Week Quiz Reviw

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Classes Materials

White Dwarfs

Degenergy Pressure keeps Brown Dwarfs to not collapse. It doesn't need fuel.

White dwarfs are very dense and hot on their surfaces. **Sirius** B is a white dwarf looks very bright under x ray. White dwarfs is 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_{sun}, the object cannot be hold by itself only by degenercy pressure.

How it be 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 accret masses from its companion.
- Hydrogen falls into 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 Chandreasekhar 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 explosio, 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 degenergy pressure, the limit is higher (about $2.9\mathrm{M}_{Sun}$).
- Most of them are around 1.3 and 1.5 solar masses.
- Dense $> 10^{15}\,\mathrm{g\,cm^{-3}}$
- $G_{gravity}$ can be up yp 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 magnatic fields. That creates **a specific radiation.**
- After supernovae of two stars, their remnants finally merge.

Neutron Stars

What would happen when a NS grows beyond what NDP can Support?

Dark Star

$$v_{esc} = c = \sqrt{\frac{2GM}{R}}$$

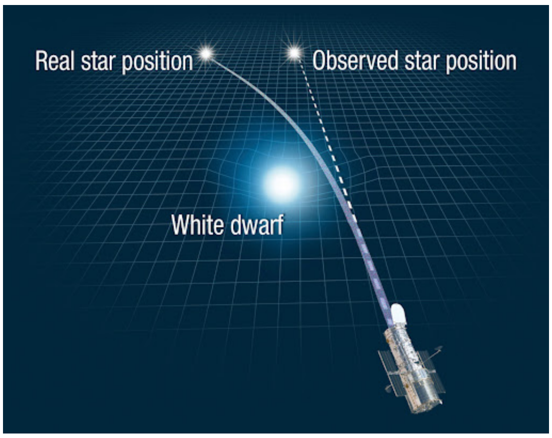
Light moves at the same speed in all situations (regardless of their relative motion).

Equivalence Principle

- falling under the gravitational field and upward have no different for the person in the spacecraft.
- curved path of the light in the accelerating elevator mush also be seen when in a gravitational field on Earth - therefore light is affected by gravity.

Gravity is a distortion of space - time itself, caused by objects wih mass. Gravity warps space - time and therefore warps light.

The curvature causes massive objects to orbit. WD and NS profuce large distortion in spacetime, and the effects they cause on light can be and have been clearly observed.



When NS gets too massive to be stable from NDP, all mass collapse into an infinitely small point called a singularity $\rightarrow$ **Black Hole**.

Schwarzschild Radius is for the black hole that is not rotating.

Gravitational Time Dilation closer we are from a object (with high gravity), the time SLOWER. Time travel using black holes is totally doable. Hawking Radiation can eventually lead to the evaporation of the black hole as it steadily radiates away energy over time. This distortion may form a firewall which would stop. Objects falling into the black hole, the have huge X-ray radiation (from a small area). The closest known black hole is only about 1000 light years from Earth and orbit a star.