Astronomy Division C Exam

Names: ____________________________

Team Name: ________________________
For questions 1-7 fill in the blank with one of the terms below (some terms are not used, but no term is used twice):

- Binary
- Type Ia
- White Dwarf
- Red Giant
- Cosmic Rays
- Gravitational Waves
- AM CVn
- Type II
- Neutron Star
- Blue Giant
- Magnetic Fields
- Molecular Cloud
- Planetary Nebula
- Dwarf Nova
- Main Sequence Star
- Variable Star
- X-Rays
- Globular Cluster

1. J0751/J1741 are most likely ________________ progenitor systems.

2. Sirius A and B form a ________________ system.

3. M15 is a ________________.

4. Inconsistencies in ________________ most likely caused the shape of Tycho’s SNR.

5. SNR G1.9+0.3 was theoretically a ________________ merger.

6. SS Cygni is the prototype for ________________.

7. Henize 3-1357 is the youngest known ________________.
For problems 8-17 choose the best fitting answer.

8. What type of supernova formed SN 2011fe?
   a. Type Ia
   b. Type Ib
   c. Type Ic
   d. Type Ila

9. What elements seen in SNR 0509-67.5 reveal that it was formed by a Type Ia supernova?
   a. Carbon and Oxygen
   b. Hydrogen and Helium
   c. Silicon and Iron
   d. Lithium and Silicon

10. In which constellation is Tycho's SNR located?
    a. Sagittarius
    b. Cassiopeia
    c. Cygnus
    d. Tycho

11. What system contains the hottest known white dwarf star?
    a. NGC 2440
    b. Sirius A & B
    c. M15
    d. SS Cygni

12. Why are we most interested in studying AM CVn systems?
    a. They are theorized to produce gravitational waves
    b. They are theorized to contain traces of life
    c. They are a progenitor for triple systems
    d. They provide insight into the formation of galaxies
13. What is can cause a binary system to merge?
   a. The region of resonance for an orbiting body
   b. A plume of matter in a x-ray binary system
   c. The two stars exceed the Chandrasekhar limit
   d. Each star overcomes the Roche limit of the system

14. Which wavelength allows us to see the closest known instance to the big bang?
   a. Infrared
   b. X-ray
   c. Microwave
   d. Gamma

15. Which of these objects is typically the oldest?
   a. Open star cluster
   b. The Sun
   c. Red Giant
   d. Globular star cluster

16. Which of the following is a possible AM CVn system?
   a. Red dwarf + neutron star
   b. Red dwarf + red giant
   c. White dwarf + red giant
   d. White dwarf + neutron star

17. What makes it possible to detect a spectroscopic binary?
   a. Doppler effect
   b. Fermi exclusion principle
   c. Line broadening
   d. Emission and absorption lines
For problems 18-21 answer to your best knowledge, and show your work.

1. Use the distance modulus to determine the distance (in pc) to an object that has a mass of 2 $M_\odot$ an absolute magnitude of 1.42, and an apparent magnitude of -1.44.

Tie Breaker: What type of object is this? What object could this be?

2. Use the distance modulus to determine the absolute magnitude of an object that has an apparent magnitude of 9.4, and is 3.8 kLy (1.23 kpc) from earth.

Tie Breaker: What object could this be?
3. Using Kepler's laws of motion, determine the orbital period (in hours) of a binary system consisting of a 0.6 $M_\odot$ star and a 0.4 $M_\odot$ star.

Tie Breaker: What system could this be?

4. Use Kepler's laws to determine the approximate separation (in Au) of two equal mass objects in a binary system with a combined mass of 1.8 $M_\odot$ and an orbital period of 4 hours. (HINT: assume a circular orbit)

Tie Breaker: What system could this be?