AST 309N (Cosmic Catastrophies), Spring 2016, Exam 1, Form A

All multiple choice questions are worth 3.03 points. Mark the letter corresponding to the best answer on the scan-tron sheet and circle that letter on the exam.

1. Which of these is the oldest?

    A. the Crab Nebula   B. Betelgeuse   C. the oldest white dwarf   **D. the Universe**

2. A star converting hydrogen to helium in its center is called a:

    A. white dwarf   B. supernova   **C. main sequence star**   D. red giant

3. The Sun is currently burning:

    A. hydrogen to helium   B. helium to carbon   C. carbon to oxygen   D. oxygen to silicon

4. The Sun is expected to eventually:

    A. eject its outer envelope and leave a white dwarf   B. collapse to form a neutron star
    C. form a Carbon/Oxygen core that explodes   D. convert all of its hydrogen to helium

5. A red giant is a star that:

    A. has expelled its hydrogen envelope   B. is burning hydrogen to helium in its center   **C. is cooler and brighter than the Sun**   D. is hotter and brighter than the Sun

6. A white dwarf is a star that:

    A. will expel its outer envelope to make a planetary nebula   B. is burning hydrogen to helium in its center   **C. is hotter and dimmer than the Sun**   D. is hotter and brighter than the Sun

7. When hydrogen is burned out in the center of a star, the star will next become:

    A. a supernova   B. a white dwarf   C. a planetary nebula   **D. a red giant**

8. A planetary nebula surrounds a

    A. main sequence star   B. red giant   **C. white dwarf**   D. supernova

9. A red giant is about the same distance across as:

    A. the Earths orbit around the Sun   B. Tychos supernova remnant   C. the Earth   D. the Sun

10. A white dwarf is about the same distance across as:

    A. the Sun   B. Keplers supernova remnant   **C. the Earth**   D. Betelgeuse

11. Which lives the longest?

    A. white dwarf   B. red giant   C. planetary nebula   D. massive main sequence star

12. Which of the following does not characterize supernovae?

    A. catastrophic explosions that end the lives of stars   B. provide heavy elements upon which life depends   C. produce neutron stars   **D. cause the Universe to expand**

13. Once astronomers recognized that other galaxies exist beyond the Milky Way, they understood that:

    A. white dwarfs are old   **B. some new lights in the sky are "super" novae**   C. white dwarfs explode in spiral arms   D. red giants can become main sequence stars

14. Supernovae explode somewhere in the Universe about once per:

    A. century   B. year   C. day   **D. second**

15. Supernovae explode in a galaxy like the Milky Way about once per:

    A. century   B. year   C. day   D. second

16. Compared to a star on the Main Sequence with an initial mass of 10 solar masses, the Sun:

    A. lives a longer time   B. is hotter   C. has a larger radius   D. is bluer

17. Stars are currently being born:

    A. between the spiral arms of spiral galaxies   **B. in the spiral arms of spiral galaxies**   C. in elliptical galaxies   D. in the central bulges of spiral galaxies

18. If a white dwarf explodes as a supernova, what is expected to be left behind in the center?

    A. black hole   B. neutron star   C. planetary nebula   **D. nothing**

19. When Betelgeuse explodes, what is expected to be left behind in the center?

    A. neutron star   B. planetary nebula   C. white dwarf   D. nothing

20. Which supernova did not produce a neutron star?

    A. the Crab of 1054   B. SN 1987A   **C. Tychos of 1572**   D. Cas A of 1680

21. Which supernova definitely was not the explosion of a white dwarf?

    A. The Crab of 1054   B. Keplers of 1604   C. Tychos of 1572   D. SN 1006

22. Which supernova shows evidence of a jet-like flow?

    A. Cas A of 1680   B. Keplers of 1604   C. Tychos of 1572   D. SN1006

23. Which supernova remnant would you expect to find near a spiral arm of the Milky Way?

    A. Tychos of 1572   B. SN 1006   **C. Cas A of 1680**   D. Keplers of 1604

24. Elements such as oxygen, magnesium, silicon, and calcium are commonly observed in supernova explosions because these elements form when:

    A. hydrogen combines to make helium   B. hydrogen assembles into heavier elements   **C. helium assembles into heavier elements**   D. iron assembles into heavier elements

25. How many helium nuclei must combine to make a carbon?

    A. 2   **B. 3**   C. 4   D. 5

26. Intermediate-mass elements such as silicon are produced before the explosion of a:

    A. star born with more than 12 solar masses   B. white dwarf   C. neutron star   D. star like the Sun

27. Intermediate-mass elements such as silicon are produced during the explosion of a:

    A. a star born with more than 12 solar masses   **B. white dwarf**   C. neutron star   D. star like the Sun

28. The primary means of distinguishing a Type II from a Type Ia supernova is that Type II:

    A. occur in spiral galaxies   B. occur in elliptical galaxies   C. show spectral features of calcium and oxygen   **D. show spectral features of hydrogen**

29. When a supernova explodes away from the spiral arm of a spiral galaxy, we deduce that the star that exploded:

    A. was long-lived   B. was short-lived   C. retained its hydrogen envelope   D. made a neutron star

30. A supernova explodes and shows hydrogen in its spectrum. Where do you expect it to have exploded?

    A. within the spiral arms of a spiral galaxy   B. in a spiral galaxy, but not in the spiral arms
    C. in an elliptical galaxy   D. in a white dwarf

31. Type Ia and Type Ic supernovae both show no evidence for either hydrogen or helium. Astronomers can tell them apart because:

A. Type Ia show oxygen, magnesium and calcium after peak light and Type Ic show iron   B. Type Ic explode in elliptical galaxies and Type Ia do not   **C. Type Ic explode in the spiral arms of spiral galaxies and Type Ia do not**   D. Type Ia explode in the spiral arms of spiral galaxies and Type Ic do not

32. If the light curve of a supernova shows a plateau, we expect it to explode in:

A. an elliptical galaxy   **B. the spiral arm of a spiral galaxy**   C. a spiral galaxy, but away from the spiral arms   D. a white dwarf

33. If the light curve of a supernova shows a plateau, what element do we expect to see prominently during the plateau phase?

A. hydrogen   B. oxygen   C. silicon   D. magnesium

Extra Credit Questions: Write in this space on the exam. (One Point Apiece)

1. What famous wealthy person operates a rocket launch facility near Van Horn, Texas?

1. **Jeff Bezos (of Amazon)**

2. In what city was a form of calculus used in 100 BC?

2. ___**Babylon**___