# Life Cycles of Stars

**Purpose:**
To observe the changes in the temperature, absolute magnitude, and other observable characteristics of two different types of stars as they go through their life cycles. The absolute magnitude is a measure of how bright a star would appear if it was approximately 32 light years away from the Earth. One of the stars you will observe will be a medium sized star similar to our own Sun, and the other star will be a massive star over 100 times the size of the sun.

**Procedure A (plot on grids on back of this paper and use table at the bottom of this page)**
1. Use the data on the absolute magnitude and temperature for a sun-sized star in Table 1 to plot the location of each life-cycle stage on the blank HR diagram (Figure 1A). Plot each of the life cycles in the appropriate color that the star would be based on its temperature. Next to each point, label the life-cycle stage.
2. Using a green colored pencil, draw an arrow from the nebula location to the proto star stage. Continue to draw a green arrow connecting each preceding life-cycle stage to the next. When you are finished, make a key on your HR diagram that show the green line representing the life cycle stages of a Sun-sized star.
3. Next, use the data on the absolute magnitude and temperature for a massive star in Table 1, to plot the location of each life-cycle stage on the blank HR diagram (Figure 1B). Plot each of the life cycles in the correct color that the star would be based on its temperature. Next to each point, label the life-cycle stage.
4. Using a purple colored pencil, draw an arrow from the nebula location to the proto star stage. Continue to draw a purple arrow connecting each preceding life-cycle stage to the next stage. When you are finished, make a key on your HR diagram that shows the purple line representing the life cycle of the massive star that is over 100 times larger than the sun.

**Procedure B (use diagram on page 3)**
1. Label the six different stages for a sun-sized star on Figure 2.
2. Label the eight different stages for a massive star on Figure 2.
3. Use the correct colored pencil to color in each specific stage on Figure 2.

**Procedure C (put stars on wall chart and sketch the finished results in the blank space on page 3)**
1. Examine the star circles your teacher give you. Each circle has the following information:
   *Star name* – the common or catalog name of the star
   *Temperature* – the temperature of the surface of the star
   *Brightness* – the number of times brighter the star is than our sun (a fraction means it is dimmer than our sun)
   *Expected lifetime* – the number of years that stars of this type are expected to exist at this color and brightness
2. Correctly position and attach your circles on the wall chart's temperature and brightness axes.
3. Once all the star circles are in place, sketch the distribution of stars below:

***Table 1***

| **Sun-Sized Star** | | |
|---|---|---|
| *Life Cycle Stage* | *Temperature* | *Absolute Magnitude* |
| Proto Star | 3,000 | 0.4 |
| Main Sequence | 6,000 | 4.9 |
| Red Giant | 2,500 | -5.0 |
| White Dwarf | 8,000 | 13.0 |
| **Massive Star** | | |
| Proto Star | 7,000 | 2.5 |
| Main Sequence | 12,000 | -1.0 |
| Super Red Giant | 9,000 | -7.0 |
| Neutron Star | 17,000 | 7.0 |

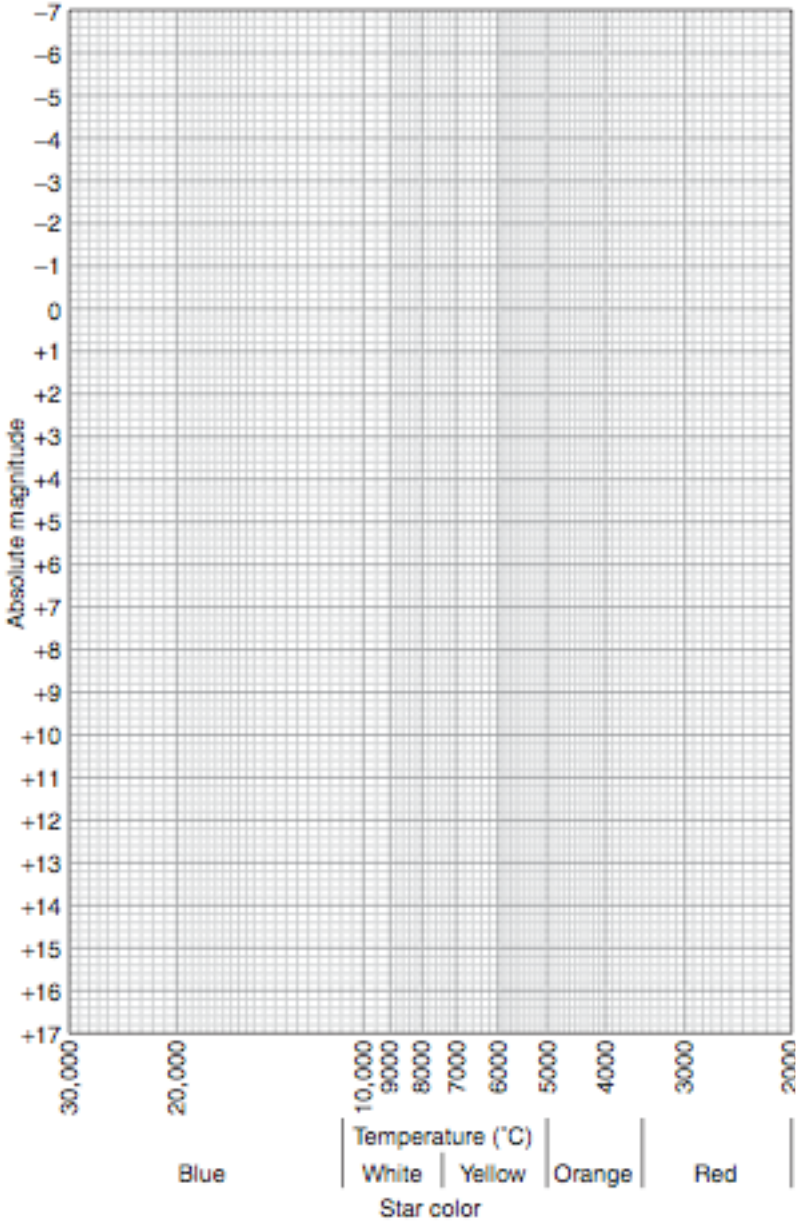


FIGURE 1A

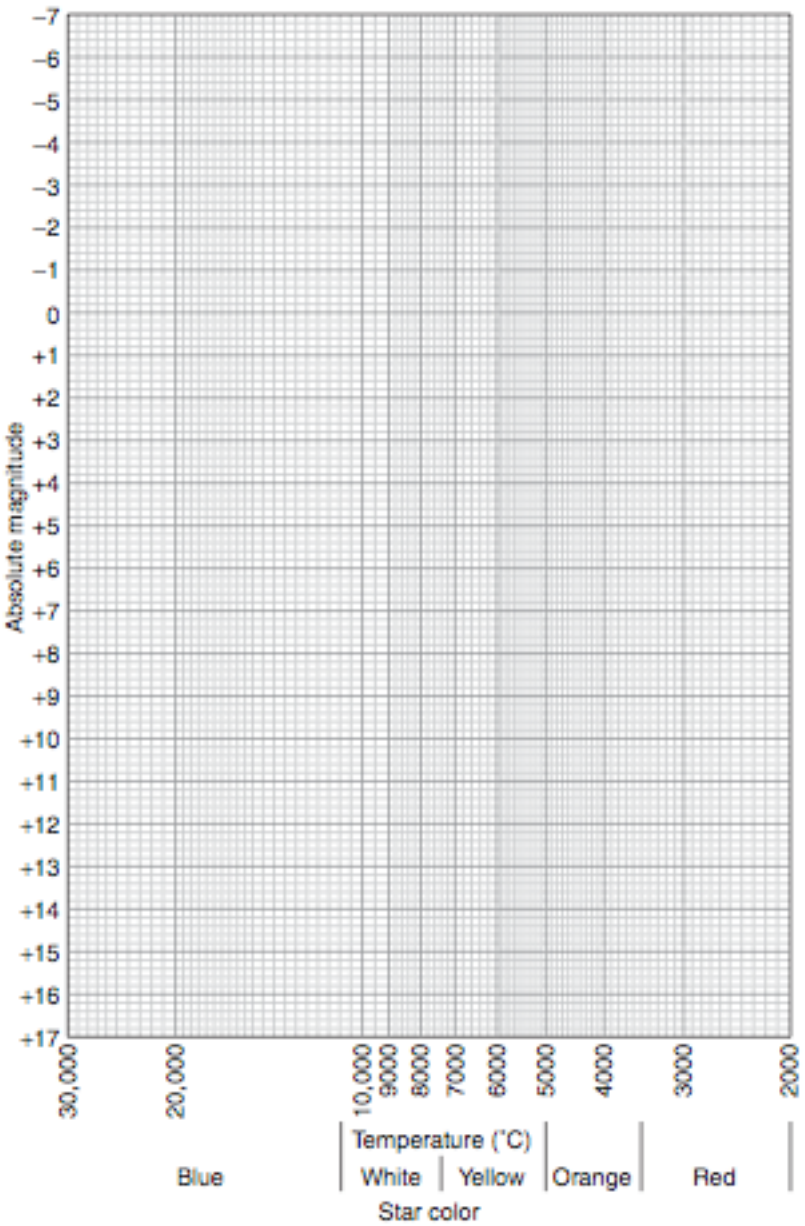


FIGURE 1B

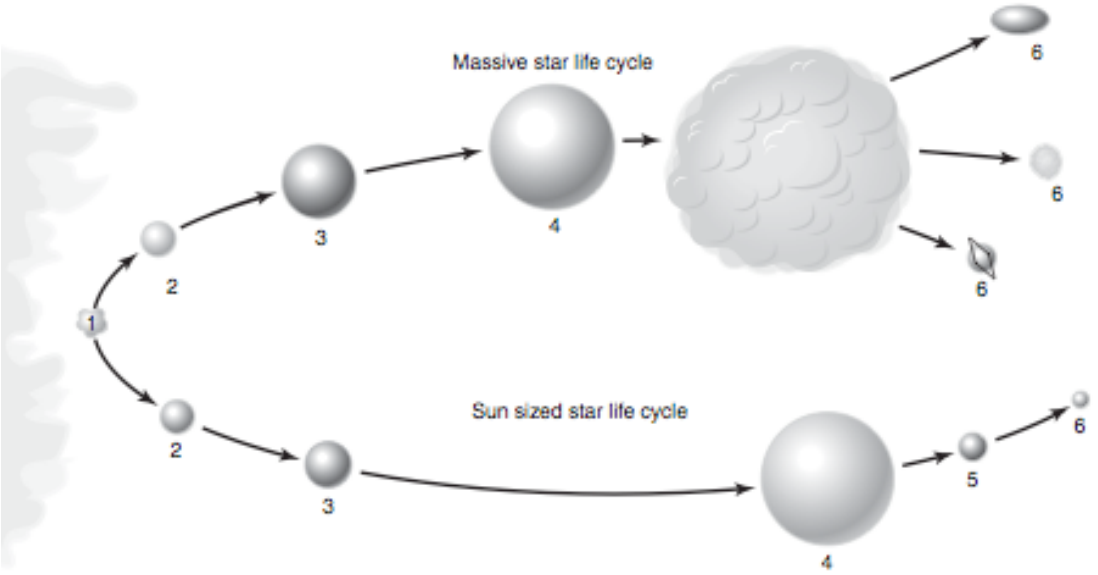


**FIGURE 2**

**Sketch completed Wall Chart here:**

**Questions (Answer on a separate piece of paper and turn in….you keep this packet for your notes):**

1. What changes occur in the temperature and size of a sun-sized star as it goes through its life cycle?
2. What are the main differences that can occur in the life cycles of a sun-sized and a massive star?
3. After a supernova explosion, what are the 3 things that can result in the life cycle of a massive star?
4. Describe the general trend between temperature and brightness.
5. What is the color and brightness of the most abundant stars? The rarest stars?
6. What are the characteristics of the stars that do not conform to the graph's trend?
7. In terms of the graph's trend, is our sun typical or exceptional?
8. If you replaced the temperature scale on the graph's x-axis with a color scale, which color would be closest to the graph's origin and which would be farthest away?
9. In the stars that fit the general trend (these are often called the main sequence stars), what relationship do you notice between color and expected liftime?
10. What color are the hottest stars?
11. What color are the coolest stars?
12. Using your HR diagram, what would be the approximate absolute magnitude of a main sequence star with a temperature of 9000 degrees Celsius?
13. If a red giant is cooler than a main sequence star, what makes it have a higher absolute magnitude?