

Week Quiz Review

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Classes Materials

White Dwarfs

Degeneracy Pressure keeps Brown Dwarfs from collapsing. It doesn't need fuel.

White dwarfs are very dense and hot on their surfaces. **Sirius B** is a white dwarf that looks very bright under x-ray. White dwarfs are very hot but not bright. In order to support more mass they need to be dense enough to fit the electrons using degeneracy pressure (smaller and more massive).

Once the mass reaches $1.4 M_{\text{sun}}$, the object cannot be held by itself only by degeneracy pressure.

How it becomes 1.4?

- White dwarfs don't exceed this mass when they are formed, but if a white dwarf is in a close binary, it can accrete masses from its companion.
- Hydrogen falls onto the white dwarf's surface that is very hot.
- Once sufficient pressure builds up, it can fuse explosively, causing the disk to brighten by a factor of 10,000 in just a few days.

- Only a small amount of mass are consumed during the nova.
- When its mass becomes above the Chandrasekhar limit;
- The temperature is enough to fuse the carbon into heavier elements.

That calls **white dwarf supernova** or **Type Ia supernova**. This is not the same things as supernova phenomenon for high mass stars.

The white-dwarf supernovae hit the same peak luminosity, true luminosity for one = all. Then we can not the distance by also using apparent brightness on Earth. The best current way to measure the distance of objects in universe is to measure the distance from a supernova that can be seen 10 billions far.

Neutron Stars

- The leftover of Type II supernova including the high mass stars' death.
- Their surfaces are 10^{11} K hot when they were formed.
- They were formed in explosion, so they move really fast than other objects.
- Small less than 20km across.
- Like white dwarfs, they massive they are, the smaller are they in radius.
- Supported by neutron degeneracy pressure, the limit is higher (about $2.9M_{Sun}$).
- Most of them are around 1.3 and 1.5 solar masses.
- Dense $> 10^{15} \text{ g cm}^{-3}$
- $G_{gravity}$ can be up to 10^{11} , so escape velocity up to 64% of the speed of light.
- They spin faster when shrinking because of angular momentum. *Its period can be from few seconds to few milliseconds.*

- It creates strong magnetic fields. That creates **a specific radiation**.
- After supernovae of two stars, their remnants finally merge.