2/11/15

Astrophysics:

Recall: $p = nkT$

Radiation also produces pressure and can balance out the force of gravity if:

$$L = \frac{4\pi GMc}{\kappa}$$

κ ← average opacity

L ← Eddington Luminosity

Creation of planets:

As a dust cloud shrinks in size it begins to flatten out into a disk shape because of conservation of angular momentum that creates planets

Nuclear power Generation:

Stars produce energy through nuclear fusion (see slides for a diagram)

The energy released from this process is described by the equation $\Delta E = \Delta m c^2$ where ΔM is the diffrence in mass, So the energy each hydrogen produces is

$$\frac{M_{^4He} - 4m_H}{4} c^2 = \frac{\text{Energy}}{\text{per Hydrogen}}$$

(final product) (initial products)

The CNO Cycle

The CNO cycle: is another way in which fusion can occur in stars. This reaction goes in a chain to ~~turn~~ ~~4~~ H into 1 ^{4}He (see slides for a diagram). The process is more powerful than the previous one and occurs in stars slightly more massive than the sun

H shell burning: Even if center is depleted, shell surrounding it can burn H → ^{4}He

He burning:

As more He begins to accumulate at the center of the star the process of He burning begins. With more He at the center of the sun a shell of Hydrogen forms around the denser He this causes Hydrogen to fuse even faster and increase the energy output of the star. A star with enough mass can begin to fuse the He.

The process by which He fuses is roughly shown below:

$^4He + {}^4He \rightarrow {}^8B$ (however ^8B is unstable and does not stay for long so another ^{4}He atom needs to come along and fuse with ^8B before it dissipates)

$^8B + {}^4He \rightarrow {}^{12}C$

(The final product of He fusion is Carbon-12)