

CORNELL NOTES

Directions: You must create a minimum of **5 questions** in this column **per page** (average). Use these to study your notes and prepare for tests and quizzes. Notes will be turned in to your teacher at the end of the Unit for scoring.

UNIT 3: Astronomy

Chapter 26: Stars and Galaxies (pages 816-847)

I. Observing the Universe

A. Constellations

1. **Mythology**- Ancient cultures gave names to _____ patterns

a. _____ - was a great hunter who had two hunting dogs, Canis Major (big dog) and Canis Minor (little dog)

b. Another constellations named after two _____ that traveled around the Earth's north pole.

1). **Ursa Major** (big bear) the Big _____ is part of this constellation

2). **Ursa Minor** (little bear) _____, the north star is in this constellation

2. Telescopes

a. _____ and stars that make them up can be seen with the naked eye

b. _____ needed to see other objects

c. **Optical telescopes**- study objects in _____ light

1). _____ **Optical telescope**- uses convex lens. Has size limitations

2). _____ **Optical telescope**- use a mirror to reflect light to the focus. Used for _____ telescopes

3). **New Telescope Designs**- _____ are used to make changes due to temperature, mirror distortions, and bad viewing conditions.

4). **Radio Telescopes**- collects and amplifies _____ waves emitted by stars and other objects.

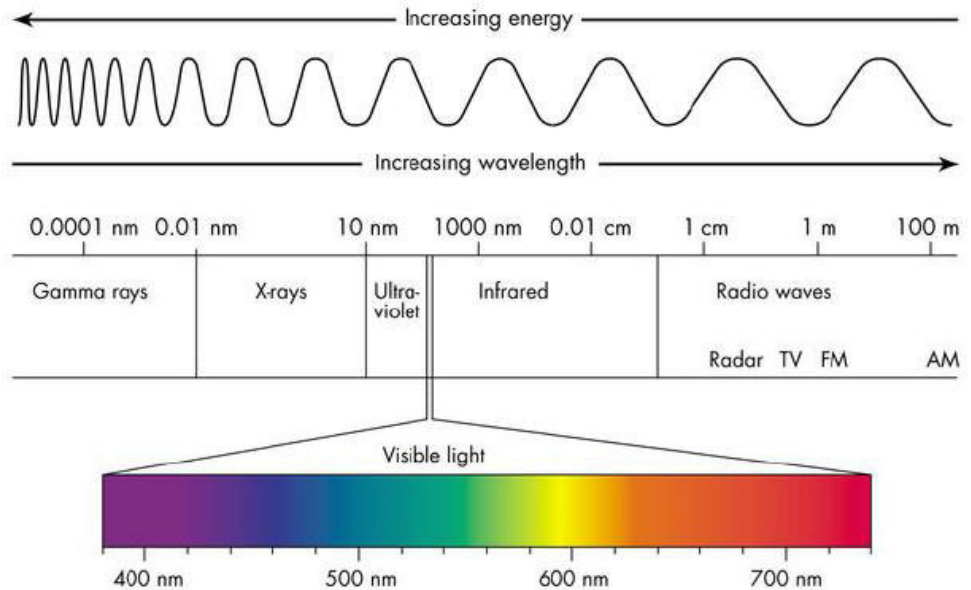
5). **Hubble Space Telescope**- space telescope eliminates problems with viewing through _____

B. **Spectroscopes**- device that uses a _____ or diffraction grating to disperse the light into its component _____.

1. Can determine _____ **composition**, **surface** _____, and whether its **moving** away for or towards Earth

2. **Spectra**- spectroscope disperses light into its individual wavelengths, or its _____

3. _____ **light**- Includes Red, Orange, Yellow, Green, Blue, Indigo, Violet. (_____)



II. Evolution of Stars

A. How do Stars form?

1. Star formation begins with _____ of a large cloud of gas, ice, and dust called a _____.

a. Nebula _____ because of gravitational attraction

b. Instability causes it to break up into _____ cloud fragments

c. These condense and _____ up

d. Forms _____

e. When temperature reaches **10 million K**, hydrogen fuses to form helium and a _____ is born

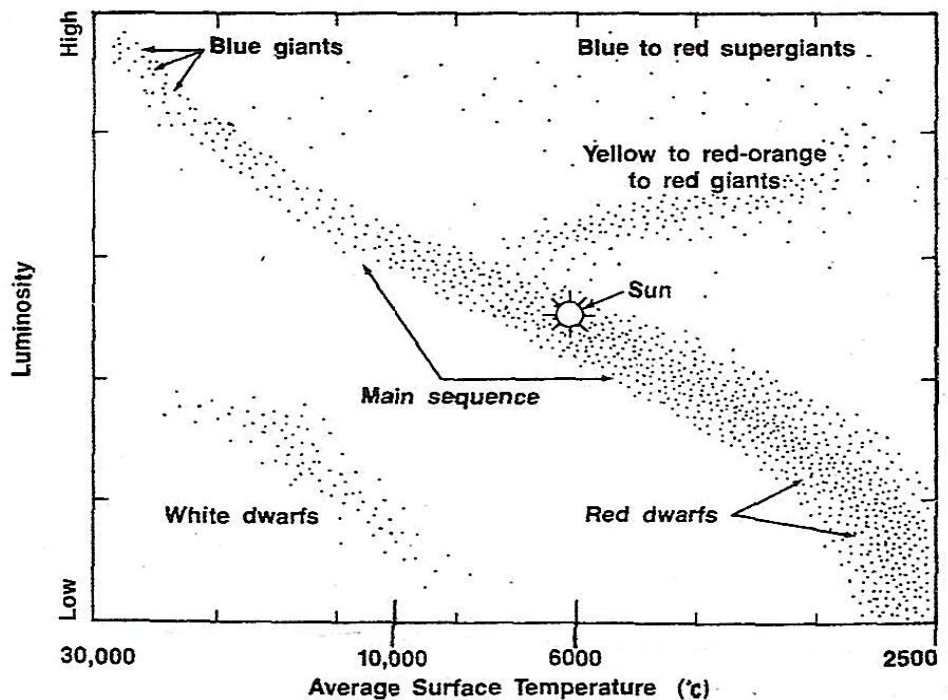
2. **H-R Diagram**- _____ - _____ diagram.

a. Developed in early 1900's to study relationship between absolute _____ and _____ of stars

b. About ____% of all stars fall on a line drawn from the upper left to lower right of diagram- called _____ **sequence**

c. Other ____% fall elsewhere on the graph

The Hertzsprung-Russell Diagram



B. How do stars change?

1. Stars begin as _____ – 100 times its eventual size

a. Then begins to _____ and increase

b. Interior **temperature** increases and _____ begins

c. Attains **stellar equilibrium**– balance between outward pressure due to energy released in fusion and inward pressure due to _____

d. When _____ lost, star enters next stage of life cycle

2. **Main Sequence**– When in equilibrium, remains main sequence star.

a. **Most of** _____ spent in this state

b. Makes up _____ group in **H-R diagram**

c. Our _____ has been main sequence star for about 5 billion years

d. When _____ fuel is depleted, star lose equilibrium and its main sequence status.

e. What happens next is determined by total _____ of star.

1). An **average star** like the Sun becomes a _____, then **white dwarf**, and finally a **black** _____

2). **More massive stars** than Sun become _____ and end up as **neutron stars** or **black holes**

3). Stars much lower in mass (**Red Dwarfs**) than Sun remain main sequence for long time (16 trillion years) Make up _____% of all stars in universe

3. Giants and Dwarfs– occurs when hydrogen in star's _____ is used up

a. _____ – When star expands

b. _____ **dwarf**– Eventually giant contracts because of gravity and forms white dwarf

4. Supergiants, Neutron Stars, and Black Holes

a. Stars over 8 times the _____ of our Sun take a different course.

b. Star expand into _____

c. _____ causes the core to collapse violently and outer portion of star explodes, producing _____

d. Collapsing core becomes **neutron star** (about size of major city on Earth, but greater than our _____)

e. Stars with mass 25 times greater than the Sun eventually collapse and form _____ **holes**—an object so _____ that nothing can escape its gravity if it gets to close

5. _____ – the heavy elements you are made of formed during supernova explosions

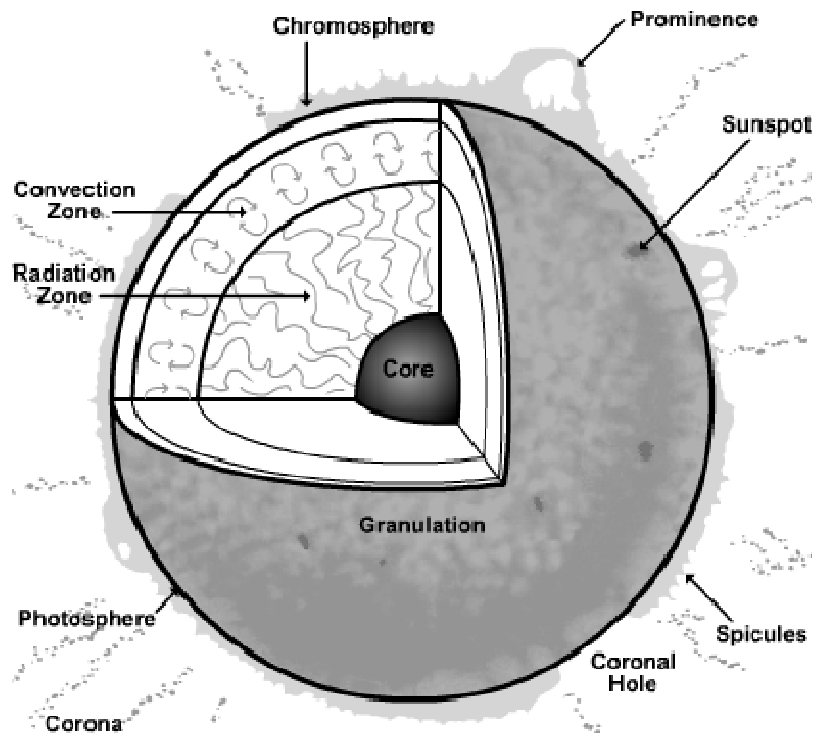
C. The Sun - A Main Sequence Star

1. **Structure of the Sun**- scientific theory about interior of Sun

a. Solar interior composed of the _____, the _____ **layer**, and _____ **layer**

b. Surface called _____ (layer that gives light)

c. Atmosphere above photosphere composed of **chromosphere** and **corona**



2. Solar Interior

a. **Core**- innermost layer where _____ occurs

b. _____ **layer**- layer above core where gases are completely ionized (radiation travels easily through this layer)

c. **Convection layer**- Energy is carried to the surface of the Sun by _____ (hotter gases at the bottom move upward and cooler gases sink- making **convection** _____)

d. **Photosphere**- _____ of Sun at top of convection zone has mottled appearance called _____

e. _____ - darker areas on photosphere created by cooler regions on surface.

f. **Prominence and Flares**-

1) **Prominences**-intense _____ fields associated with sunspots cause huge arching columns of _____

2). _____ **flares**- high temperature gases shooting at high speed out into space (100 million K)

g. _____ - large bubbles of ionized gas emitted from the sun (**coronal mass ejection**)

1). These create _____

2). Can interfere with orbiting _____ and _____ signals

II. Galaxies and the Milky Way

A. **Galaxy**- large group of stars, gas, and dust held together by _____.

1. _____ **Galaxy**- our own galaxy containing 400 billion stars

a. Estimated over ___ **billion galaxies** can be seen

b. Each contains the same _____, **forces**, and types of _____ as our galaxy

c. _____ major types of galaxies: **spiral**, **elliptical**, and **irregular**

2. _____ **galaxies**- spiral arms wind outward from galaxy's center

a. _____ made up of bright stars

b. Milky way is either normal or barred spiral galaxy

3. _____ **galaxies**- most common type

a. Most of these are _____ **galaxies** (too small and dim to easily be seen)

b. Shaped like large, 3-dimensional _____ (football shaped)

c. **Giant elliptical galaxies** can be over 9 million light-years _____ and contain trillions of stars

d. **Dwarf elliptical galaxies**- only about 3,000 light-years across and contain fewer than a million _____

4. _____ **galaxies**- can take many different shapes and contain 100 million to 10 billion stars

a. Larger than Dwarf ellipticals but smaller than _____ galaxies

b. Less _____ than other two

5. **The Local Group**- Clusters of _____ including Milky Way galaxy

a. Small cluster containing about 45 galaxies of various _____ and _____

b. Largest in our cluster is _____ **galaxy**

B. How do Galaxies form?

1. Astronomers aren't sure how galaxies originally formed

a. May have formed from " _____ " of **gas**

b. Some grew by _____ or merging with other smaller objects

c. Smaller galaxies that existed long ago merged to make larger, more organized galaxies in the universe _____

2. _____ **galaxies**- galaxies come together and merge

a. Combined galaxies may change shape, but individual stars may not be affected because of large _____ between stars

b. New _____ are formed in the process

C. The **Milky Way**- our _____

1. Classified as normal _____ **galaxy**

2. Composed of about _____ **billion stars**

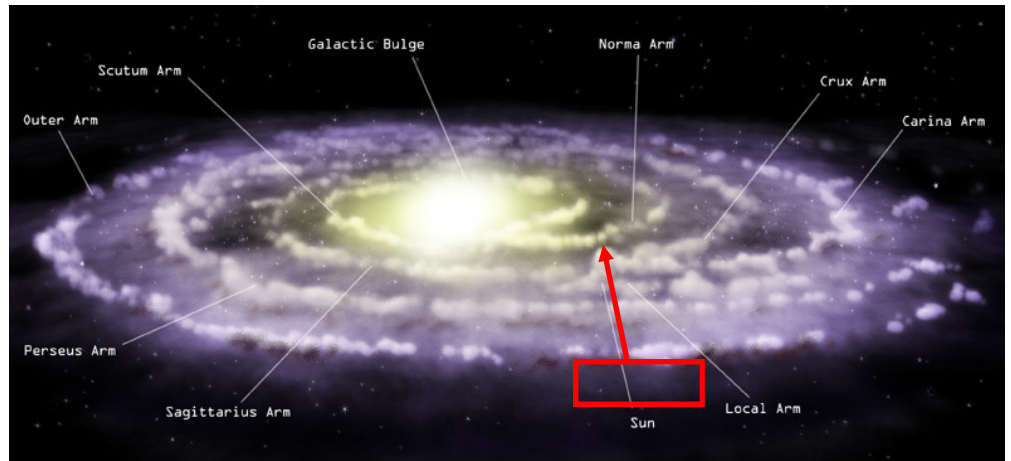
3. Sun and Earth located on one of **spiral** _____

4. Structure of Milky Way

a. Measures about **100,000** _____ - _____ **across**

b. Sun lies about **26,000 light-years** from _____ on edge of one of the spiral _____

c. **Central** _____ about 10,000 light-years thick



5. **Spiral arms**- look like _____

a. Begin near center and extend _____

b. Part of spiral galaxies where stars are _____

c. Not sure what causes _____ shape

6. **Galaxy Center**- very _____ population of stars at galaxy core

a. Extremely massive _____ **Holes** may exist at core

b. **Sgr A*** (*saj-ay-star*) located at galaxy nucleus emitted energy equivalent to a _____ suns

III. Cosmology

A. How did it begin?

1. _____ - the study of the universe, how it began, how it evolves, and what it is made of

2. Several theories

a. _____ **State theory**- proposed in 1948. States that universe has always existed and it always will. _____ of universe remains the same

b. _____ **Model**- universe expands rapidly, then slowed, and eventually contracts. Back-and-forth through time

B. The **Big Bang Theory**

1. **Most accepted** _____ how universe formed

2. Started with **big bang**, or _____, and has been _____ ever since

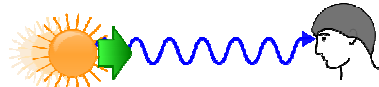
3. Data shows that universe began about _____ **billion years ago**

C. Expansion of the Universe

1. Motion of stars can be detected by using the _____ **effect**



a. If stars are moving towards us or away from us, the **wavelengths of light** they emit are changed



b. Away from us causes a _____

c. Towards us causes a _____

2. **Hubble Redshift**- redshift seen in the light from all galaxies indicates entire universe is _____

D. What is the Universe made of?

1. The way in which galaxies rotate and move can't be explained with regular _____

2. **Regular matter** makes up only a _____ amount of known universe

3. _____ **matter**- little understood and unseen matter that influences universe

a. The presence of dark matter is inferred from its _____ effects on visible matter

b. Accounts for the vast majority of _____ in the Universe

4. _____ -

a. Dark energy is necessary to account for the fact that the Universe is apparently not just expanding, but _____ at an ever-faster pace

b. Dark energy currently accounts for almost **three-quarters of the total** _____ - _____ of the universe

