Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per:\_\_\_

**LAB: How Is a Star’s Color Related to Its Temperature?**

**Background:** On a clear night you have surely noticed that some stars are brighter than others. But stars also have different colors. Rigel is blue, and Betelgeuse is red. Capella and our sun are yellow. In this activity you will make your own Hertzsprung-Russell (HR) diagram. You will see how star luminosity (amount of light – brightness), color, temperature, and class are related.

**Materials:**

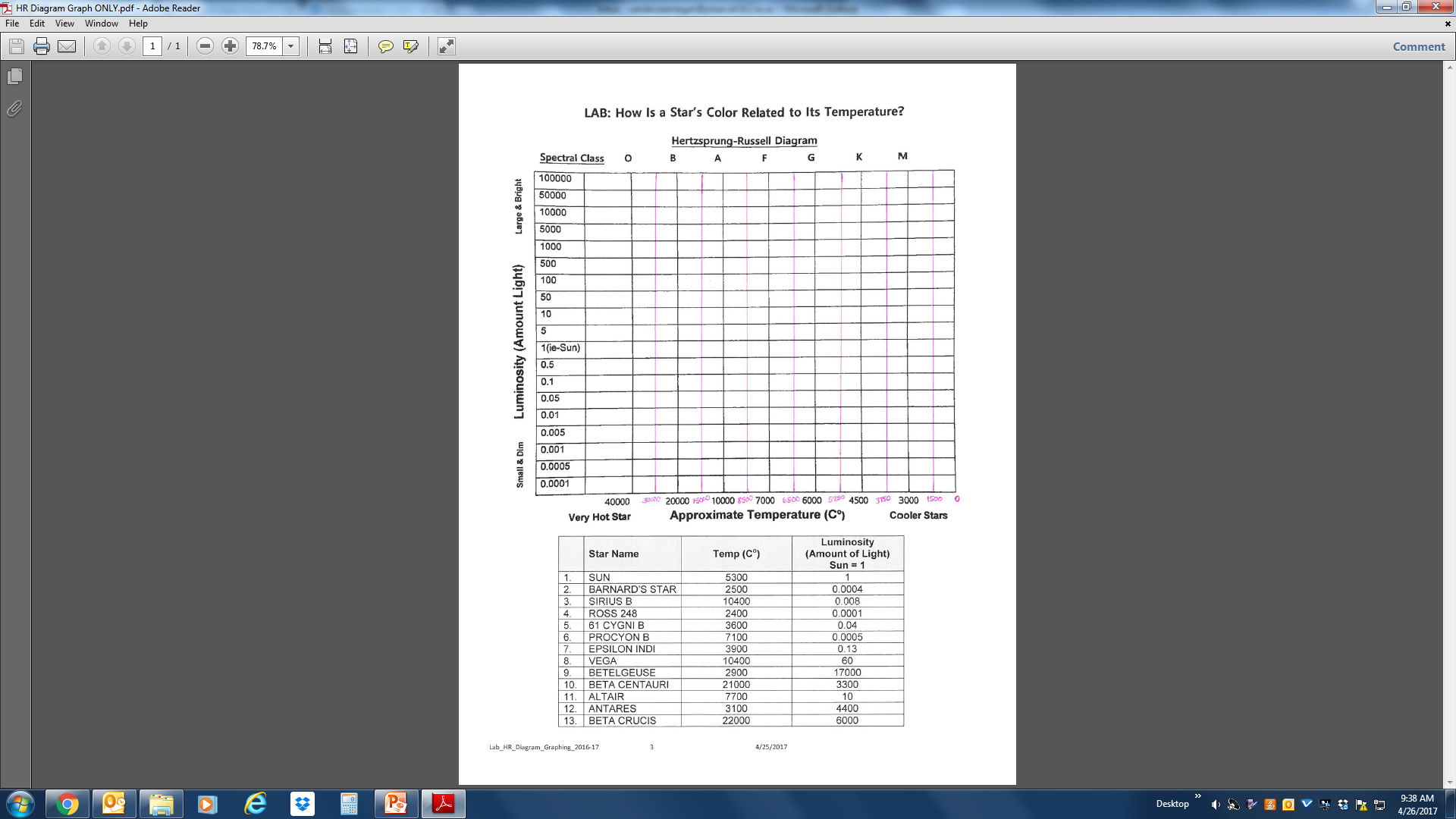
Colored pencils (red, orange, yellow, blue)

**Procedure:**

1. Study the star data chart below the graph on page 3. Note: the **sun, used as a standard of luminosity/light, is given a value of 1**. The luminosity given for each other star shows how that star compares with the sun.
2. **Plot the data** from the table onto the graph on the next page.
   1. NOTE: The graph is unusual. Numbers along the X-axis are not in equal increments. Plot carefully.
3. **Label each star** on the graph with its number from the data table.
4. **Shade vertical bands of color** for the following temperature ranges. Color from the bottom to the top of the graph:
   1. 2000oC to 3500oC **red**. (Stars with surface temperatures up to 3,500oC are red. This will identify the stars in the graph that are red)
   2. 3500 to 5000o C **orange**.
   3. 5000 to 6000oC **yellow**.
   4. 6000 to 7500oC **white**.
   5. 7500 to 40,000oC **blue**.
5. **Look for patterns** in your graph. **Compare it to** the Figure 30-17 on p.819 of your textbook.

**Analysis Questions**

1. **Circle and label the following groups of stars:** blue/white dwarf stars, red giants, and main sequence stars.
2. To which of the 3 groups you just circled, do most of the stars you graphed belong?
3. What is the general relationship between temperature and star luminosity (amount of light energy) for stars on the main sequence?
4. What relationship do you see between star color and temperature?
5. List the colors from coolest to hottest:
6. The stars located in the lower right portion of the chart are cool and dim. What are the characteristics of a star in the **upper left** portion of the diagram?
7. What are the characteristics (temp, size, & luminosity) of a star located in the **upper right** portion of the diagram?
8. Our Sun:
   1. Put a next to point #1 that represents the sun.
   2. How does the sun’s **temperature** compare to the other stars on the main sequence?
   3. How does the sun’s **size** compare to the other stars on the main sequence?
   4. How does the sun’s **luminosity** compare to the other stars on the main sequence?
9. What spectral class (O,B,A,F,G,K,M) does our sun belong to?
10. If a star is class B on the main sequence (see letter along top of graph)
    1. What is its temperature? \_\_\_\_\_\_\_\_\_\_\_
    2. What is its color?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Blue/white dwarf stars are hot.
    1. Describe the luminosity (amount light) of most hot stars.
    2. Describe the luminosity (amount light) of white dwarfs.
    3. Explain what you think may cause the luminosity of white dwarfs to differ from that of most hot stars. (Use p. 820 to help)
12. Red giants are cool.
    1. Describe the luminosity of most cool stars.
    2. Describe the luminosity of red giants.
    3. Explain what you think may cause the luminosity of red giants to differ from that of most cool stars. (Use p. 820 to help)
13. On your diagram, there is another star that is plotted near Betelgeuse.
    1. What is the name of the star?
    2. What kind of star is it?
14. Compare our Sun with the red supergiant, Antares.
    1. Which star is further along in its life cycle?
    2. How do you know?



|  |  |  |  |
| --- | --- | --- | --- |
|  | **Star Name** | **Temp (Co)** | **Luminosity**  **(Amount of Light) Sun = 1** |
|  | SUN | 5300 | 1 |
|  | BARNARD’S STAR | 2500 | 0.0004 |
|  | SIRIUS B | 10400 | 0.008 |
|  | ROSS 248 | 2400 | 0.0001 |
|  | 61 CYGNI B | 3600 | 0.04 |
|  | PROCYON B | 7100 | 0.0005 |
|  | EPSILON INDI | 3900 | 0.13 |
|  | VEGA | 10400 | 60 |
|  | BETELGEUSE | 2900 | 17000 |
|  | BETA CENTAURI | 21000 | 3300 |
|  | ALTAIR | 7700 | 10 |
|  | ANTARES | 3100 | 4400 |
|  | BETA CRUCIS | 22000 | 6000 |