questions

3. What type of star is Polaris? What is the temperature of Polaris?

4. Which category of stars is the sun placed?

5. Find the star Rigel, what is the luminosity of this star (estimate)?

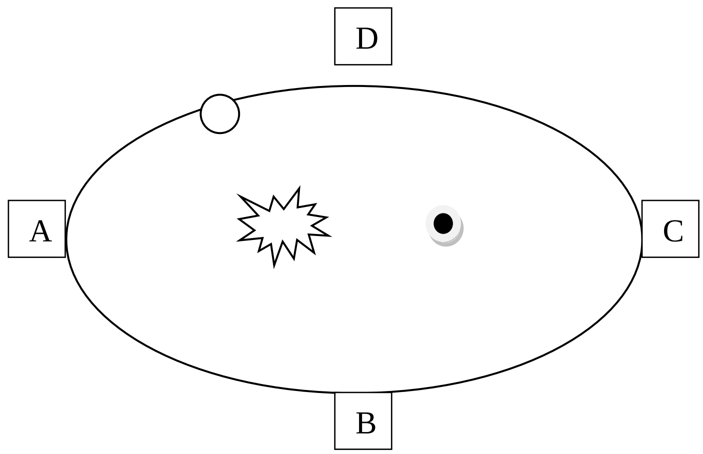
6. Define Luminosity—

7. What is the difference between revolution and rotation?

8. Which planet has the highest eccentricity? What does it tell you about this planet's orbit?

9. Which planet has the highest density?

10. Which planet distance from the sun is close to 50 times the distance of Mercury?



The above Diagram represents a planet revolving around a star. Several position in its orbit are labeled.

11. What position would the planet have its greatest velocity? Slowest?

12. Calculate the eccentricity of the orbit using your ruler on the front cover of your earth science reference tables.

13. At what position does the planet and the star have its greatest gravitational attraction?

14. If another planet revolved around this star and was interior to the pl planet above how could you describe its period of revolution? Could you predict anything about its rotation?

15. Below, do your best and draw our galaxy as if you were hovering above it. Then place a dot where you think our solar system is located.

19. List each of the following in order of increasing size.

Jupiter	**Earth**	**the solar system**
Universe	**moon**	**galaxy**
Sun	**Venus**	**a meter**