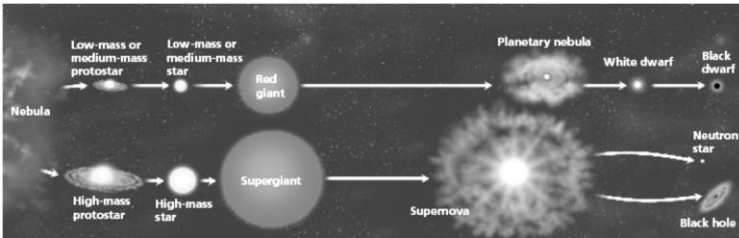


## Life Cycle of a Star

**A STAR IS BORN – STAGES COMMON TO ALL STARS**

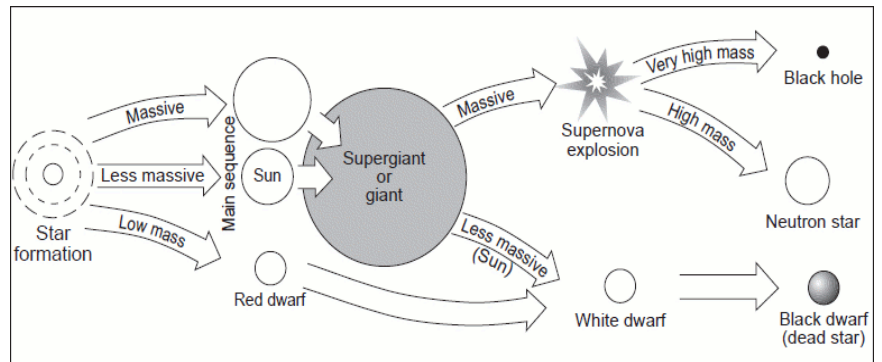
All stars start as a **nebula**. A **nebula** is a large cloud of gas and dust. Gravity can pull some of the gas and dust in a nebula together. The contracting cloud is then called a **protostar**. A protostar is the earliest stage of a star's life. **A star is born when the gas and dust from a nebula become so hot that nuclear fusion starts.** Once a star has "turned on" it is known as a **main sequence star**. When a main sequence star begins to run out of hydrogen fuel, the star becomes a **red giant** or **red super giant**.

**THE DEATH OF A LOW OR MEDIUM MASS STAR**

After a low or medium mass star has become a red giant the outer parts grow bigger and drift into space, forming a cloud of gas called a **planetary nebula**. The blue-white hot core of the star that is left behind cools and becomes a **white dwarf**. The white dwarf eventually runs out of fuel and dies as a **black dwarf**.

**THE DEATH OF A HIGH MASS STAR**

A dying red super giant star can suddenly explode. The explosion is called a **supernova**. After the star explodes, some of the materials from the star are left behind. This material may form a neutron star. **Neutron stars** are the remains of high-mass stars. The most massive stars become **black holes** when they die. After a large mass star explodes, a large amount of mass may remain. The gravity of the mass is so strong that gas is pulled inward, pulling more gas into a smaller and smaller space. Eventually, the gravity becomes so strong that nothing can escape, not even light.



(Not drawn to scale)

**Section One - Sequencing**

The stages below are not in the right order. Number the stages in the correct order.

- \_\_\_\_\_ The star begins to run out of fuel and expands into a **red giant** or **red super giant**.
- \_\_\_\_\_ Stars start out as diffused clouds of gas and dust drifting through space. A single one of these clouds is called a **nebula**
- \_\_\_\_\_ What happens next depends on the mass of the star.
- \_\_\_\_\_ Heat and pressure build in the core of the **protostar** until **nuclear fusion** takes place.
- \_\_\_\_\_ The force of gravity pulls a nebula together forming clumps called **protostars**.
- \_\_\_\_\_ Hydrogen atoms are fused together generating an enormous amount of energy igniting the star causing it to shine.

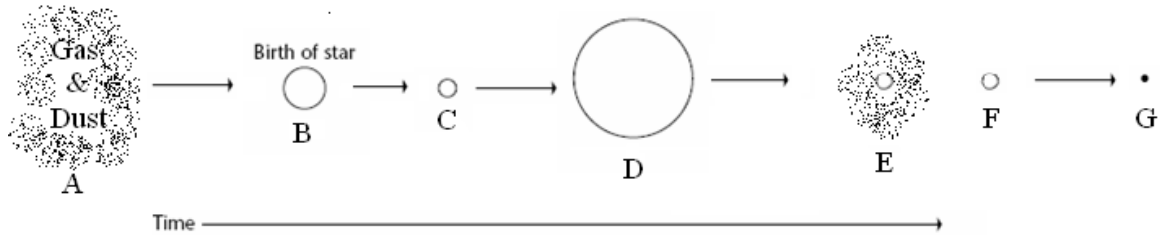
**Section Two - Vocabulary**

Match the word on the left with the definition on the right.

- \_\_\_ **black dwarf**                      e. star left at the core of a planetary nebula
- \_\_\_ **white dwarf**                    g. a red super giant star explodes
- \_\_\_ **nebula**                            c. what a medium-mass star becomes at the end of its life
- \_\_\_ **protostar**                        b. a large cloud of gas or dust in space
- \_\_\_ **supernova**                        a. exerts such a strong gravitational pull that no light escapes
- \_\_\_ **neutron star**                    d. the earliest stage of a star 's life
- \_\_\_ **black hole**                        f. the remains of a high mass star

**Section Three – Understanding Main Ideas - Low Mass Star**

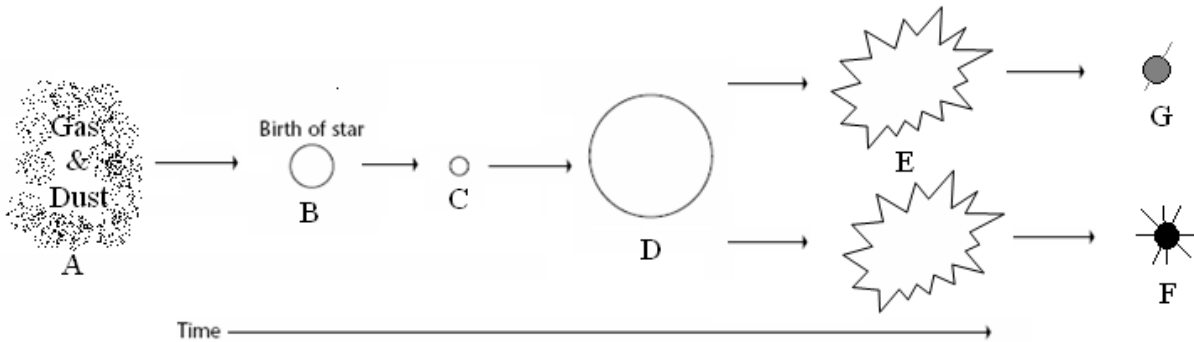
Label the diagram with all the words given as well as write down the Letter that matches each object.



- \_\_\_ 1. Red giant
- \_\_\_ 2. Where fusion begins
- \_\_\_ 3. Nebula
- \_\_\_ 4. Black dwarf
- \_\_\_ 5. The stage the sun is in
- \_\_\_ 6. White dwarf
- \_\_\_ 7. Planetary Nebula

Label the diagram with all the words given as well as write down the Letter that matches each object.

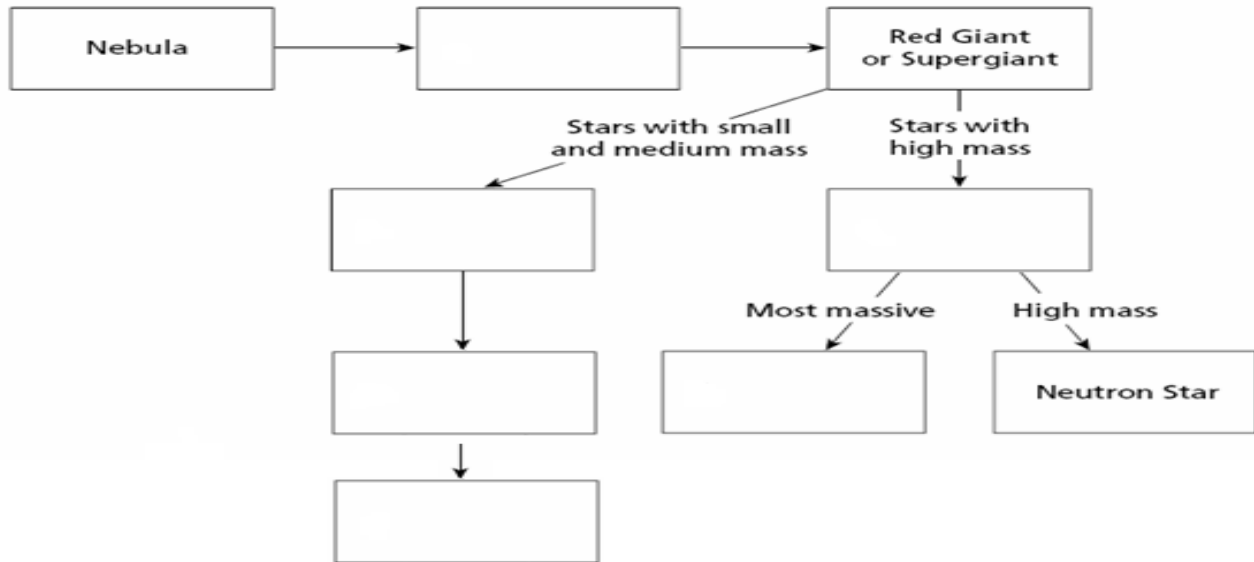
**Section Four – Understanding Main Ideas - High Mass Star**



- \_\_\_ 1. Black Hole
- \_\_\_ 2. Supernova
- \_\_\_ 3. Protostar
- \_\_\_ 4. Gravity causes this to condense into a protostar
- \_\_\_ 5. Main sequence star
- \_\_\_ 6. When a star begins to run out of fuel and grows larger
- \_\_\_ 7. Neutron star

**Section Five – Graphic Organizer – Putting it all Together**

Black hole      Supernova      White dwarf      Planetary nebula      Protostar      Black dwarf



**Section Six –** Use the following words to fill in the blanks

Black hole      Massive      White dwarf      Supernova      Average      Nebulae  
 Super-giant      Neutron star

1. \_\_\_\_\_ are clouds of dust and gas from which a star first forms. They are pulled together by gravity into a spinning disc. The center of the disc becomes a star while the rest can become a system of planets.
2. \_\_\_\_\_ come from giant or massive stars. They grow to as much as three times the mass of our sun as they lose the nuclear fuel at their core. The outer layer of this red star expands as the core contracts.
3. Nebula can form either an \_\_\_\_\_ star that is about the size of our Sun or a \_\_\_\_\_ star which can be over three times as big as our Sun! These stars stay in this period for most of their lives and they convert hydrogen to helium while generating lots of heat and light.
4. At the end of the life of a giant star, a \_\_\_\_\_ is resulted when a red supergiant's core collapses in on itself. The electrical forces at the center of the star overcome the gravitational pull and create a massive explosion that scatters the outer layers of the red supergiant.
5. The outer layers of a red giant keep expanding until they eventually drift off and form a \_\_\_\_\_.
6. Eventually the outer layers of an average star drift away and the star becomes a much smaller \_\_\_\_\_. It has now run out of nuclear fuel to burn off.
7. If the star is very massive or big enough, a \_\_\_\_\_ is formed, which is so dense that not even light can escape its gravitational pull!

Using the word list, fill in the blanks in the paragraphs below.

**fuel, nebula, expanding, less, hydrogen, smaller, energy, Sun, quickest, supernova, homes, white, neutron, giants, helium, Big Bang, billions**

The Universe is believed to have been formed from a very dense fireball \_\_\_\_\_ of years ago. As the fireball expanded and cooled stars and galaxies formed. The fireball explosion is often called the \_\_\_\_\_. The explosion threw all the material outwards; that is why scientists believe the universe is getting bigger or \_\_\_\_\_. Scientists have confirmed that the Universe is expanding by examining the light given off by stars. Astronomers now know that the distance to the furthest galaxies is becoming greater as these galaxies are moving away the \_\_\_\_\_. Stars are produced from gas clouds or \_\_\_\_\_, which contain mainly the element \_\_\_\_\_. The type of star produced depends on the mass of the star. Red \_\_\_\_\_ are stars formed which have a mass \_\_\_\_\_ than that of our \_\_\_\_\_.

Hydrogen is the \_\_\_\_\_ of all stars. During nuclear fusion the hydrogen molecules combine producing \_\_\_\_\_, releasing lots of \_\_\_\_\_ in the process. How quickly the hydrogen is used up depends on the size of the star. Massive stars burn hydrogen very quickly. Additional nuclear fusion reactions can convert helium into elements with larger atoms, for example lithium. However the elements with the largest atoms only form when a star explodes as a \_\_\_\_\_

The amount of energy given out by a star, its luminosity, varies considerably. \_\_\_\_\_ dwarfs are stars that have a very low luminosity, about one hundredth of the Sun. Super giant stars which are very large red giant stars, can give out as much energy as 1,000,000 Suns. Some scientists believe that our Solar System was once a binary star system. The Sun was the \_\_\_\_\_ of the two stars and burnt its fuel slowly, lasting millions of years. The larger star used up all its fuel and destroyed itself in a supernova explosion, leaving the Sun behind.

The Sun is a very stable star. In a few billion years from now the Sun will use up its fuel supply and start to change. It will probably expand and form a red giant. Finally, it may form a white dwarf or a \_\_\_\_\_ star. When this happens there will no longer be life on the Earth, but by then we should have found new \_\_\_\_\_ around other stars.