**Stars, Galaxies and the Universe:**

**Unit 4: Astronomy**

**Mini-Unit:** The Universe

**Goal 3: The student will demonstrate the ability to identify and describe the properties, natural forces, and theories of formation and operation of the solar system and universe.**

Objectives – The student will be able to:

* Describe the life cycle of stars (nebulae, protostar, red giants, white dwarfs, neutron stars, pulsars, supernovas, black holes), and the role of gravity in their stellar evolution.
* Explain the relationship between absolute magnitude and surface temperature of stars using the Hertzsprung-Russell Diagram
* Use bright and dark line spectra to determine the movement and elemental compositions of stars
* Describe the structure and evolution of galaxies using their visible characteristics
* Explain how the Doppler effect supports the concept of an expanding universe and the Big Bang Theory

**Textbook:** Unit 8, Chapter 30, pg. 774

Characteristics of Stars:



Star:

Analyzing Starlight:

1. The composition of a star can be determined by:
2. Spectrograph –
3. By analyzing where dark lines cross the colors, one can determine:



The Elemental Composition of Stars:

The Temperature of Stars:

The Size and Masses of Stars:

1. Can range in size from the size of Earth to a 1,000 times the diameter of the sun
2. Stars can have more mass and be smaller than our Sun, they can also have less mass and be larger than our Sun

Stellar Motion:

1. Apparent Motion:
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: can be the rotation of the star on its axis, revolution around another star, or moving towards/away from our solar system
3. Doppler Effect:
4. A star moving towards the Earth will be shifted towards the blue end of the spectrum, while stars moving away from Earth will show a shift towards red

Expanding Universe Theory:

Stellar Evolution:



Hertzsprung-Russell Diagram (H-R Diagram):

* Used to describe the life cycle of stars
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: The location on the H-R diagram where most stars lie; it goes from hot and bright to cold and dim

Nebula:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Dense regions of gas in the nebular that begin to spin and flatten as heat energy builds turning the gas into plasma; as temperature increases fusion begins thus making it a star

Main Sequence Stages:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: As medium size stars cool they expand and begin glow red (10 or more times larger than the sun)

Planetary Nebula:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: As medium size star cools, matter collapse inward creating a hot, extremely dense core of matter (about the size of Earth)

Red Supergiant:

Nova and Supernova:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: A star that has collapsed under gravity to the point that the electrons and protons have smashed together to form neutrons.

Black Hole:



Galaxies:

Galaxy:

Types of Galaxies:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – most common; nucleus of bright stars with spiraling flattened arms emanating from it
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – stretched out football shaped; bright in the center, no arms
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_– have no particular shape with a low total mass but an abundance of gas and dust



The Big Bang Theory:

Big Bang Theory:

Evidence of:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – Edwin Hubble discovered that many galaxies had a red shift in their spectra, with those furthest away having the greatest shift; meaning that not only was the universe was expanding, but it was accelerating
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – Radiation uniformly detected from every direction in space; remnant of the Big Bang