1. What is the specific energy source of main-sequence stars? What are the two methods that are responsible for this energy production?

2. What is happening while stars are on the main-sequence? What causes stars to move off the main-sequence?

3. Suppose two stars are classified as M2I and F3V, respectively. Give two differences in their properties.

4. You are an astronomer and you observe a cluster of stars. You determine that only K and M spectral types are present. Explain how this gives you information on the age of the cluster. Is the cluster younger or older than our sun?

5. What defines when a “star is born”? What was the star prior to this?
6. The diameter of the Sun is about 100 times that of the Earth and it has a rotation period of about 30 days. When the Sun ends its life it will become a white dwarf and shrink to the size of the Earth. Assuming that no mass is lost during this process, what will happen (circle one)?

   a) The smaller Sun will spin at the same speed as the current Sun.
   
   b) The smaller Sun will spin slower than the current Sun.
   
   c) The smaller Sun will spin faster than the current Sun.

   Why?

7. What are the two major types of telescopes (not interferometers)? Sketch an example of each, labeling appropriately and showing the path of the light through the system. Indicate which type of telescope astronomers prefer and give two reasons why.
8. A black hole has a radius of 30 km. What is its mass? Would you expect this black hole to form as a result of a star collapsing? Why or why not?

9. A train car is accelerating at 3g’s (3 times Earth gravity). The front of the train car is in the direction of motion. The person inside, Erik, has two clocks which he has synchronized to be the same by sitting them on his lap and adjusting them. He now places one clock on the back wall and one clock on the front wall and goes to the middle of the train car. What does Erik observe? (Circle one)

a) The clocks run at the same rates but he does not see the same time on each.

b) The clock in front runs more slowly than the one in back.

c) The clocks run at the same rates and have the same time.

d) The clock in back runs more slowly than the one in front.

10. What is meant by the term “dark matter”? How do we know it exists?

11. What are the fundamental postulates of special relativity?
12. List the three “stellar” endpoints of stars, give roughly what mass ranges of stars generate them, and explain what the stellar endpoints are.

13. You see a person falling into a black hole. List two things you would see happen to them. Explain briefly why these happen.

14. What keeps a white dwarf from collapsing? Explain what this means and why it happens.
15. List and explain the fundamental postulate of General Relativity?

16. List two effects of general relativity with a one-sentence explanation for each (do not list curvature of space-time as an answer).

17. Sketch an edge on view of the Milky Way, labeling each of the important components. In addition, roughly indicate the size scale and show the distance of the Sun from the center.