

**Lab 09: NOVA film “Death of a Star”**

1. What country did astronomers first observe the supernova? \_\_\_\_\_
2. What year was the supernova observed? \_\_\_\_\_
3. Ian Shelton took a picture of the \_\_\_\_\_ galaxy, which led to his discovery of the supernova?
4. How far away was the supernova from Earth? \_\_\_\_\_
5. The last supernova to burst in our galaxy was observed in the year \_\_\_\_\_.
6. Sterling Colgate thinks supernovae are important to understand because they synthesize \_\_\_\_\_ that humans are made up of.
7. Sterling Colgate’s computer programs showed that supernovae material should \_\_\_\_\_ after it explodes.
8. Theorist Stan Woosley states this type of supernova explosion only works for stars (more massive/less massive) than our Sun.
9. He believes the star we are thinking of here lived \_\_\_\_\_ million years.
10. When the core collapsed a shock wave was born and a gargantuan burst of atomic particles called \_\_\_\_\_ were released.
11. The whole process is very fast; the time from instability to the time to get to nuclear density is \_\_\_\_\_ of a second.
12. It is an incredible amount of energy. It is equal to all the energy that the entire observable \_\_\_\_\_ puts out in 1 second.
13. Supernovae are the second most powerful explosions in the universe. The most powerful explosion in the universe was \_\_\_\_\_.
14. Bob Kirshner wanted to study ultraviolet radiation from the supernova, instead he believes he discovered that the star (did/did not) blow up.
15. When a supernova occurs \_\_\_\_\_ contribute to the star’s explosion but most stream off into space to reach the Earth even before the brightening of the supernova is visible.

16. Stan Woosley states that 99% of the energy, which comes from binding energy of the neutron star, comes out in the form of neutrinos. Only 1% of this energy goes into exploding the rest of the star and \_\_\_\_\_% comes out as the light we see.
17. The progenitor star, Sanduleak –69°202, was a (red/blue) star.
18. A \_\_\_\_\_ star resides at the center of the supernova.
19. The Kamioka mine holds a \_\_\_\_\_ detector. The detector was placed deep underground to block out \_\_\_\_\_ rays. The detector's giant tank is filled with \_\_\_\_\_. When a neutrino passes through the tank it could collide with an electron and give off a (line/square/circle) of blue light.
20. Of the billions of neutrinos that passed through the tank during the supernova only \_\_\_\_\_ neutrinos were detected.
21. According to theory, blue stars do not explode, but this supernova acted differently, it brightened in \_\_\_\_\_ hrs instead of many days.
22. Sanduleak was a denser star. (More/Less) energy was needed to expand the star and less energy remained as light.
23. Sanduleak –69°202 was a red supergiant about 20,000 years before the supernova. At the time of the supernova explosion it was a blue star with a shell of gas 1 light-year from the central star. Theorize what this shell of gas might be. How could a red supergiant turn into a blue star?