

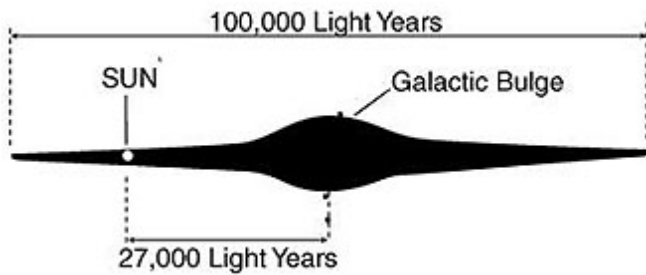


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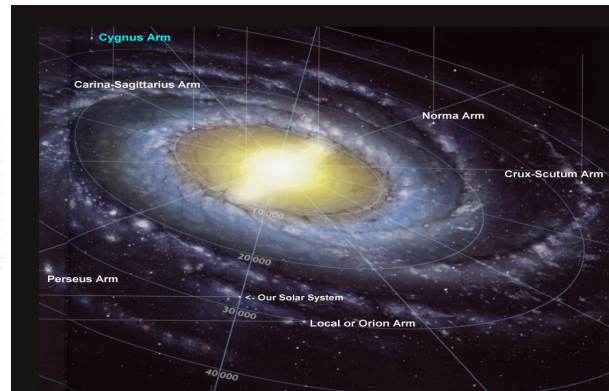
Chapter 25 & 26 Notes: Space

1. Everything that we can see and observe and is known to exist is called the **Universe**.
2. Universe is still expanding and accelerating
 - a. **Hubble's Law**: says that the speed at which a galaxy is moving away is proportional to its distance from us.
 - i. Galaxies closer to us are moving away from us slower
 - ii. Galaxies further from us are moving away faster
 - b. Observations of galaxies show a shift in their spectra
 - i. **Redshift** means the galaxy is moving away and stretching the light waves
 - ii. **Blueshift** means the galaxy is moving towards us and compressing the light waves
3. If galaxies are continually moving away, then if we rewind their movement, it takes us back to a single point in space and time.
 - a. The single point is called a **naked singularity** or **primordial singularity**.
 - b. Contained all matter and energy ever to exist.
 - c. This point expanded rapidly, suddenly, like an explosion. This sudden expansion is called the **Big Bang Theory**.
 - i. Hydrogen and helium atoms formed first as universe cooled.
 - ii. Hydrogen forms into stars, and starts fusion
 - d. **Dark Energy** is the force that is causing our universe to expand and accelerate.
4. Galaxy: a huge group of individual stars, star systems, star clusters, dust, and gas bound together by gravity.
 - a. We live in the Milky Way Galaxy

- i. 200 – 400 Billion stars in our galaxy
- ii. Diameter is 100,000 light years
- iii. Takes 220 million years for our sun to complete one orbit
- iv. We are a barred-spiral galaxy



Side View of MWG



Top View of MWG

- b. Galaxy classification is by shape, there are 4 types.
 - i. Spiral, Barred-Spiral, Elliptical, and Irregular

4 Types of Galaxies	
<u>Spiral</u>	<u>Elliptical</u>
<u>Barred-Spiral</u>	<u>Irregular</u>

5. Star Life Cycle:

- a. Born in a **Nebula** (Hydrogen gas and dust cloud)
 - i. Gravity pulls it together. The gas gets so compressed that it glows, this is called a **protostar**.
 - ii. Gravity keeps compressing until Hydrogen atoms are fused into Helium.
 - iii. A star is formed when nuclear fusion begins.
- b. Adult Star- different sizes, temp, color and luminosities.
- c. A star dies when run out of fuel (run out of atoms to fuse, can't fuse past Iron)
 - i. If they are 8 solar masses or less, die as **white dwarf**
 - ii. If they are 9-25 solar masses, die as **neutron star**
 - iii. If they are greater than 25 solar masses die as **black hole**

6. Solar System Formation- **The Nebular Theory**:

- a. Star is born from gas and dust coming together
- b. Most of the mass (99%) goes into the center to form the star
- c. The left over matter clumps together around the star

Formation of Our Solar System		
<u>Nebula comes together</u>	<u>Flattens into disk</u>	<u>Protostar is formed, planetessimals form</u>

<u>Protoplanets accrete & solar winds blow less dense material out</u>	<u>Planets finish forming with 8 planets. Still left over material</u>
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7. Facts about planets in our solar system:

<i>Mercury</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planet made of:	

<i>Venus</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planet made of:	

<i>Earth</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planet made of:	

<i>Mars</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planet made of:	

<i>Jupiter</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planets made of:	

<i>Saturn</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planets made of:	

<i>Uranus</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	

Planets made of:	
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<i>Neptune</i>	
Size:	
Location:	
Orbital plane	
Atmosphere:	
Primary Elements:	
Planets made of:	

8. Other objects in our solar system:

- a. **Comets**: dusty pieces of ice and rock that partially vaporize when they pass near the sun.
- b. **Meteoroids**: pieces of rock, usually less than a few hundred meters in size, that travel through the solar system.
 - i. **Meteor**: when its falling through atmosphere.
 - ii. **Meteorite**: when its on the ground.
- c. **Asteroids**: small, rocky solar-system bodies, most of which are found orbiting the sun in a region between Mars and Jupiter.
 - i. These unaltered remnants show us the age of the solar system and what it originally was made from.

Standards to know for the test:

H1E1: Classify bodies in Solar System (properties & composition)
Describe attributes of our galaxy & evidence of multiple Galaxies.

(Sun, rock & gas planets, asteroids, comets, moons)
(Size, location, orbital path/plane, atmosphere, elements, % comp)
(Relative stellar mass, galaxy size/shape)

H2E3: Describe how the universe, galaxies, stars, and planets evolve over time.

(Big Bang, expanding still, H and He formed 1st)
(Accretion, star life cycle, fusion cycle)
(Solar system formation, meteor evidence)