

NAME: _____ PERIOD: _____ DATE: _____

LAB PARTNERS: _____ LAB #41

PROPERTIES OF STARS HR DIAGRAM

INTRODUCTION

Astronomers have found a relationship between the color and the surface temperature of the stars. Astronomers also study a star's luminosity, or brightness. The luminosity of a star is the amount of light a star actually emits from its surface. The sun has a luminosity of 1. If the luminosity of a star is a number greater than 1, it is brighter than the sun. If the luminosity of a star is less than 1, it is not as bright as the sun.

The Hertzsprung-Russell diagram, or H-R diagram, is a graph in which a star's temperature is plotted against its size. From such a diagram, other information about a star's properties can be determined. In this laboratory you will map certain stars on a graph and plot their surface temperatures against their luminosity. Then you will use this graph to compare the temperature and the brightness of the sun with other stars.

OBJECTIVES

1. To graph star temperature vs. luminosity.
2. To identify the characteristics of a star from data in the diagram.
3. To classify a star by its position in the diagram.
4. To compare the life cycle stages of stars based on their positions in the diagram.

MATERIALS

Colored Pencils
Earth Science Reference Tables

APPROXIMATE TIME 2 Periods

PROCEDURE

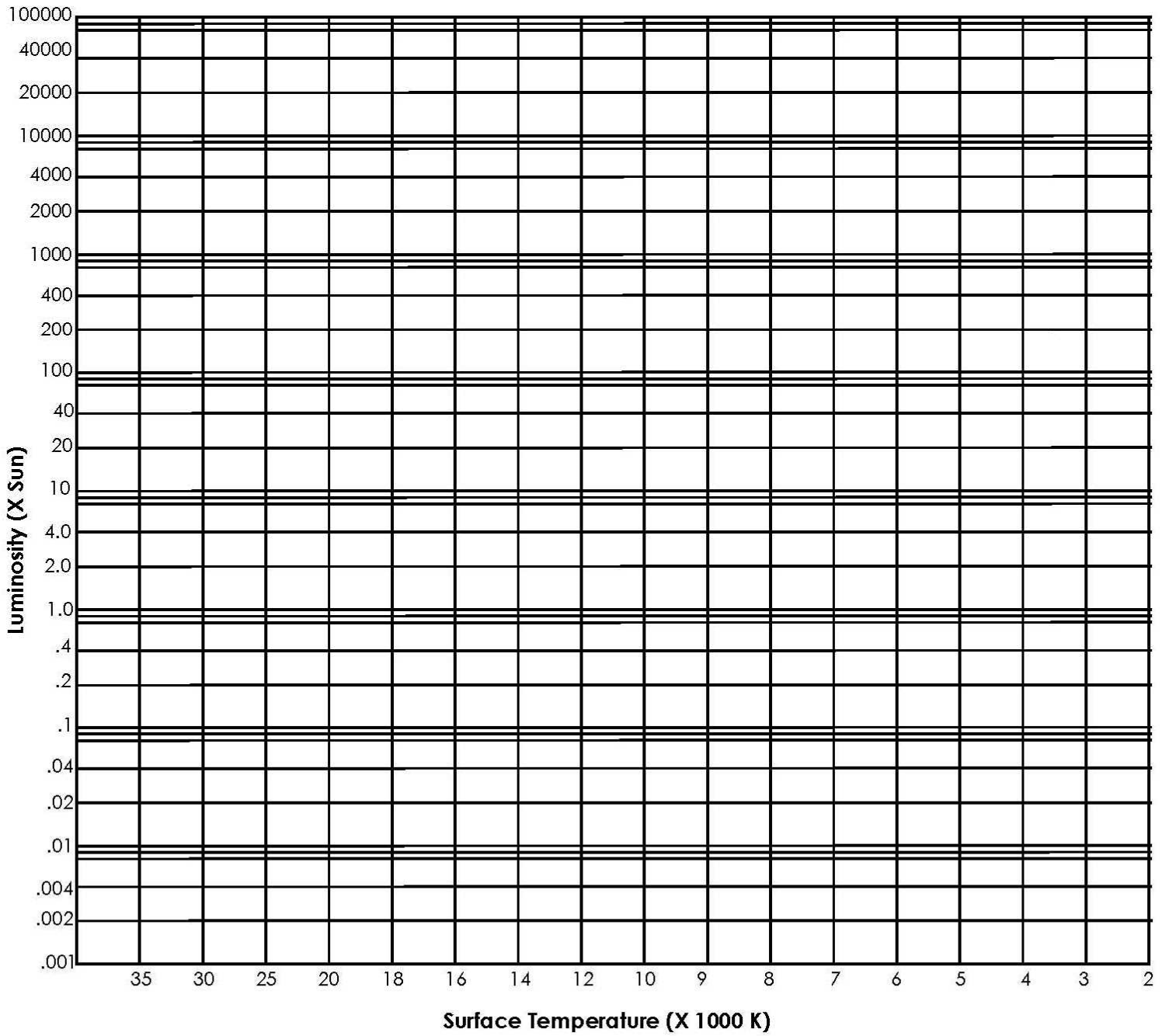
1. Look for the surface temperature of Betelgeuse in the "Table of Information about Some Stars" on page 4 of the lab. Find out what color corresponds to that temperature by looking at the chart on page 15 ESRT. Record the color of Betelgeuse in the table. Follow the same procedure for each of the other stars in the table.
2. Using the luminosity and the surface temperature of each star, plot each star's position on the grid for the H-R (Hertzsprung-Russell) Diagram on page 3. Regulus has already been plotted for you. To plot the rest of the stars begin with Betelgeuse find its surface temperature along the bottom of the graph and its luminosity along the side. Place a point where on graph to show Betelgeuse's position. Betelgeuse is a red star. **Color the point with a red pencil. Circle the point with red.**

3. Complete the diagram, plotting the position of all the stars in the Table of Information about Some Stars. For white stars use a grey or regular pencil. **For white-yellow stars use a pale yellow pencil.**
4. A giant is a star with relatively high luminosity (more than 100 times greater than that of the sun) and relatively low surface temperature (2,000-6,000°K). Draw a line to enclose all the points representing stars that appear to have these characteristics and label this enclosed area *Giants*.
5. A white dwarf is a star with low luminosity (100 times less than the sun) and a relatively high surface temperature (7,500 - 20,000°K). Draw a circle around the point representing a star that appears to have these characteristics and label this area *White Dwarfs*.
6. The majority of the stars belong to what is known as the main sequence of stars. The range of temperatures of these stars is great and so is the range of their luminosities. However, unlike the red giants and white dwarfs, the temperature and luminosity of the main sequence stars seem to be directly related. The main-sequence stars that have high temperatures also have high luminosities. The main-sequence stars that have low temperatures also have low luminosities. Draw a line enclosing the points representing stars that have these characteristics. Label this area *Main Sequence*.
7. Answer questions 1 through 8.

TABLE OF INFORMATION ABOUT SOME STARS

STAR	LUMINOSITY	TEMPERTURE (x 1,000 K)	COLOR
Barnard's Star	0.01	3.2	
Polaris	1,000	5.9	
Antares	1,000	3	
Spica	30,000	25	
Vega	40	12	
Procyon A	50	6.9	
Regulus	1,000	18	
Lacaile	0.02	4.5	
Sirius B	0.01	8	
Betelgeuse	100,000	3	
Achemar	2,000	24	
Aldebaran	200	4	
Ceti	0.1	4.5	
Sirius A	20	9.5	
Sun	1	5.7	
Procyon B	0.004	8.6	
Altair	0.01	9	
Alpha Centauri	1.6	5.9	

Complete the graph using the chart from the previous page:



LABORATORY QUESTIONS

Use the results you obtained to answer the following questions using complete sentences.

1. How would you describe the location of the area on the grid labeled *Giants*?
2. Why do you think stars in this group are called giants?
3. How would you describe the location of the area on the grid labeled *White Dwarfs*?
4. Why do you think they are called dwarfs?
5. How would you describe the location of the area on the grid labeled *Main Sequence*?
6. Why do you think this group is called main sequence?
7. To which group of stars does the sun belong?
8. To which group do most of the stars on your diagram belong?