

Name:

Class:

H-R Diagram Webwork

The astronomer Annie Jump Cannon was looking for any trends in the variety of sizes, shapes and colors of stars that exist. She categorized them according to their luminosity (the amount of light energy they give off in a unit of time). We often refer this to brightness. Two other astronomers, Hertzsprung and Russell organized these stars into a graph of luminosity vs temperature and discovered some trends in the life cycle of a star are revealed by the graph we now know as the HR diagram named after it's creators. You will discover these trends in temperature, brightness, size, color and life stage by exploring the HR diagram at <http://astro.unl.edu/naap/hr/animations/hr.html>

Review the settings and then remove the main sequence check and the isoradius lines check to remove both. Note, too, that the luminosity is in terms of solar luminosities (L_{\odot}). That is, if a star has a luminosity of $10L_{\odot}$, it will be ten times brighter than our sun. The temperature is given in Kelvins (K), a temperature scale very similar to the Celsius scale with a different zero point. Kelvin and Celsius temperatures differ by 273 degrees with room temperature at around 27 degrees C and 300 K.

While the image on the right is the HR diagram, the image on the left is of our sun in comparison to a star on the HR diagram at the position of the red X. Using your cursor to click and drag to different points on the HR diagram compare stars to our sun and answer the questions below.

1. Describe the size of stars in the H-R diagram (in comparison with the sun) in the upper right portion:

much larger somewhat larger the same size somewhat smaller much smaller

2. Describe the color of the stars in the upper right portion of the H-R diagram.

Redder about the same color bluer

3. Describe the size of stars in the H-R diagram (in comparison with the sun) in the upper left portion:

much larger somewhat larger the same size somewhat smaller much smaller

4. Describe the color of the stars in the upper left portion of the H-R diagram.

Redder about the same color bluer

5. Describe the size of stars in the H-R diagram (in comparison with the sun) in the lower right portion:

much larger somewhat larger the same size somewhat smaller much smaller

6. Describe the color of the stars in the lower right portion of the H-R diagram.

Redder about the same color bluer

7. Describe the size of stars in the H-R diagram (in comparison with the sun) in the lower left portion:

much larger somewhat larger the same size somewhat smaller much smaller

8. Describe the color of the stars in the lower left portion of the H-R diagram.

Redder about the same color bluer

9. Where in the H-R diagram would you find the sun the same size and color as our sun? (Click here and there around the diagram until the two stars in the upper left box are the same in terms of color and size.)

upper left upper right middle lower left lower right

10. Check the box below the H-R diagram labeled “show luminosity classes.” What is the classification of the Sun?

white dwarf red dwarf dwarf red giant blue supergiant

11. Note the main sequence of stars running from upper left to lower right. By clicking at various point along the sequence and carefully noting the characteristics of stars found there, determine if the main sequence is a changing sequence of any of the following:

- Temperature Yes / No
- Luminosity Yes / No
- Color Yes / No
- Size Yes / No

12. Deselect the “show luminosity classes” box, and click on “the nearest stars” button. The diagram now shows the stars nearest our Sun. How would you characterize most of the nearest stars in comparison to our sun?

smaller/dimmer larger/brighter smaller/brighter larger/dimmer

13. Deselect the “the nearest stars” button, and click on “the brightest stars” button. The diagram now shows the brightest stars as seen from the Earth with our eyes alone. How would you characterize most of the stars that we see at night with our eyes?

smaller/dimmer larger/brighter smaller/brighter larger/dimmer

14. Now, turn on “both the nearest and brightest stars”. Note the small overlap between these two groups. Turn off “both the nearest and brightest stars” and turn on “the overlap”. How many stars are in this overlap region?

15. How would you characterize the stars that are both the nearest the sun and brightest as see with our eyes?

blue giants red giants white dwarfs red dwarfs sun-like