The Zodiac, Constellations, and Star Characteristics

Geology Mr. Traeger

Name: _____ Period: ____ Date: _____

Purpose

The purpose of this activity is to become familiar with the zodiac and other prominent constellation star groups. Students will also become familiar with basic star characteristics of stars.

Materials

- 1 ½ manila folders
- star finder cutout sheet
- textbook
- scissors
- star wheel cutout sheet
- Google Sky®
- glue
- star handouts
- Starry Night® Program

Part 1: The Zodiac

1. Observe the Starry Night Program and the demonstration that is done in class. What determines the sign of the zodiac for a particular time period?

2. What is the difference between astronomy and astrology? Which one is a science and which one is not?

Part 2: Star Finder (Planisphere) Construction

1. You should obtain 1 ½ manila folders, scissors, a star-finder holder cutout sheet, a star wheel cutout sheet, and glue.

2. Glue the holder cutout pattern on to the front of a manila file folder, with the east-south edge of the holder along the fold of the file folder.

3. Cut out the outside of the star finder holder and the center oval (one side only!). Staple the front and back together.

4. Cut out the simple star wheel and glue to one side of the manila folder. Cut out the manila folder to match the wheel. Cut out the complex star wheel and glue to the side opposite the simple star wheel.

5. Place the wheel inside of the holder. Rotate it to make sure that it rotates freely. Align the date with the time of night to find the stars that will be visible. Remember to subtract one hour for daylight savings time!

Part 3: Star Finder Questions (Use the simple star field to answer these and subtract 1 hour if it is currently daylight savings time.)

1. Assume that you will go outside tonight to observe the stars. What constellations will be completely visible at 9:00 PM?

2. Which constellations were visible at 9:00, but are no longer visible at 11:00?

3. Why did the constellations disappear?

4. Which horizon are disappearing constellations closest to?

5. Turn the dial until it is set for 5:00 AM. Which constellations are still visible that were also visible at 9:00 PM?

6. Why do some of the constellations ñset,ò while others seem to stay in the sky for the whole night?

7. Rotate your dial one complete circle. In what part of the sky (north, east, south, or west) do you find constellations that never seem to set?

8. What are the names of the constellations that never seem to set?

9. Find a star that never seems to move. What constellation is it in? What is the starôs name? How could this star help you to find your way if you are lost?

10. What constellations will be visible at 9:00 PM six months from now (on October 14)?

11. Why are the constellations six months from now going to be different? What is Earth doing?

12. Could you use this star finder in the southern hemisphere (Australia)? Why or why not?

Part 4: Star Characteristics (Use the Star Data Sheets to answer these)

1. **Label** the 10 stars in the Star Data Sheet on the complex star field side of your Star Finder.

2. What is apparent magnitude? What two factors does it depend on?

3. What is a light year?

4. How many years did it take light to get to Earth from the star Pollux?

5. What is the name of your birthday star? How many light years from Earth is it? What does the concept birthday star mean? See birthday star website here: http://outreach.jach.hawaii.edu/birthstars/

6. How far away (in kilometers) is one light year if the speed of light is 300,000,000 meters per second? Show the math.

7. Parallax is how we determine distances to stars within 326 light years of Earth. Describe parallax by drawing a diagram of it. Stick a pencil out in front of you and open and close your left and right eye. Describe what you see. What happened to the parallax angle the farther away you moved the pencil? What happened to the parallax angle the closer you moved the pencil?

8. Calculate the distance in parsecs and light years for the following stars. Distance in parsecs = 1/parallax angle. There are 3.26 light years in every parsec.

Star Name	**Parallax angle (arcsecs)**	**Distance in parsecs**	**Distance in light years**
Alpha Centauri	0.732		
Alpha Canis Majoris	0.379		
Alpha Aquiliae	0.194		
Alpha Canis Minoris	0.286		

9. What are Cepheid Variable Stars and how do we use them to find distances to stars greater than 326 light years from Earth?

10. What star do we compare the mass and radius of other stars to when describing their sizes?

11. How does the temperature of a star affect its color according to Wienôs Law? Remember that Wienôs Law says that the wavelength of maximum emission of a star ($\lambda_{maximum}$) = 2,900,000 divided by the temperature of a star in degrees Kelvin.

12. Categorize the spectral classes OBAFGKM (Oh Be A Fine Girl(or Guy), Kiss Me.) and tell me what temperature range each star falls in to. Circle the spectral class that our Sun belongs to.

Spectral Class	O	B	A	F	G	K	M
Temperature Range (°C)							
Color							
Elements							

13. What is absolute magnitude? What is the reference distance for absolute magnitude? What single factor does absolute magnitude depend on?

14. Every decrease of 1 in apparent or absolute magnitude of a star will result in how much of an increase in brightness?

15. The sun has an apparent magnitude of -25.5 and an absolute magnitude of +4.8. Explain why this is.

16. How many times brighter is the sunôs apparent magnitude of -25.5 compared to Betelgeuseôs apparent magnitude of +0.5? Show the math!

Part 5: Rating 10 Stars and Spectral Classes

1. Using the star information sheets or Google Sky to fill in the following chart.

Star Name	Apparent Magnitude	Distance in light years	Mass (Solar masses)	Size (Solar diameters)	Temperature (Kelvin)	Luminosity (compared to sun)	Absolute Magnitude	color	Spectral class (O, B, A, F, G, K, M)	Type of Star (red giant, main sequence, etc.)
Rigel										
Arneb										
Procyon										
Betelgeuse										
Capella										
Sirius										
Aldebaran										
Castor										
Alnitak										
Pollux										

2. Arrange each of the ten stars from hottest to coldest. Put the spectral class next to the name of each star.

Homework for tonight! Go outside tonight after dark with your star finder and some binoculars if you have them. A small flashlight (preferably with a red filter) is also needed. Make sure to hold the star finder over your head and point the North arrow in the direction of the mountains. **On a separate piece of paper**, do the following: A) List the names of the constellations/star groups you can identify. B) What was the time and location where you observed? (Note: do this on the next night that it is clear if it is cloudy tonight.) C) What are some of the brightest stars in the sky and where are they? Just say the location in the sky if you do not know the name. D) Find a star that appears red. Where is it? E) Find a star that appears yellow. Where is it? F) Find a star that appears blue. Where is it? G) What does the color of a star tell you about that star? H) Are the brightest stars burning the hottest? Why or Why not? I) How can you tell the difference between the planets (Venus, Jupiter and Saturn) and the stars?