

The Life Cycle of a Star

1. Birth of a Star: A _____ is a massive cloud of dust and gas where stars are born. _____ causes the densest parts of the nebula to collapse, forming regions called _____ (baby stars). Protostars continue contracting and pulling in more and more dust and gas until the core is hot and dense enough to begin nuclear fusion.
2. Main Sequence Stars: When a star is born, it begins fusing _____ atoms (1 proton) into _____ atoms (2 protons). This process releases a lot of energy in the form of heat and light. During the time that stars are fusing hydrogen into helium, they are classified as _____ stars. Most of the stars in the observable universe are on the main sequence. A star's _____ determines what happens to it once it leaves the main sequence.
 - a. High mass stars (stars with more than 10 times the mass of our Sun) will follow a different path through their life cycle than our Sun. The heaviest of these stars may one day end up as a black hole!
 - b. Low mass stars such as our Sun will eventually burn out and end their life as a black dwarf.
3. Red Giants: When a star runs out of hydrogen to fuse into helium, it leaves the main sequence and becomes a _____. Red giant stars contract and expand as heavier _____ are formed within the core through the fusion process.
 - a. High mass stars eventually become red _____ as heavier elements such as neon (10 protons), oxygen (8 protons), silicon (14 protons), and iron (26 protons) are fused within their core.
 - b. Low mass stars begin fusing helium into _____ during the red giant stage.
4. Death of a Star: Just as the _____ of a star determines how it lives, its _____ also determines how it will die. Low mass stars eventually fizzle out, while high mass are destined for a more spectacular finish.
 - a. Once a high mass star has fused all of the iron in its core, it can no longer sustain the nuclear fusion process. The force of _____ becomes too great, collapsing the star and causing a massive explosion called a _____. The heat and pressure produced in this explosion is responsible for creating all of the natural elements heavier than iron.
 - b. When a low mass star burns through all of its helium to make carbon, it doesn't have enough mass to continue the fusion process. The gasses on its surface are cast out into space exposing the hot, dense, slowly cooling core. This glowing sphere of carbon is known as a _____. It will continue cooling off until the heat energy stored up during the life of the star is gone.
5. Final Outcome: The final outcome of a star can vary greatly. Some end up as insignificant balls of matter while others can influence the future of the universe.
 - a. High mass stars can affect the future of the universe.
 - 1) The most massive of high mass stars collapse into an extremely dense ball of mass. Their _____ is so great that not even _____ can escape. As a result, these objects are called _____.
 - 2) Other high mass stars end up as _____. These form when the normal spaces within atoms are eliminated during a supernova. What is left is a dense, spinning core of neutrons pulsing light across the universe.
 - 3) Another effect of a supernova is the formation of new nebulae. Dust and gas along with heavy elements are cast out into the universe to form new stellar nurseries. These regions of dust and gas can eventually give birth to new _____!
 - b. The outcome of a low mass star is much less exciting. White dwarfs continue to get dimmer and dimmer as their heat radiates out into the universe. Eventually, their energy is gone and they remain as cold, dark balls of carbon called black dwarfs.

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3a. Red _____

2a. A _____
mass star

3. _____
The star runs out of
hydrogen to fuel it. The star
expands and contracts as
heavier _____ are
formed through fusion.

2b. A _____
mass star

3b. Red _____

4a. _____
A huge explosion where
all the elements heavier
than _____ are
formed

5a₂. The core collapses into
a _____

5a₃. _____
and _____
are flung out
into space

5a₁. The most
massive stars
become a _____

1. _____
Clouds of gas and
dust gather due to
stars (_____)
Baby
form

2. _____
stars fuse hydrogen atoms
into helium atoms by
burn for billions of years
and _____

4b. _____
There are no more light
elements to fuse and it
collapses

5b. The star will
end its life as a _____

