School Name: Your Names:
Team Number:

Reach for the stars
2002

Each question is worth 3 points.

1. T Tauri stars have strong emission lines of which elements? Which of these lines are not found in normal stars? What does this tell us about T Tauri stars?

2. Where can T Tauri stars be found on an H-R diagram? What does this tell us about them?

3. List all the steps of fusion in the Proton-proton 1 chain reaction. Based on the change in mass between the starting and ending particles in this reaction, "calculate" (and show your work) the energy released in this reaction.

4. Approximately much time does it take a 1 solar mass protostar to arrive on the main sequence? How much time does it take a 5 solar mass protostar to arrive on the main sequence?

5. Consider a cloud of gas that may collapse to form a star. In its early stages, the temperature of this cloud of Hydrogen gas is 10 K. What is the average speed of the hydrogen atoms in this cloud? Hint:Use the Boltzmann relationship.

Sketch an H-R diagram and draw on it where you would find

6: The nuclei of planetary nebulae
7: White Dwarfs
8: The Main Sequence
9: Red Giants
10: Red Super giants

11: What physical principles keep a white dwarf from collapsing? What is the maximum mass of a white dwarf in solar masses?

12: A Type II Supernovae is found in what kind of galaxy? At maximum brightness, what is the wavelength of its most prominent emission line?

13: Why if a stellar corpse has a mass greater than 1.4 solar masses does it form a neutron star. Why is it made of neutrons, and why does the neutron star not collapse?

14: Why does a pulsar pulse?

a. what is the physical source of this radiation
b. why is it pulsing?

15. Derive the Schwarzchild radius from conservation of energy. Express the radius in terms of mass of the star, the speed of light, and the Universal Gravitational Constant.

16. Globular Clusters contain what population of stars? Are they old or young stars (how old)? How can we tell this from the spectrum?

17. What is the sum of the stellar masses in a visual binary of period 40 years, maximum separation of 5.0", and parallax 0.3"? Assume an orbital inclination of zero and a circular orbit.

18. How do we find the ratio of masses in a spectroscopic binary system?

19. If the stars at the turn-off point in a star cluster have masses of about 4 solar masses, how old is the cluster?

20. Gliese 229B is what type of star? Why is it difficult to see?

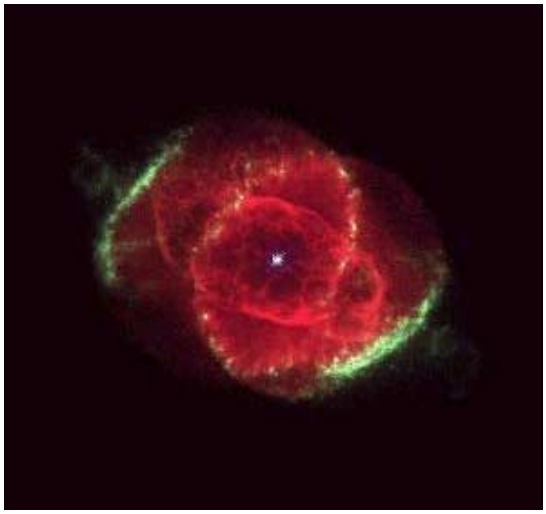
21. Identify the following object. What is its name? What is it? Where is it?

22. What type of star is SS Cygni? What is the usual period of oscillation for this type of star?

23. What is Mayall II? Where is it? In what was does it exceed all other objects like it in which area?

24. What is Circinus X-1? What are the two types of stars in this system? Circinus X-1 has spectral lines named after what star?

25. What is the name of this object, what is this object, and in what constellation is it located?



26. Why is Eta Carinae prone to such great variable oscillations? There are those who claim that a near-by type 2 supernova could finish us off. How close is too close to be to a Type 2 Supernova explosion, and is Eta Carninae a concern?

27. LP944-20 is what kind of star found in what constellation? It has the pride of being the first of its kind to be observed to do what, and at what wavelength was this observation made?

27. What is the second largest and second brightest globular cluster in the sky? Who cataloged it as a nebulous object and when? What constellation is it in?

28. What is M4, where is it, and what was discovered here in 1987?

29. What happens in the rho Ophiuchi molecular clouds? What wavelengths does the dust in the clouds absorb and emit in?

30. Why does the gas in the Trapezium Glow? Why has star formation in the Trapezium stopped? Why is there star formation in the Orion Molecular Clouds?

31. Prove that pulsars must have neutron star densities (4 x 10^16 kg/m^3) using geometry, centripetal force, Law of Gravitation. Suppose that the period of the pulsar is 2 milliseconds.

32. The Crab pulsar was the first pulsar discovered which had what property about the type of radiation its pulses emits? It was also the first pulsar to exhibit what phenomena in the timing of its pulsing? Where is the rotational kinetic energy of the pulsar going?

33. The radiation from the Crab nebulae is a continuous spectrum and highly polarized. The nebula is also a strong radio emitter and both its optical and radio emission has a wavelength emission that does not follow the Plank blackbody curve. What type of radiation is emitted from the nebula and how are the above statements proof of this?