UNIT 2
Life Cycle of the Sun

Purpose

The purpose of this activity is to have you 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.

Materials

colored pencils
ruler

Procedure A

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.

TABLE 1

Sun-sized Star		
Life Cycle Stage	Temperature (°C)	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

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 shows 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 a massive star that is over 100 times larger than the Sun.

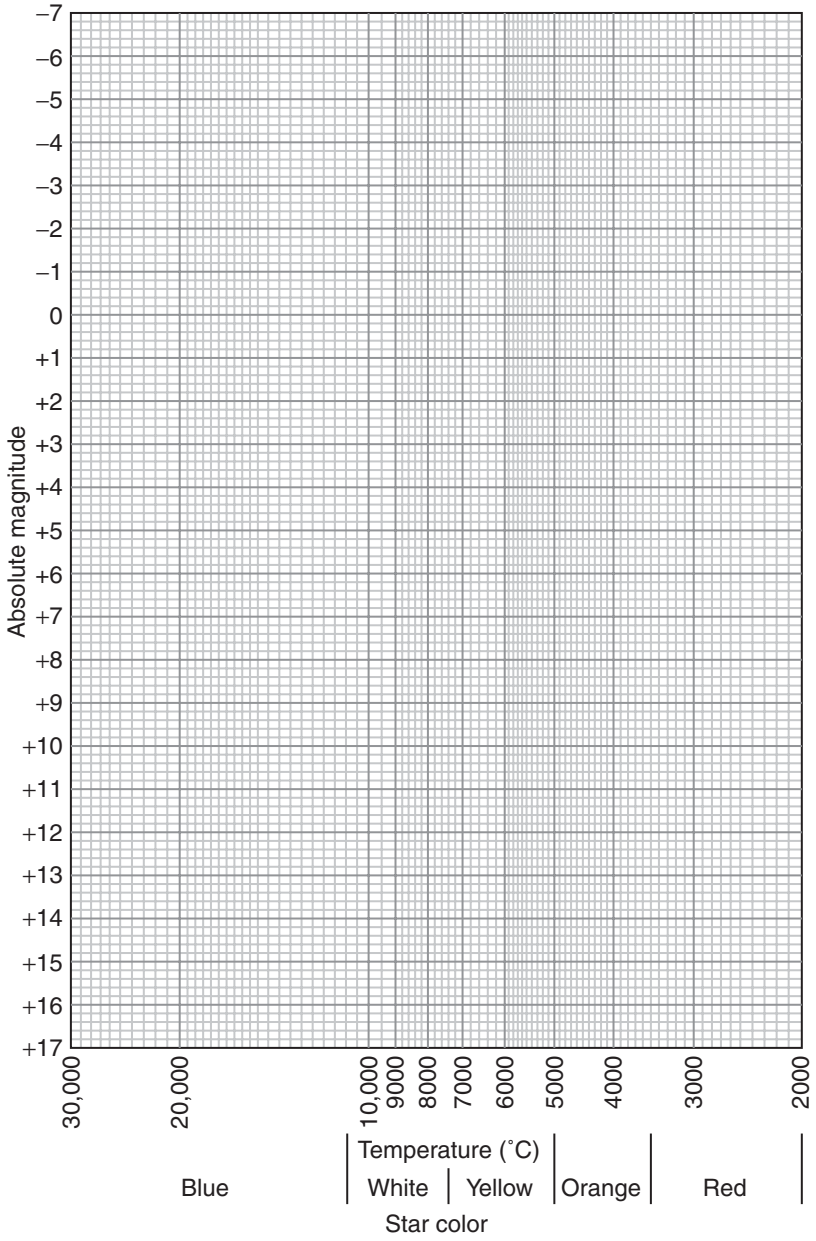
Absolute magnitude
–7
–6
–5
–4
–3
–2
–1
0
+1
+2
+3
+4
+5
+6
+7
+8
+9
+10
+11
+12
+13
+14
+15
+16
+17
30,000
20,000
10,000
9000
8000
7000
6000
5000
4000
3000
2000
Temperature (˚C)
Blue
White
Yellow
Orange
Red
Star color

FIGURE 1A

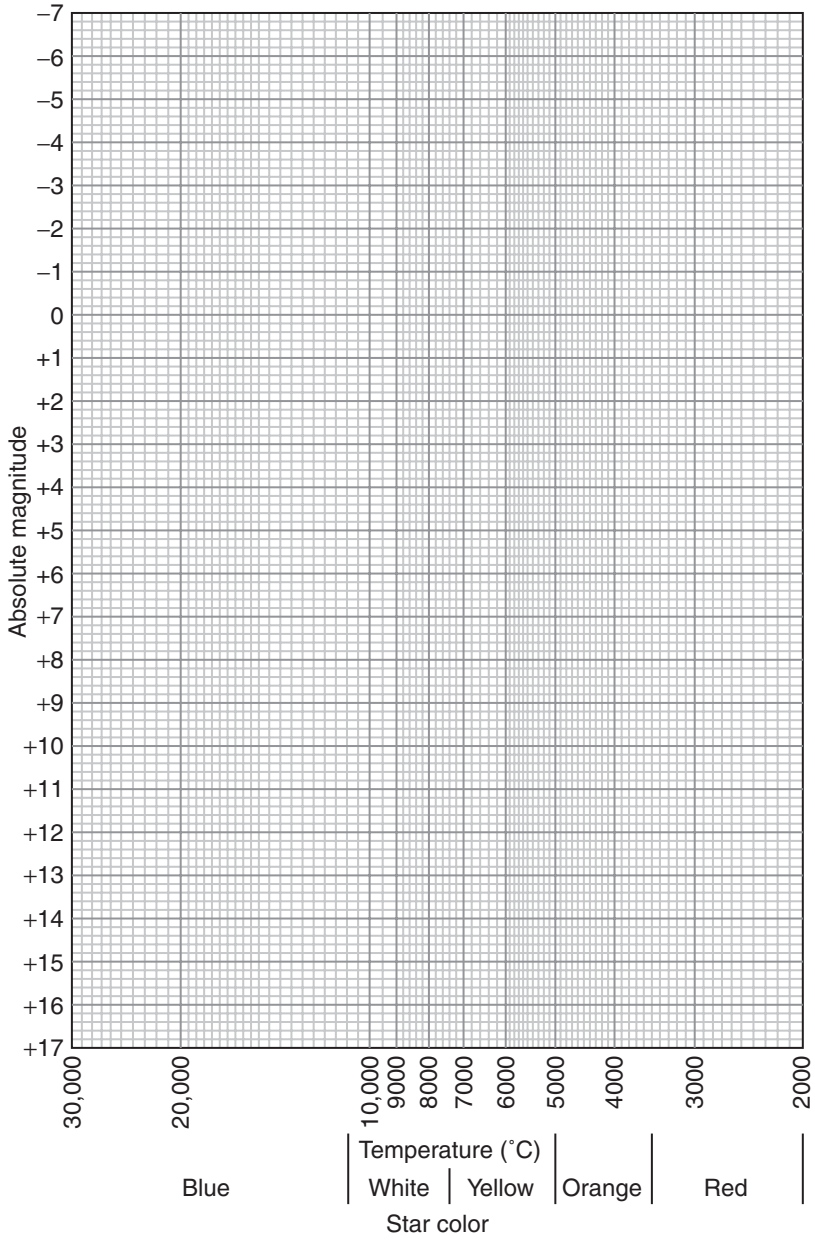
Absolute magnitude
−7
−6
−5
−4
−3
−2
−1
0
+1
+2
+3
+4
+5
+6
+7
+8
+9
+10
+11
+12
+13
+14
+15
+16
+17
30,000
20,000
10,000
9000
8000
7000
6000
5000
4000
3000
2000
Temperature (˚C)
Blue
White
Yellow
Orange
Red
Star color

FIGURE 1B

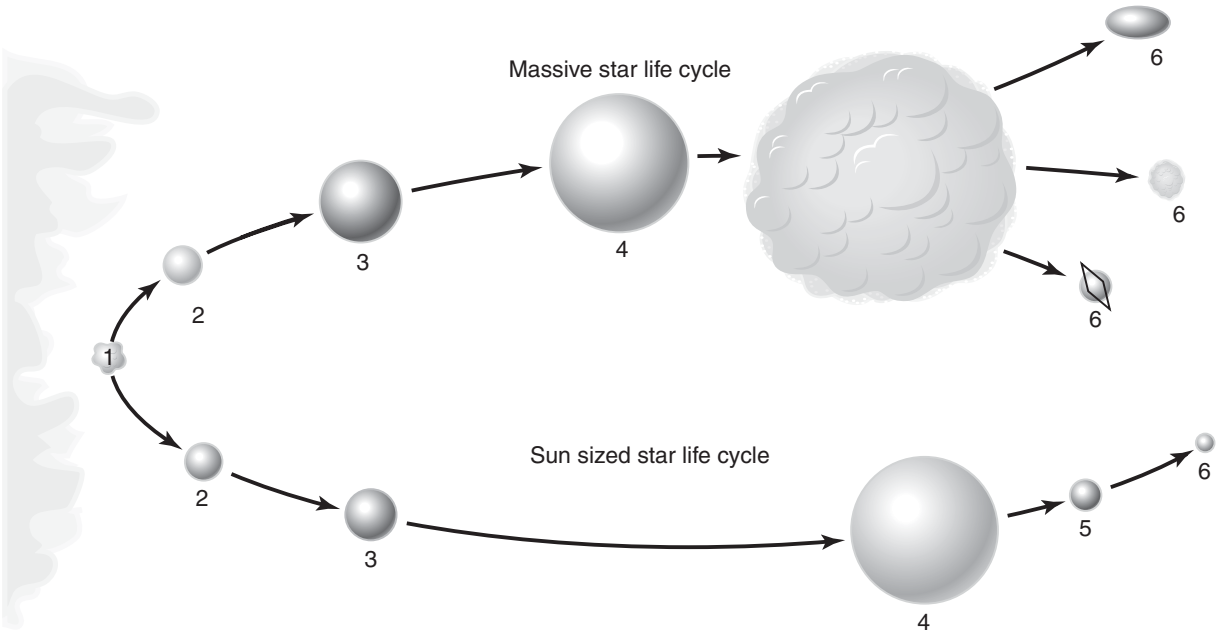

FIGURE 2

Procedure B

1. Label the six different stages for a Sun-sized star as shown in Figure 2.

2. Label the eight different stages for a massive star as shown in Figure 2.

3. Use the correct colored pencil to color in each specific stage as shown in Figure 2.

Conclusions

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 star and a massive star?

3. What color are the hottest stars?

4. What color are the coolest stars?

5. Using your HR diagram, what would be the approximate absolute magnitude of a main sequence star with a temperature of 9,000°C?

6. If a red giant is cooler than a main sequence star, what makes it have a higher absolute magnitude?

7. After a super nova explosion, what are the three things that can result in the life cycle of a massive star?

8. What is the difference between the luminosity and absolute magnitude of a star?