Branches of Earth Science

- **Astronomy**: The study of ____________ , stars, and other objects in ____________ .

- **Lithosphere**: the ____________ masses of earth
  - Litho means ____________

- **Hydrosphere**: ____________ of the earth
  - Hydro means ____________

- **Atmosphere**: The envelope of gases that surround the ____________ as well as ____________ and ____________ .

Tools Used to Study Stars

- **Spectroscope**: Breaks light from a distant star into its characteristic ____________
  - SPECTRUM: the band of ____________ that forms as light passes through a prism
  - Used to see if galaxies are moving away or toward the ____________

- **Telescopes**: device that makes distant objects appear ____________

Types of Telescopes

- ____________
- Radio
- ____________
- U-V
- ____________

Constellations

- **Constellations**: group of stars that formed ____________
- Different cultures gave different ____________ to the constellations
  - Greeks named constellations according to ____________
    - ____________ → Orion
    - Ancient Sumerian → ____________
    - __________________ → Three

- **Importance of Constellations**
  - Navigation
    - ____________ use Polaris (North Star)
    - Important in space ____________
  - Used to predict ____________

- **Best Known Constellations**
  - Big ____________ or Ursa Major
    - Has pointer stars to Polaris
  - Little ____________ or Ursa Minor
Characteristics of Stars

- What are stars like?
  - Stars are made up of mostly ______________
  - Stars produce energy through ______________ ______________.

- There are 4 characteristics of stars that scientists use to ___________ stars
  - Color & Temperature
  - Size
  - Composition
  - Brightness

- Color and Temperature
  - A star’s ______________ reveals its ______________ temperature
    - The surface temperature is ______________ than the core temperature due to nuclear fusion.
  - Stars are very Patriotic when it comes to color
    - Coldest ______________
    - Hottest ______________

- Size
  - 5 Types or Categories
    - Smallest Neutron (16-20 km diameter)
      - White ______________ (size of Earth)
      - Medium Size (the sun) *MOST ______________ *
      - ______________ (10-1000 x’s the sun)
    - Largest ______________ Giant (1000 x the diameter of the sun)
    - Belelgeus
    - Rigel
    - Antares

- Composition (_______________ Makeup)
  - Most stars have the ______________ general composition
    - 73% ______________ Most Common
    - 25% ______________ 2nd most common
    - 2% Other Elements
  - Scientists use a spectroscope to identify characteristics
    - Characteristic: Something that ______________ an object
    - Elements have “Fingerprint” ______________ characteristics
      - They have a ______________ set of lines in the spectrum

- Brightness (Also called Magnitude)
  - Depends on...
    - ______________
    - ______________
    - ______________
- Apparent Brightness: the brightness of a star as it __________ on Earth.
- Absolute Magnitude: The amount of light the star actually __________

**Measuring Distance to Stars**
- Light Year- Astronomers use light years to measure the distances __________ stars
  - A light year is the distance that light __________ in one year
    - 9,460,730,472,580.8 km
    - 5,878,630,000,000 miles
- Parallax- the apparent change in the __________ of a star in the sky.
  - The change is due to the __________ in the Earth’ position as the Earth revolves around the sun.

![Diagram of parallax](chart.png)

**Hertzsprung-Russell Diagram: (H-R Diagram)**
- It is a __________ plot
- Shows the relationship between absolute __________ and surface __________
- This is the single most __________ diagram that astronomers use
- Uses
  - __________ Stars
  - Understand how stars __________ over time

![Diagram of H-R Diagram](chart.png)

- **Main sequence**: the area where the most stars are __________
  - Extends from the upper ________ corner to the lower ________ corner
  - __________ of stars are located here.
Lifecycle of Stars

• ________________ (large cloud of gas and dust) forms protostar with gravity
  o Nuclear Fusion (atoms ________________ to form heavier atoms)
  o ________________ Mass Stars
    ▪ Giant Star: outer layer expands
    ▪ White Dwarf: extremely ________________
    ▪ Black Dwarf: ________________
  o ________________ Mass Stars
    ▪ Super Giant: Fusion continues until ________________ is formed
    ▪ EXPLOSION: No more ________________ fusion
      • Super Nova: star ________________ apart
        o Neutron Star
        o BLACK HOLE

Deaths of Stars: when a star begins to run out of ________________, its core shrinks and its outer portion expands
  o White Dwarf
  o Neutron Star
  o Black Hole

Multiple Star Systems

• Multi Star System: Star system with one or more ________________ stars
• Most stars have companions but not all ________________
  o The ________________ does not have a companion
    ▪ The sun is the closest star to the ________________
• Example of multi star system: ALPHA CENTURI: a ____________ star system that is the CLOSEST star to the sun.

• Binary Stars: Star systems with ____________ stars
  o Bi = ____________ (remember bicycle)

• Eclipsing Binary Star System
  o The larger companion ____________ the smaller companion

Star Clusters
• Star Clusters: large ____________ of stars
  o Open Cluster
    ▪ ____________ and disorganized appearance
    ▪ Contain few hundred to 1000 ____________
    ▪ ____________ stars
  o Globular Cluster
    ▪ more common ____________, densely packed stars
    ▪ 100,000 to 1,000,000
    ▪ ____________ stars

Galaxies
• Galaxy is a huge collection of stars bound by ____________
  o Contain various star ____________
• ____________ of galaxies in the universe
• 3 types of galaxies
  o Spiral
  o Elliptical
  o Irregular

The Milky Way
• The galaxy we ____________ in
  ____________ shaped
• Looks like a ____________ or whitish band in the sky
• Sun is located in one of the ____________ arms
• It has 400 ____________ stars
• It takes the sun and planets over 200 million years to move around the center of the ____________

Big Bang Theory
• Theory is an idea that is supported by ____________
• The universe began to ____________ with the explosion of concentrated matter and energy and has been ____________ ever since