

Star in a Box Worksheet - Beginning

☆ Launch Star in a Box and open the lid. The main plot is a Hertzsprung-Russell diagram. On the right, the information panel allows comparisons between the radius, surface temperature, luminosity and mass of the star relative to the Sun. The starting parameters are for a star like the Sun.

A. Click the play button below the Hertzsprung-Russell diagram to show the Sun's evolution. Once it is complete, you can click on "Data Table" (upper right) to see the final values for each stage in the lifecycle.

- 1. Describe how the Sun changes over its lifetime.
- 2. When will the Sun be at its brightest?
- 3. When will the Sun be at its hottest?
- 4. In which stage of its life does the Sun spend the longest time?
- 5. In which stage of life will the Sun undergo the most change?
- 6. What kind of star will the Sun be at the end of its life?
- 7. How long will the Sun live for?
- **B.** By adjusting the mass of the star in the "Star Properties" you can explore the evolution of different stars.
 - 1. Where do the different mass stars lie on the main sequence?
 - 2. List the different final stages of a star's life.

C. Follow the evolution for five stars with different masses. Complete the table below filling in a row for each mass (you will need to watch the evolution not just look at the Data Table summary).

Mass of star (Msun)	Time on main sequence (Myr)	Number of stages	Final state	Total lifespan (Myr)	Maximum radius (Rsun)	Maximum luminosity (Lsun)	Maximum temperature (K)

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- **D.** Compare the data table for a range of stars.
 - 1. Are more massive stars the brightest and hottest types of star for their whole lives?
 - 2. Which mass star gets the hottest?
 - 3. Which mass star gets the coolest?
 - 4. Which mass star becomes the most luminous?
- **E.** Deneb and Betelgeuse are both 20x the mass of the Sun, but look very different. Deneb has 100 times the radius of the Sun and its temperature is about 8000 K. Betelgeuse has 1000 times the radius of the Sun and its temperature is about 3500 K.

Select a star with 20x the mass of the Sun and run the animation, use this to find:

- 1. What stages of their lives the two stars are in.
- 2. How long each star has to live.