

Lect 7: Chp 19: Section 2: Life Cycle of Stars

A star is born: Just like living organisms, stars have a life cycle. In the same way that you are born, develop, age and die, stars do the same things. One big difference is that stars don't need parents. Stars are born from huge clouds of gas and dust. It's amazing how that gas and dust are probably the most boring things in the universe and they can become everything. So you've got that huge cloud of dust and gas. Astronomers call that cloud a _____. That's when it all starts to happen.

Contractions: The nebula begins to condense and form a ball. That ball is called a _____. "Proto" is a prefix that means "early" or "before." So a protostar is the first step in becoming a full-fledged burning star.

Start the Fire: After the star finished the protostar phase, it becomes even denser. The heavy elements move to the center of the star while the light gases stay in the star's atmosphere. Those gases are usually _____ (H) and _____ (He). Then something amazing happens, the nuclear fire begins. The star heats up and the gases ignite.

Not all of them make it. Remember Jupiter? Jupiter is a special planet in that it has a very similar makeup to the Sun. It has a low density and hydrogen and helium are the main components of the atmosphere. It is still missing one thing, nuclear fire. Jupiter could be the star that never was.

Once nuclear fusion begins, a star is in the _____ stage of its life. If you looked, you would see the birth of the star. This is the longest and most stable part of a star's life. The time a star will stay in this stage depends on its _____. The _____ the mass - the _____ its life. This is because it uses up its gases much more quickly. Conversely, low-mass stars live longer.

Path #1: Average Stars ↓

Reaching Middle Age

After the main sequence, an _____ - sized star becomes what astronomers call a _____. This is the time when the star begins to die. As with anything in nature, stars need fuel. Well there is only so much hydrogen to fuel a star's fusion reactions. Eventually that fuel runs out. When the star begins to _____, it _____. The cooling takes the color of the star and drops it into the red range, leaving a red giant.

Shrinking Away

This red giant begins to lose some of its layers. Eventually it enters the Cepheid stage. This is the final phase of the star's life. It then becomes a _____. In a white dwarf, the core of the star is left, some fires still burn, but there is very little fuel left. It is about the size of Earth, but with the mass of the sun (whoa, major density here). Sadly, the white dwarf eventually goes out and becomes a brown or black dwarf. Our universe is not old enough to have any black dwarfs - or at least that we know of.

Path #2: Massive Stars ↓

Fire Works & Explosions

If star is _____, it becomes a _____ instead of a red giant. When a supergiant starts to use up its fuel, there comes a point where the star's reactions stop and an explosion occurs. One day, BOOM! That boom is the _____. Basically, this is the death of a HUGE star by explosion. Supernovas are awesome. It is brighter than 10 billion stars put together. A supernova can even be SO bright that it outshines an entire galaxy for a few seconds. More than 90% of a star's mass is blown away in this explosion. Heavier elements like gold and uranium are made as the atomic nuclei are smashed together.

Poor little dying star

The light & heat of a supernova fade away eventually. The remnants become a nebula that can be used to make more stars. All that remains of the original star is a core made entirely of neutrons, called a _____. This super-dense object is no more than a few-kilometers in diameter. A _____ is simply a neutron star that is spinning.

Sometimes its not the end...







The life of a star is not always finished with the white dwarf. Sometimes the star continues to contract and its gravity increases. Imagine that the Earth contracted. First to half its size and then a quarter. Then even smaller. Imagine that the entire mass of the Earth was able to fit in your house. The gravity would be enormous. That's what happens with some stars. They continue to contract and their gravity increases. They become _____



Strange Happenings:

Black holes are areas in space where there is a huge amount of _____ in a very small space. The gravity of this mass is so great that everything in the area is pulled toward the mass. Even light cannot escape... which is why we call them black holes. No object can escape the gravitational pull of a black hole. So, how do we know they exist? Have we ever seen a black hole? No. Actually you can't see a black hole because no light escapes the event. Astronomers use other ways to look for black holes. Since they have large masses and gravities, they affect the surrounding stars and systems. They have found evidence of black holes in the dark centers of galaxies and systems that emit large amounts of x-rays.



THE GRAVITY OF BLACK HOLES IS SO STRONG THAT LIGHT IS PULLED IN.

- Which term best describes a stellar nursery?
 - A flaming ball of gas
 - A cloud of gas and dust
 - A cloud of thousands of small, young stars
 - A star system with planets and moons
-  In the movie, Tim refers to baby stars as "protostars." What can you infer about the prefix "proto-"?
 - It means "last" or "after"
 - It means "infinite" or "everlasting"
 - It means "first" or "before"
 - It means "large" or "huge"
- Place the following stages in the life of a low-mass star, like the sun, in order: A) Red giant; B) White dwarf; C) Main sequence star
 - A, C, A, B
 - A, C, B
 - B, A, C
 - D, B, C, A
- Which of the following describes the process of nuclear fusion, as it occurs inside our sun?
 - Hydrogen and oxygen atoms combine to make water molecules
 - Helium atoms split apart to form hydrogen atoms
 - Water molecules break apart into hydrogen and oxygen atoms
 - Hydrogen atoms combine to make helium atoms
- What effect does gravity have on stars?
 - It allows stars to break free of their galaxies
 - It helps break helium atoms apart inside of stars
 - It forms stars from clouds of gas and dust, and causes them to ignite
 - It causes stars to swell from white dwarfs to red giants
- What is a supernova?
 - A type of black hole
 - An incredibly dense but small star
 - A star that is large and not dense
 - The explosion of a large star
-  How does a white dwarf compare to our sun as it exists now?
 - It has a similar mass, but is much denser
 - It has a larger mass, but is less dense
 - It has more mass, and is more dense
 - It has less mass, and is less dense
- What will a star that's 1,000 times as massive as the sun ultimately become?
 - A white dwarf
 - A black hole
 - A planetary nebula
 - A red giant
- Which of the following depicts a planetary nebula?
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- How is a neutron star different from a regular star?
 - It emits electromagnetic pulses
 - It has an almost infinite density
 - It burns brighter than a galaxy with a billion stars
 - It has less mass and greater gravity

- Place the following events in sequence: A) A black hole forms; B) A large star stops burning fuel; C) Gravity causes a large implosion
 - B, A, C
 - C, B, A
 - B, C, A
 - A, C, B
- How are black holes similar to large stars?
 - Both exhibit strong gravitational forces
 - Both need to burn fuel in order to sustain their existence
 - Both emit light
 - Both have relatively little mass
- According to our current understanding, the universe is:
 - Three-dimensional
 - Four-dimensional
 - Five-dimensional
 - Six-dimensional
-  What has to happen in order for a black hole to form at the center of a galaxy?
 - A star has to explode in a supernova
 - A star has to become a red giant first
 - A star has to become a brown dwarf first
 - Tons of matter must gather at the center of the galaxy
- What do black holes look like?
 - Big brown circles
 - Long tubes that emanate light
 - Thousands of tiny dark spots
 - No one knows; it's impossible to see a black hole
-  What happens after an object passes into a black hole's event horizon?
 - The object will circle the black hole forever
 - The object has a 50 percent chance of entering the black hole
 - The object must eventually enter the black hole
 - The object is flung back into space
- What is the definition of space-time?
 - The amount of time it takes to travel a particular distance
 - The measuring device that existed before the Big Bang
 - A measure of the stuff that the universe is made of
 - A measure of how long it takes an object to enter a black hole
- In the sentence, "Black holes exhibit substantial gravitational forces," what does "substantial" mean?
 - Powerful
 - Long-ranging
 - Weak
 - Opposing
- According to Einstein, an object's gravitational pull depends on its:
 - Density
 - Mass
 - Volume
 - Size
- Which of these statements is an opinion about black holes?
 - Scientists believe there's a black hole at the center of our galaxy
 - A human being could never escape a black hole's gravity
 - Black holes are the most mysterious parts of the universe
 - No one knows what a black hole looks like

Life Cycle Of Stars

