Chapter 16 Stars and Galaxies

Vocabulary

1. Light-year
2. Nebula
3. Supernova
4. Black hole
5. Galaxy
6. Constellation

Lesson #1: What is the history of astronomy?

Patterns in the sky: Seasons, phases of the moon, rising and setting of the sun. All are predictable cycles in the sky.

***Eclipses***

Solar eclipse – When the Moon blocks the Sun’s light.

Lunar eclipse – When earth casts a shadow on the moon. Ancient cultures assumed something bad was going to happen when an eclipse occurred.

Different people have studied the sky for thousands of years.

1. Stonehenge – built more than 5,000 years ago. Builders of it had a good understanding of the cycle of the sun and the seasons. The stones were placed to mark the rising and setting of the sun or moon during different parts of the year.
2. Chiche’n Itza’ - El Castillo – 24 meter tall pyramid – built 700 years ago. Each of the four sides have 91 steps – 365 steps in all – same as the days in a year. Special pattern – snake slithering down the stairway - during the spring and fall equinox – when day and night are equal in length.

***Early Tools :*** Astrolab – 200 B.C. until 1700 A.D. Star map drawn on a metal plate - measures the angle between the horizon and a star or planet. Used to find the time, predict rising and setting of the sun, determined where stars would appear.

Sextant - sailors used this to navigate by the stars.

Early telescopes – Galileo Galilei (1564-1642) First person to use the telescope in astronomy.

Galileo discoveries :

1. Discovered that the moon has mountains
2. The sun spins.
3. Venus has phases like the moon.
4. Jupiter has 4 moons that orbit around it.
5. Geocentric - people believed that everything revolved around earth. Galileo helped to change this belief to the heliocentric theory that everything revolves around the sun.

Isaac Newton – developed the reflecting telescope. Using a curved mirror, instead of lenses, allows people to see objects that are dimmer and farther away and to see them in sharper detail.

Special telescopes have been developed that can detect different types of invisible radiation. Keck I and Keck II.

Some modern telescopes are launched into space to study specific types of electromagnetic radiation, which may be blocked by earth’s atmosphere.

Lesson 2: What is a Star?

Stars – are gigantic balls of very hot gases that give off electromagnetic radiation.

Sun - yellow star, medium sized.

The sun gives off enormous amounts of thermal energy and light energy. Comes from powerful reactions involving ***helium and hydrogen***.

Its energy comes from the fusion of hydrogen atoms into helium atoms.

The brightest stars are those that give off the most energy.

A star’s brightness depends on ***its size, temperature, and distance*** from earth.

A star’s color tells you how hot it is. Star colors from coolest to hottest. Red, orange, yellow, white, blue-white.

***3 layers of the sun***

1. Photosphere - layer that gives off the light energy that we see. The innermost layer.
2. Chromoshpere - middle layer of the sun.
3. Corona - the outermost layer of the sun.

The sun rotates more slowly at its poles than at its equator.

***Prominences*** - fountains of blazing gases that leap out of the chromosphere. May stay for a few days or months and they may rise as high as a million kilometers.

***Solar flares*** – give off more light than other parts of the Sun. These bright spots may last for a few minutes to a few hours. They spew out huge amounts of electromagnetic waves, protons, and electrons into space.

***Light year*** – the distance light travels in one years, over 9.4 trillion km.

A star is born in a cloud of gas and dust called a nebula and dies when it runs out of fuel, hydrogen.

Stars die in different ways depending upon their mass. Our Sun will eventually become a red giant, then a white dwarf, and finally, a black dwarf.

When stars much more massive than the Sun run out of fuel, they shrink. When they finish shrinking, they hurtle matter and energy through space in a huge explosion called a supernova that eventually becomes a neutron star.

A black hole forms when the core’s gravity of a massive star causes it to collapse inwardly.

Lesson #3: How are Stars grouped together?

Galaxy - a huge system of stars, dust, and gas held together by gravity. There are billions of galaxies in the universe.

Milky Way – earth’s galaxy. It is a spiral galaxy.

Three types of galaxies

1. Spiral - ¾ of galaxies are spirals. Look like pinwheels. Bright bulging middles with wispy arms that fan out from the center.
2. Elliptical – round or oval shaped like a football. Largest galaxies.
3. Irregular – usually young forming galaxies with no shape.

A constellation is a group of stars that form a pattern. Orion’s Belt or The Hunter is my favorite constellation.

Stars in the same constellation are not necessarily close to each other just because they are in the same area of the sky.

Earth can be divided into two halves or hemispheres. We are located in the Northern Hemisphere.

Some constellations, like Centaurus can’t be seen in the northern hemisphere only in the Southern.

Only the Northern Hemisphere has a pole star, Polaris. It can’t be seen from the Southern Hemisphere.

Constellations appear to move across the sky because Earth rotates.

Certain constellations are only visible during certain times of the year. Orion’s Belt can be seen during the beginning of October until the month of February.

Constellations change shape very slowly over time due to the movement of the stars within the constellation.