** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**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
	1. **Hubble’s Law**: says that the speed at which a galaxy is moving away is proportional to its distance from us.
		1. Galaxies closer to us are moving away from us slower
		2. Galaxies further from us are moving away faster
	2. Observations of galaxies show a shift in their spectra
		1. **Redshift** means the galaxy is moving away and stretching the light waves
		2. **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.
	1. The single point is called a **naked singularity** or **primordial singularity**.
	2. Contained all matter and energy ever to exist.
	3. This point expanded rapidly, suddenly, like an explosion. This sudden expansions is called the **Big Bang Theory**.
		1. Hydrogen and helium atoms formed first as universe cooled.
		2. Hydrogen forms into stars, and starts fusion
	4. **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.
	1. We live in the Milky Way Galaxy
		1. 200 – 400 Billion stars in our galaxy
		2. Diameter is 100,000 light years
		3. Takes 220 million years for our sun to complete one orbit
		4. We are a bared-spiral galaxy



 Side View of MWG Top View of MWG

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

|  |
| --- |
| **4 Types of Galaxies** |
| Spiral | Elliptical |
| Barred-Spiral | Irregular |

1. Star Life Cycle:
	1. Born in a **Nebula** (Hydrogen gas and dust cloud)
		1. Gravity pulls it together. The gas gets so compressed that it glows, this is called a **protostar**.
		2. Gravity keeps compressing until Hydrogen atoms are fused into Helium.
		3. A star is formed when nuclear fusion begins.
	2. Adult Star- different sizes, temp, color and luminosities.
	3. A star dies when run out of fuel (run out of atoms to fuse, can’t fuse past Iron)
		1. If they are 8 solar masses or less, die as **white dwarf**
		2. If they are 9-25 solar masses, die as **neutron star**
		3. If they are greater than 25 solar masses die as **black hole**
2. Solar System Formation- **The Nebular Theory**:
	1. Star is born from gas and dust coming together
	2. Most of the mass (99%) goes into the center to form the star
	3. The left over matter clumps together around the star

|  |
| --- |
| Formation of Our Solar System |
| Nebula comes together | Flattens into disk | Protostar is formed, planetessimals form |
| Protoplanets accrete &solar winds blow less dense material out | Planets finish morning with 8 planets. Still left over material |

1. Facts about planets in our solar system:

|  |
| --- |
| *Mercury* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planet made of: |  |

|  |
| --- |
| *Venus* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planet made of: |  |
| *Earth* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planet made of: |  |

|  |
| --- |
| *Mars* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planet made of: |  |

|  |
| --- |
| *Jupiter* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planets made of: |  |

|  |
| --- |
| *Saturn* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planets made of: |  |

|  |
| --- |
| *Uranus* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planets made of: |  |

|  |
| --- |
| *Neptune* |
| Size: |  |
| Location: |  |
| Orbital plane |  |
| Atmosphere: |  |
| Primary Elements: |  |
| Planets made of: |  |

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

Standards to know for the test:

**HIEI:** 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)