

PROPERTY OF:

EARTH SCIENCE – UNIT 6 – CHAPTER 25 NOTES

STARS AND GALAXIES

25.1 Stars and Constellations

- constellation = a grouping of stars that resemble a particular shape
- Some stars can be seen year-round, while others can only be seen during certain seasons.
- EX: Orion can only be seen in the winter. (It faces the Earth during the daytime, not at night.)
- circumpolar constellation = constellation that is visible throughout the entire year.
- Polaris = the “North Star” – located almost directly above the north pole
- Circumpolar constellations appear to move around Polaris.

25.1 Energy, Temperature, and Distance to Stars

- absolute magnitude = a measure of the actual amount of light a star gives off
- apparent magnitude = a measure of the amount of the light that is received on Earth
- EX: A star that is close to Earth will be very bright.
A star that is very far away from Earth will be dull.
- Parallax = the apparent shift in position of an object (star) when viewed from different places
- Parallax can help determine the distance from the Earth to the star.
- EX: A star that is close to Earth will “move” a lot in the sky throughout the year.
A star that is very far away will stay in the same part of the sky throughout the year.
- The color of a star is an indication of its temperature.
- The sun, which is yellow, is an average star that is slightly on the cooler side.

25.1 The Speed of Light

- Light travels at the speed of 300,000,000 meters every single second (over 670 million mph!)
- Light travels from the sun to the Earth in 499 seconds (8 minutes, 19 seconds).
- Therefore, the distance from the sun to the Earth is “499 light seconds”.
- Astronomical distances are measured in light years.
- 1 light year is the distance that light travels in one year.
- 1 light year = 5.9 trillion miles (the distance that light can travel in one year)
- A “light year” is a unit of DISTANCE, not TIME!!!
- Looking into space is really like looking back in time:
EX: If you look at a planet that is 1000 light years away, you are really seeing what happened 1000 years ago!

25.2 The Sun

- The sun makes up 99% of the matter in our solar system.
- The sun is an average-sized, average-temperature, middle-aged star.
- The sun is basically a large ball of gas.
- corona = the outer part of the sun’s atmosphere, where the temperature can reach 2,000,000 °C.
- sunspots = dark spots on the sun’s surface that are a little bit cooler than the rest of the sun
- Sunspots can be seen in cycles.
- Sunspots near the sun’s equator rotate every 27 days.
- Sunspots near the sun’s poles rotate every 31 days.
- A complete sunspot cycle takes 11 years (when maximum # of sunspots that are visible).
- Solar flares and solar prominences are bright spots in the sun’s atmosphere.
- The sun is the only star in our solar system.
- In other systems, stars exist in pairs (called a binary system) or in clusters.

PROPERTY OF:

25.3 The Hertzsprung-Russell Diagram

****SHOW PICTURE OF THE H-R DIAGRAM ON PAGE 734****

- Most stars fit into the “main sequence” of the H-R Diagram.
- main sequence stars = Stars that are brighter are hotter. Stars that are dimmer are cooler.
- Blue stars are the largest and the hottest. Red stars are the smallest and the coolest.
- Fusion reactions take place inside of all stars.
- fusion = a reaction between hydrogen and helium atoms that produce a lot of energy

25.3 The Evolution of Stars

1. Nebula =
A large cloud of dust and gas spins around and contracts (gets smaller).
When it has fully collapsed, the star forms in the middle and begins to do fusion.
2. Main Sequence Stars =
The star does fusion reactions, using hydrogen and helium atoms to produce energy.
As the hydrogen and helium are used up, the star gets smaller, dimmer, and cooler.
3. Red Giant =
When the hydrogen is all used up, the star contracts again, causing it to get hotter.
The outer layers of the star expand to become very large and very cool.
4. White Dwarf =
When the core of the red giant runs out of helium, it contracts even more.
The outer layers of the sun (it’s atmosphere) escape into space.
The star’s core is all that remains.

25.3 Other Types of Stars

1. Supergiant =
In extremely large stars, the stages of evolution occur more quickly and more violently.
The star gets much larger because the temperatures are so much higher in the core.
2. Supernova =
When the supergiant collapses, the force causes the outer part of the star to explode.
3. Black Hole =
When the supergiant collapses, the core may become so dense that nothing can escape its gravitational field – not even light!

25.4 Galaxies

- galaxy = a large group of stars, gas, and dust held together by gravity
- EX: The Milky Way galaxy contains 200 billion stars, including the sun.
It is 100,000 light years across. It is considered a spiral galaxy.
- There are 3 types of galaxies: elliptical, spiral, and irregular
- EX:
 1. elliptical galaxies = oval-shaped galaxies; may look like spheres, eggs, or footballs
 2. spiral galaxies = galaxies with a bright center and long, curved arm-like spirals
 3. irregular galaxies = galaxies with no particular shape or pattern
- Doppler Shift = stars appear to have a slightly different color depending on how they are moving
- EX: When galaxies move away from Earth, they appear a little bit more red.
When galaxies move toward Earth, they appear a little bit more blue.
- Big Bang Theory = theory of how the universe began about 15 billion years ago (15,000 MYA)
(see page 744)
- NOTE: The Big Bang did ****NOT**** occur 4,600 MYA! That’s when the Earth formed.