Goal: To learn about how stars are formed and how it relates to the big bang and out universe and the elements we know today

| **Question/Key Term** | **Notes** |
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| Video 1 : The Stars Light Up | Big History Project  Video 2 : Stephen Hawking - The Birth of Stars  Video 3: How stars are formed and born  Article:  <https://docs.google.com/document/d/1XS0Lai0w-nPosfcuPjqPnhHjEOCeNFGmQsifYA_96gQ/edit#> | Yonge universe= plasma= hot mush of charged particles without much structural complexity.  About 380,000 years later, things began to change. temperatures had fallen low enough for protons, which have positive charges, to link up with electrons, which have negative charges. And formed neutral atoms  Now we have a bunch of helium and hydrogen atoms with gravity now  -Gravity got packed slightly denser regions ever closer together, squashing them so tightly  that they began to heat up.  Eventually, the clouds got so hot, the protons and electrons split apart once more, recreating a plasma.  when temperatures got to about 10 million degrees Celsius, protons began to fuse together  and part of them turned into energy as they did so.This huge release of heat from the center of each cloud of matter stopped the cloud from collapsing any further.  -the first stars lit up.  Each star would continue releasing energy until it had no more protons to fuse.  as these stars formed, so did galaxies, each containing billions of stars.  Galaxies grouped together into huge clusters and chains of galaxies- the largest structures in the Universe.  Universe seemed to have a lot more variety  and a lot more structure.  …………………………………………………………………………………………………….  Hydrogen simplest gas but has much power when heated makes stars shine  To make a star: hydrogen gas , swish hydrogen together/compact it and it will start to heat- 10 million degrees and nuclear fusion happens - hydrogen fused together making helium and makes some pure energy. Stars give off a lot of energy and this process happens many times in the universe  …………………………………………………………………………………………………….  Our galaxy has gas and an atmosphere of gas and dust surrounding stars and that creates new clouds. In the beginning gravity vs dissipating. The nuclear fire is in the core of the star and when made it clears the space around them- bigger flashes when the stars die then when they are born  …………………………………………………………………………………………………….  for most stars we cannot tell the age but When we have a large group of stars we can tell their age  possible because all of the stars in a cluster are presumed to have begun their life at approximately the same time. time a star spends in the main sequence phase depends on its mass.  HR diagram  Computer models allow us to predict how old a star of that mass must be to be at that juncture of its life and then estimate the age  !st type - 'globular clusters' appear as huge, round globs containing anywhere from a few thousand to a few million stars. Globular clusters are very old, and they are scattered around  the second type used to be called 'galactic clusters' but now called 'open clusters' -are much looser and their stars more spread out on the sky than are those in globular clusters. can contain anywhere from a few dozen to a few thousand stars - come in a wide range of ages. galaxy started making open clusters soon after it settled down to its present size and continues making them today.  90 percent of its lifetime, a star shines because nuclear reactions are converting hydrogen to helium in the star's center, releasing vast amounts of energy.  Bigger a star is, the bigger the furnace in the center, and the brighter and the hotter the star is in this stable stage of its life. Biggest = bright and blue-hot; smaller star is somewhat fainter and white-hot  A star 10 times as massive as the sun contains, clearly, 10 times as much fuel. It consumes that fuel roughly *10,000* times faster than the sun, however. As a result, it has a total lifetime 1,000 times shorter  star's mass tells us how much fuel the star had when it was born, and the star's brightness tells us how fast it is burning that fuel  theoretical physics probably lead to an uncertainty of 10 percent to 20 percent in our estimate of the absolute ages of the globular clusters. According to our best available estimates, stars having about 90 percent of the sun's mass are just now starting to die in the globulars. These stars are most probably around 15 billion years old, but they could conceivably be as young as 12 billion years or as old as 18 billion years. It is very unlikely that most of them could be either younger or older than this range |