Name _____ **How is a Star's Color Related to its Temperature?**

Introduction:

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. Alpha & Beta Centauri and our Sun are yellow. In this activity you will make your own Hertzsprung-Russell diagram. You will see how star brightness, color, temperature, and class are related. Keep in mind that the Sun has a number of 1 for brightness and radius, all other stars are compared against this number. For example: Altair has a brightness of 11 (11 times brighter than the Sun), and a radius of 2 (two times the size of the Sun).

Class	Color	Temperature °C
O	Blue	31,000 and over
B	Blue/ White	10,001 - 31,000
A	White	8,001 - 10,000
F	Yellow/ White	6,001 - 8,000
G	Yellow	5,001 - 6,000
K	Orange	3,001 - 5,000
M	Red	2,200 - 3,000

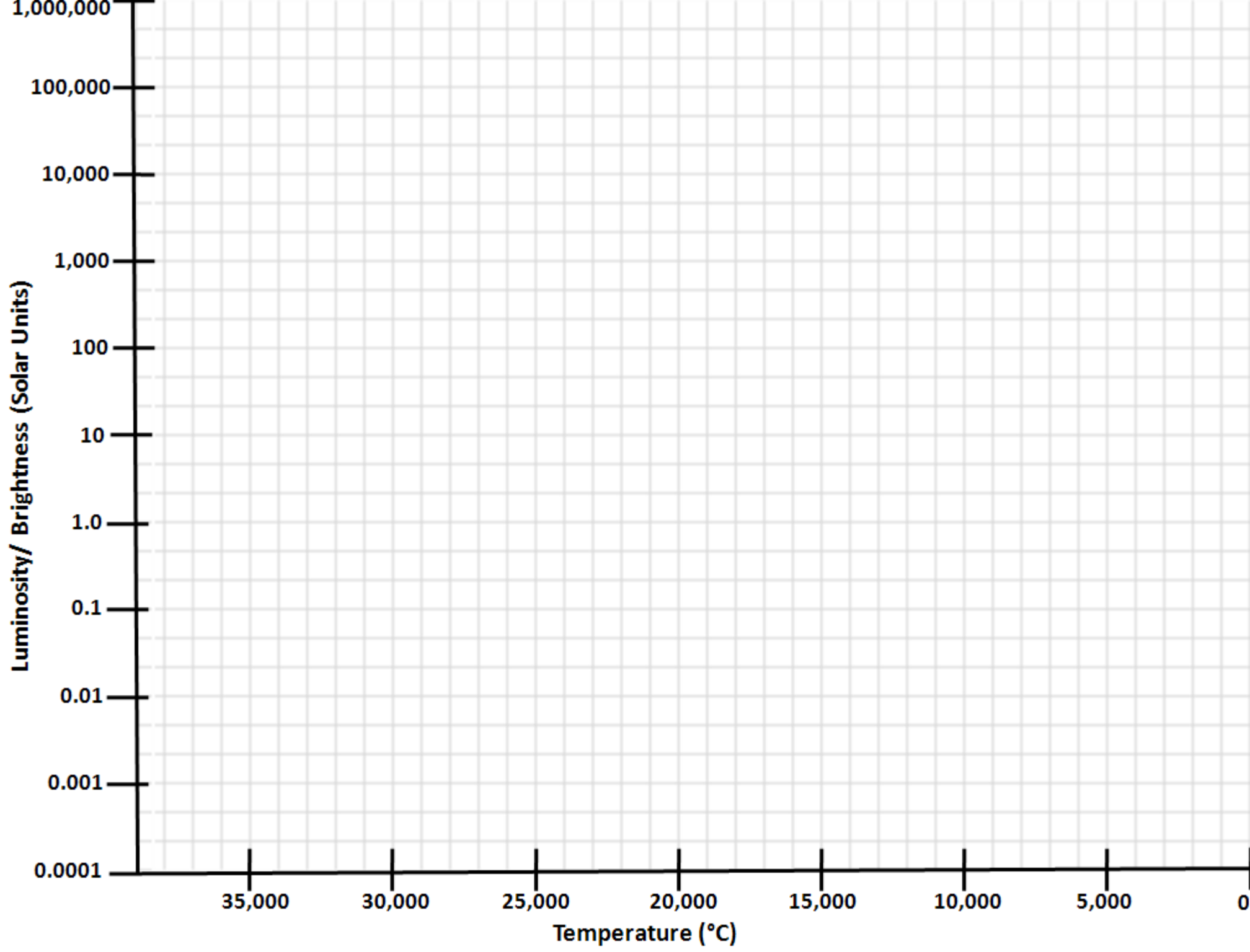
Procedure:

1. Draw vertical lines on your graph to separate each spectral class ----------→
   Write the letters (O, B, A, F, G, K, M) designating each spectral class along the X axis

· 0.15 and lower
▪ 0.16 - 1.9
■ 2 - 8
○ 8.1 - 100
◎ 101 - 1,000
◎ 1,001 and up

2. Plot each star according to the data in the table below.
3. **Important:**
   The markings for each star should follow the graph to the left ←
   These markings show the size of the star (the star's radius) ←
   For Example:
   The Sun has a radius of 1, it falls between 0.16 and 1.9, so mark the Sun as: ▪
   Pollux has a radius of 8.8, which falls between 8.1 and 100, so mark Pollux as: ○
4. **Important:** Do not forget to label each star as you graph them.
   When you mark the Sun as ▪ label it as the Sun.
   Note: Write small – Some of these stars will be rather close to each other
5. When you finish graphing, answer the questions on the next page.

Temperature (C^0)	Brightness (Luminosity)	Size (Solar Radius)	Star Name
5,500	1	1	Sun
28,000	25,000	15	Acrux (Scientific name: Alpha Crucis)
3,600	518	44	Aldebaran
5500	1.5	1.2	Alpha Centauri A (write it as: α Cen A)
5000	0.4	0.9	Alpha Centauri B (write it as: α Cen B)
8,500	11	2	Altair
3,000	58,000	883	Antares
4,000	170	25	Arcturus
15,000	1,000	40	Atik (Also called Omicron Persei – Not to be confused with the fictional planet: Omicron Persei 8)
3,000	0.004	0.2	Barnard's Star
22,000	6,400	6	Bellatrix
3,000	100,000	1,200	Betelgeuse
7,100	15,000	71	Canopus
8,500	200,000	200	Deneb
2,500	0.0007	0.11	DX Cancri
37,000	1,000,000	240	Eta Carinae
4,600	43	8.8	Pollux – We're not plotting Castor as it's a six star system with two pairs of binary stars. Its hard to break apart twins ← that has two meanings
6,250	7	2	Procyon A
8,500	0.0005	0.01	Procyon B
12,500	300	3	Regulus
10,700	90,000	79	Rigel
9,600	25	1.7	Sirius A
25,000	0.03	0.008	Sirius B
22,100	12,000	7	Spica
7,000	0.0003	0.01	Stein 2051 B
3,000	350,000	1,700	UY Scuti (Largest known star)
9,300	50	2.5	Vega
39,000	700,000	20	Zeta Puppis


1,000,000
100,000
10,000
1,000
100
10
1.0
0.1
0.01
0.001
0.0001
Luminosity/ Brightness (Solar Units)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Temperature (°C)

Lab Questions:

1. On your graph, in one big circle, circle the white dwarf stars: Hint: There are 3 of them in a perfect diagonal line.
2. Now circle the Supergiant stars: Hint: There are 6 of them
3. Now circle the giant sized stars: Hint: There are 3 of them
4. Drawing a long thin circle, circle the main sequence stars: Hint: The circle will curve

5. Most of the stars in this activity, and most stars in reality, fall in which of the 4 categories:
White dwarf, Main sequence, Giant, or Supergiant?

6. Therefore, generally speaking, what is the relationship between temperature and a star's brightness

7. What is the relationship you see between star color and its temperature?

8. List the colors used in this activity from coolest to hottest

9. How does the Sun compare to other stars on the main sequence?

10. What spectral class does our Sun belong to?

11. If a star is class M, what is its temperature and color? Give an example of such a star

12. What is the largest known star and how many times larger than the Sun is it?

13. Why is Sirius the brightest star in the night sky even though there are stars much brighter?

14. Why do some stars have similar names? For example: Alpha Centauri A & B, Procyon A & B, and Sirius A & B

15. Based from the graph, which star is really the brightest star in the night sky: Sirius A or Sirius B? Explain why