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| 1. What happens to this object? | The collapsing cloud is not massive enough to generate the core temperature necessary for nuclear fusion, so the object does not become a star. Instead, it collapses to become a **planet**, which will be quite warm initially and will spend the rest of its lifetime cooling down. |
| 2. Where on the HR diagram is it? What is its energy source? | The protostar will be warm and, due to its size, very luminous, thus placing it in the Red Giant region of the HR diagram. The temperature of the protostar increases due to gravitational contraction, and its luminosity decreases since the surface area gets smaller. The contraction stops once the the core reaches the temperature needed to fuse Hydrogen into Helium; the star will be on the Main Sequence at this point. |
| 3. H core burning via what fusion process? | The proton-proton (p-p) chain |
| 4. Core runs out of H. What happens to the star? What is it called? | The core contracts and heats up. A shell of hydrogen fusion ignites, and the Helium in the core starts fusing into Carbon via the triple-alpha process. Since the energy output (luminosity) from the core has increased, the rest of the star expands (swells up) and the surface cools down. The star is now a Red Giant. |
| 5. What happens when the core runs out of He? When does burning stop? | The core contracts and heats up **again**. A new shell of Helium fusion develops around the core, but the temperature does not become high enough for the fusion of Carbon in the core. |
| 6. What happens to the pressure and mass? | The pressure increases, again, due to the increase in energy output from the core (and the shells around it). The loosely-bound Red Giant starts to shed its outer layers. |
| 7. What is the gaseous object called? | The ejected outer layers of the star form a **planetary nebula** |
| 8. The "star" finally becomes what? | The former core of the star becomes a **white dwarf** |
| 9. H core burning via what fusion process? | The CNO (Carbon-Nitrogen-Oxygen) cycle |
| 10. Core runs out of H. What happens to the star? What is it called? | The core contracts and heats up. A shell of hydrogen fusion ignites, and the Helium in the core starts fusing into Carbon via the triple-alpha process. Since the energy output (luminosity) from the core has increased, the rest of the star expands (swells up) and the surface cools down. The star is now a Red Giant. |
| 11. What happens when the core runs out of He? What does the core burn to? | The core contracts and heats up **again**. A new shell of Helium fusion develops around the core, and the temperature may become high enough for the fusion of Carbon to Oxygen in the core |
| 12. What happens in the core? When does burning stop? | The core contracts as the fuel runs out, heats up and fusion starts anew with the ashes of the previous fusion process. This is repeated until iron (Fe) is produced in the core. |
| 13. What happens to the star? (Object becomes what?) | It becomes a **supernova**. Ka-booooommm!! |
| 14. Object finally becomes what? | A **neutron star**. |
| 15. What is this object called? | A **pulsar** |
| 16. The "star" finally becomes what? | A **black hole** |