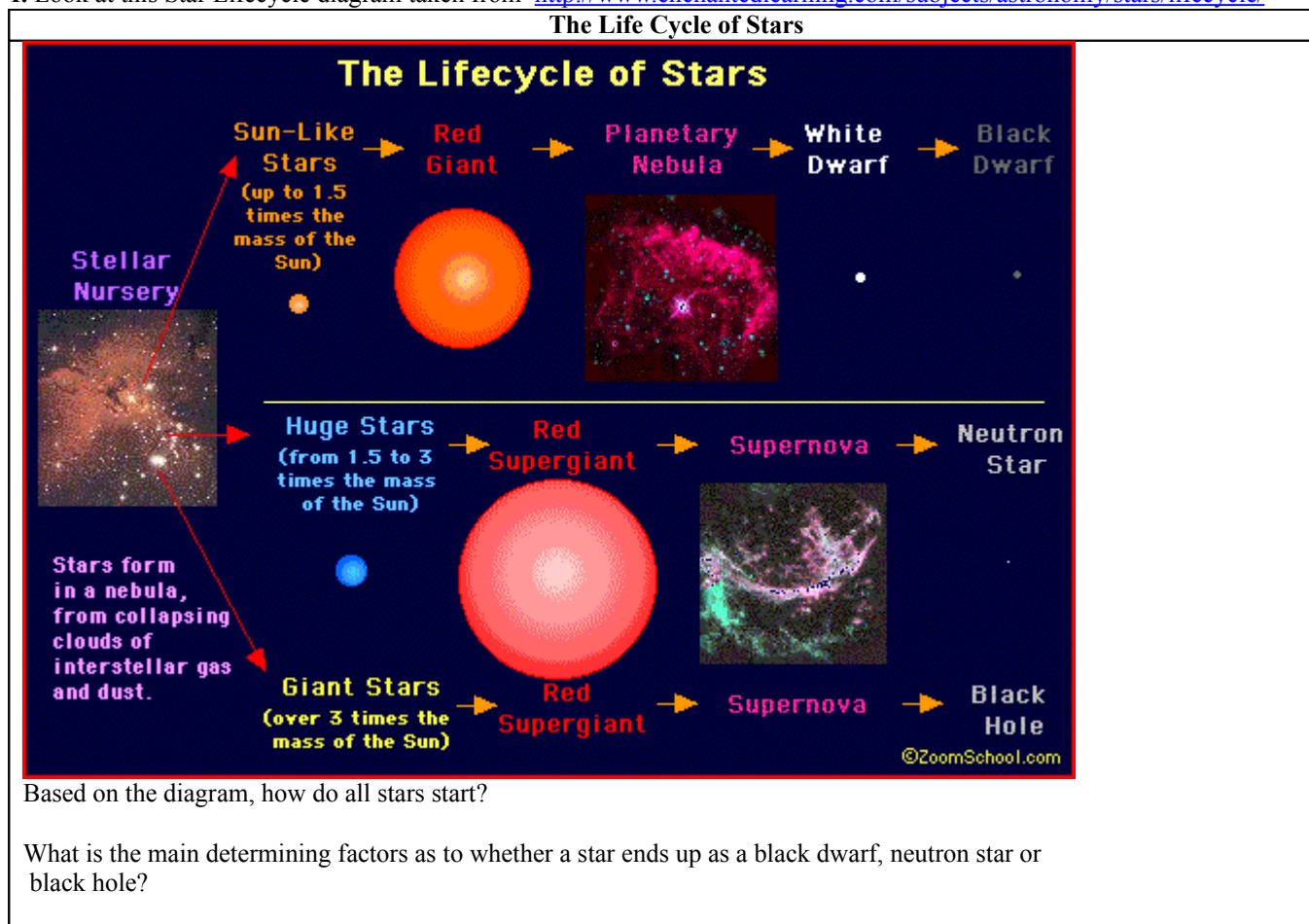


Star Life Cycle Web Activity

Directions: Click on each of the links. READ all of the information on each page AND read information within the animation link or interactive labs. Work in your table Groups to answer the questions using your Netbooks. Give detailed answers for each question.

I. Look at this Star Lifecycle diagram taken from <http://www.enchantedlearning.com/subjects/astronomy/stars/lifecycle/>



II. Go to http://sunshine.chpc.utah.edu/labs/star_life/starlife_main.html This page will give more details on each of these stages. Read the content of this first page.

1) Using the human life cycle analogy, what star phase is the birth of a star and what is the usual end stage (death) of the star?

2) Describe what the interstellar medium is....what are 3 of the elements involved?

III. Click on [Protostars - A Star is Born](#) hyperlink. Play the animation that shows how a [star begins to form](#) from a nebula. Now play the equilibrium animation and then read the rest of the page.

3) Define nebula and describe what equilibrium is for a star.

4) **What are the two options for a protostar and what determines which option a protostar will take?**

IV. Click on [Main Sequence](#) of a Star. Read the entire page first, including its questions. Then click on [beginning of their life cycles](#) of the Interactive Lab and try to answer the questions. Remember to notice the top of the animation to see if it reaches main sequence and notice for how long.

5) **Which star has a longer life span, a larger one or a smaller one? Explain why in details.**

V.. From this point on you make click on the Yellow Right Arrow at the bottom of each page. Or Click on [Equilibrium](#) of a Star. Read the web page and the summary of a typical cycle of stars given here. Stars repeat a cycle of reaching equilibrium and then losing it after burning out one fuel source...then condensing (shrinking) because of gravity, making the core more dense and hotter...so hot that now a new element can be used as fuel to burn and equilibrium is reached once again. Eventually the fuel sources run out and the star dies or explodes. The main fuel sources are Hydrogen, then Helium, then Carbon, then cool off to death.

Q6. Nuclear fusion is the process of fusing (combining) two elements together under extremely high temperatures to form new, heavier elements. What are the 3 main fuels that a star can use for fusion reactions?

VI. Click on the [practice quiz](#) link and answer the 4 Equilibrium True/False Questions. Read the answers given to all 4 questions.

7) **Write down the 3 sentence answer to #1 on this online practice quiz regarding gravity.**

VII. Click on the [Star Quiz \(part 1\)](#) and answer questions.

8) **Use the answers to the 6 questions to give a logical sequence (six steps) describing what happens once the Main Sequence Star runs out of hydrogen fuel...until the point where it reaches equilibrium again. The 6 questions will walk you right through the process.**

VIII. Click the Yellow Right Arrow OR go back and click on [After Main Sequence](#). Read this page about the inevitable death (when star no longer shines) of the star.

IX. IX. Click on [Star Quiz \(part 2\)](#) and answer the two questions.

9) Now write down the answer to this question: **As the outer shell of the star expands, the surface temperature of the star decreases (even though the core is getting hotter). Why does the surface temperature decrease?**

X. Eventually all stars will run out of fuel, and GRAVITY will win the battle against gas pressure causing the star to collapse in some way. Click on the Yellow Right Arrow to go to “The End of a Star” page. Quickly read the page, then click on the Interactive Lab at the very bottom of the page that shows what happens to different size stars at the [end of their life cycles](#).

11) After watching the life cycles for the low, medium and massive size stars, what was the life span of each and final outcome of each?

Low mass star → _____ *billion years* → *final outcome is the* _____

Medium mass → _____ →

Massive star → _____ →

XI. Now click on the in the Interactive Lab more near the top of the page. Play through all 5 steps by hitting the play button. Do NOT click “Check Answers”...it will only waste your time.

12) Explain how a supernova (in step 5) can explain the formation of elements heavier than iron (such as zinc, silver, and lead).

XII. Click on the Yellow Right Arrow or go back and click on The Hertzsprung-Russel (H-R) Diagram [Introduction](#) section only. Read this entire page. You may go to the other sections if you have time. An H-R diagram shows a wide array of stars plotted on a graph showing absolute magnitude (or luminosity) versus surface temperature (not core temperature). Notice most of the stars are in the main sequence, yet some are in white dwarf, super red giant or other stages.

13) Which named star shown on the H-R diagrams is a white dwarf and which is a super giant? Why are they given these names?

14) Define luminosity.

XIII. Click on the Hertzsprung-Russel Diagram within the Interactive Lab section.

15) After doing this lab, tell the relative temperature and brightness (luminosity) for each of the 5 stars A) Betelgeuse, B) Alpha Centauri B, C) Our Sun, D) Vega, and E) Sirius B.

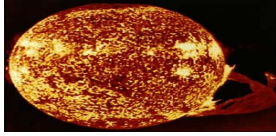
Temp. → _____ *medium temp.*

Brightness → _____ *medium bright*

Q16. What is the relationship between the brightness of a star and the relative size of a star? Explain why. (The bigger the star is the _____ it is because _____)

Typical Sequence of Nuclear Fusion Reactions in a star...

1. Nuclear fusion (of Hydrogen to form Helium.) → **MAIN SEQUENCE STARTED**
where gas pressure from heat of nuclear fusion increases to equal constant gravity (equilibrium is achieved)
 2. Out of element fuel (first H)
 3. Fusion stops, temperature drops and gas pressure decreases, no longer in equilibrium.
 4. Core contracts (gravity WINS by pulling atoms in).
 5. Increased temperature (more atoms, more collisions) and gas pressure in the core reinitiates nuclear fusion, equilibrium is achieved, and the cycle begins again at step 1 with bigger star.
-
1. *AGAIN, yet this time Helium is the fuel of the burning (Nuclear fusion of Helium to form elements up to Carbon) → **RED GIANT STAGE** → until out of fuel, less pressure core contracts, increasing collisions and temperature to reach equilibrium again*
-
1. *Then AGAIN, yet this last time Carbon is fuel (Nuclear fusion of Carbon to form heavier elements up to Iron, Fe) → **SIGNALING DEATH** of the STAR is soon to come...NO FUEL means final collapse → black dwarf OR **SUPERNOVA** explosion which creates all other elements heavier than iron in the heat of the explosion*



Star Life Cycle Web Quiz

Directions: This is to test your knowledge of the web activity you just completed. You may use your notes for this quiz. Good Luck!

Matching Section: Write the letter of the term that best matches the phrase for each question.

A) black hole B) red giant C) supernova D) white dwarf E) brown dwarf F) protostar G) black dwarf

1. ____ → the final stage of most small to medium sized stars (like our sun)
2. ____ → an intermediate phase of medium sized stars when carbon is the product of nuclear fusion
3. ____ → a stage reached only if the protostar never begins the fusion process
4. ____ → a brilliant explosion leading into the formation of a neutron star or black hole
5. ____ → the final stage of the most massive stars (over 3 times the mass of the sun)
6. ____ → a cloud of dust and gas beginning to condense on itself because of gravity

Fill in the Chart: In order for a star to continue to exist as a ball of radiant energy it must have equilibrium between two strong forces. Fill in the chart below in each of the 3 columns.

What is each force?	Contraction or Expansion Force?	What causes increase in this force?
7.		
8.		

9. What happens initially to the core temperature AND the gas pressure of a star when it runs out of hydrogen fuel for its fusion reactions? **Circle the best answer choice for each.** The core temperature (*increases/decreases*) and the gas pressure (*increases/decreases*).
10. On the Hertzsprung-Russel Diagram that you studied, which star is in a white dwarf stage? _____

Extra Credit: According to the relative descriptions on the online Hertzsprung-Russell Diagram, which star could best be described as very cool (3000 Kelvin) and really bright (10^4 luminosity). _____