Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# The Lifecycle of Stars: Webquest[[1]](#endnote-2)

**Purpose**

The purpose of this lab is to investigate the process of nuclear fusion explained by Einstein's famous equation E = MC2 and learn how mass in the form of hydrogen atoms is converted to helium and causes a release of energy that makes stars shine. We will also begin to understand the forces involved in stars that maintain this nuclear reaction and how these forces change as the star ages. We will explore the stages stars progress through from birth to death and how the death of a star depends on its initial mass. We will interpret Hertzsprung Russell diagrams and learn how they can be used to classify the life cycle stage of a star by its luminosity, temperature, magnitude, and spectral class. Finally, we will discover how infrared, x-ray, and gamma ray telescopes are being used to detect the life cycle stages of stars.[[2]](#endnote-3)

**Procedure**

**Materials**

1. Blank paper (2 sheets/student)
2. Internet Access
3. Craft supplies for Task #2

**Sequence of Steps**

To access this webquest, go to <http://www.can-do.com/uci/ssi2003/starlife.html>

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**Task #1**

1. You will begin your webquest by learning how to identify stars by their magnitude, color, and temperature, and spectral class.
2. Click [Stars: Lights in the Sky](http://www.seasky.org/cosmic/sky7a01.html) and write out the answers to the following questions on a sheet of blank paper to be turned in.
   1. Name the brightest star in the known universe.
   2. What is its magnitude?    
      Are the brightest stars low magnitude or high?
   3. How much does the brightness of a star change with each change in magnitude of one?
3. Do a search on the internet for "brightest stars" and make a top **10** list on your paper of the names of the 10 brightest stars in the known universe and their magnitude.
4. Finally, design a colored diagram (HR diagram) on the back of your paper that displays the colors of the hottest stars on the left to the coolest stars on the right.
5. Stars are grouped into spectral classes based on a range of temperatures they fall into.

Label the spectral classes (*O, B, A, F, G, K, M*) appropriately under each star color in your diagram.

1. To complete Task #1, Come up with a clever sentence or phrase (the first letter of each word in your phrase is one spectral class letter) to help you remember the order of the spectral classes and write it under your diagram on your construction paper.

*For example:* *Over Banks And Foggy Greens Kittens Meow.*

1. Answer the following few more questions on the front of your paper.
   1. What color is the brightest star?
   2. What color is the coolest star?
   3. What color is our sun?
   4. What spectral class of stars is the hottest?
   5. What spectral class of stars is the coolest?
   6. What spectral class is our sun?

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Continue to read on to the section: [A Nuclear Furnace](http://www.seasky.org/cosmic/sky7a01.html) on the same webpage. The animation shows how stars fuse the deuterium and tritium forms of hydrogen to form helium.  Your task is to design a 3-D model of this nuclear reaction. You might want to locate some red and blue styrofoam balls at an art supply store or utilize some type of spherical object to represent the different atoms in the reaction. Glue these on a piece of cardboard and label the names of the atoms and draw arrows showing the progression of the reaction.

This 3-D model is due \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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**Task #3**

Go to [The Life and Death of Stars](http://map.gsfc.nasa.gov/m_uni/uni_101stars.html).  Read the short section on "Where are stars born" and see pictures of theprotostars of M16: The Eagle nebula and other nebulae (stars in formation) on this page.  Continue by reading up on Main Sequence Stars and find out how our sun compares in mass to other stars like Sirius, and Proxima Centauri. Answer the following questions on your sheet of paper:

1. Based on its mass, will our sun be around for a while?
2. Approximately how long before our sun consumes the inner planets of our solar system?

Realize that once our Sun starts to run out of hydrogen fuel and has exhausted its ability to fuse other elements like carbon and oxygen, it will become a red giant and expand in size to envelope the Earth. And surprisingly, the larger the mass of the star, the quicker it burns its fuel sources and the shorter its lifespan. Also see and read about [Hubble Space Telescope](http://www.cnn.com/TECH/space/9906/01/hubble.milky.way/) pictures of a developing galactic nebula in our Milky Way galaxy called NGC 3603

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**Task #4**

Being that stars are quite more massive than most planet sized objects, the gravitational pull on objects close to stars is astronomically large. Find out [Your Weight on Other Worlds](http://www.exploratorium.edu/ronh/weight/). Record your weight on earth, the other planets, and the moon.

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**Task #5:** Now check out the [All Star Line Up](http://www.windows.ucar.edu/tour/link=/the_universe/AllStarTop.html&fr=t) and profile one of the 34 stars on this page. Organize the information provided about your chosen or assigned star into a one-page report, a poster, or maybe a short PowerPoint slide show. The life cycle of stars continues... All stars eventually become red giants or supergiants. As the main sequence star glows, hydrogen in its core is converted into helium by nuclear fusion.

This portion of your project is due: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***FYI:*** *When the hydrogen supply in the core begins to run out, and the star is no longer generating heat by nuclear fusion, the core becomes unstable and contracts. The outer shell of the star, which is still mostly hydrogen, starts to expand. As it expands, it cools and glows red.*

*The star has now reached the red giant phase. It is red because it is cooler than it was in the main sequence star stage and it is a giant because the outer shell has expanded outward.*

*In the core of the red giant, helium fuses into carbon.  All stars evolve the same way up to the red giant phase. The amount of mass a star has determines which life cycle path it will take Read more about* [*red giants*](http://imagine.gsfc.nasa.gov/docs/teachers/lessons/xray_spectra/background-lifecycles.html)*.*

**C:\Users\Angela\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\DRP2N1IJ\MCj04242300000[1].wmfTask #7** See animation of a [supernova explosion](http://imagine.gsfc.nasa.gov/docs/science/know_l1/supernovae.html) and photographs of actual supernova detected by emitted X-rays. At this point, stars at least 5X more massive than our Sun that have gone supernova will either die as a neutron star or a black hole.

Make a poster display of the “Life Cycle of Massive Stars” on a small poster board. Label and color the star types and progression correctly for full credit.

This portion of your project it due: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Cosmic Wonders, Stars. Retrieved May 18, 2009, from Sea and Sky Web site: http://www.seasky.org/celestial-objects/stars.html [↑](#endnote-ref-2)
2. (2008). *The Lifecycle of Stars Lab*. Atwater High School. [↑](#endnote-ref-3)