

Nebular Model

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(how the solar system formed)

- ① Rotating cloud of dust and gas (nebula) contracted due to gravity
- ② Friction between the particles caused the temperature to rise, eventually fusion reactions occurred = sun \uparrow (4H \rightarrow 1He)
- ③ Most of the material (99.99%) became the sun; the remaining material condensed to form the planets (denser ones closer to the sun)
- ④ Planets continue to revolve around the sun in the same direction the nebula was rotating (counter-clockwise)

This is where we are now ...

... What next? ...

Summary for the Evolution of a Star

A. Low Mass (less than $4x$ (or $< 1.4x$) the mass of

A. Low Mass (less than $4x$ (or $<1.4x$) the mass of our sun)

1. Cloud of dust and gas (nebula) contracts due to gravity
2. Friction causes Temp to rise, then fusion, H to He, ... etc
3. When fuel inside star is used up an envelope of H expands outward = red giant
4. H envelope disperses leaving a core called a white dwarf
5. Eventually white dwarf burns out leaving a hunk of dirt (black dwarf) where the star used to be in space

Note: our sun is a low mass star. We are in the H joining to form He stage.

B. Medium Mass (btwn 4 and $10x$ mass of sun)
 1.4 and $4x$?

1. } same as low mass
2. }
3. }

4. When fuel used up, the star explodes

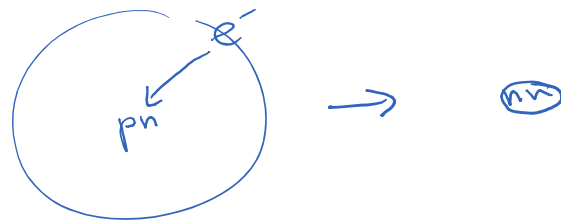
= Supernova

5. Half mass flies away to become nebula

6. Remaining mass becomes a very dense neutron star.



in a neutron star the "e⁻" and "p" join to become a "n" and the empty space is gone = very dense



C. High mass (greater than $10 \times$ mass of our sun)
 $4 \times ?$

- 1.
 - 2.
 - 3.
 - 4.
 - 5.
- } same as medium mass

6. Remaining mass becomes a very, VERY dense black hole

- have so much gravity that even light can't escape

- is a dense object/point, not a hole!