Chp 11-Review Questions. Inferring Patterns in Star Life Cycles

1. If no one has ever seen a star go through the complete formation process, how are we able to understand how stars form?
2. If an interstellar medium fills the space between the stars, how is that we are able to see the stars at all?
3. In Figure 11-2, what makes the nebula dark? What makes the Orion nebula glow?
4. Describe the energy source that causes a protostar to shine. How does this source differ from the energy source inside a main-sequence star?
5. In what ways is the internal structure of a 1-$M_\odot$ main-sequence star different from that of a 5-$M_\odot$ main-sequence star? How is it different from a 0.5-$M_\odot$ main-sequence star? What features are common to all these stars?
6. How does the chemical composition of the present-day Sun's core compare to the core's composition when our Sun formed? What caused the change?
7. On what grounds are astronomers able to say that the Sun has about 5.4×10^9 years remaining in its main-sequence stage?
8. Explain how it is possible for the core of a red giant to contract at the same time that its outer layers expand.
9. Why does helium fusion require much higher temperatures than hydrogen fusion?
10. What does it mean when an astronomer says that a star "moves" from one place to another on an H-R diagram?
11. Explain how and why the turnoff point on the H-R diagram of a cluster is related to the cluster's age.
12. What is the difference between Population I and Population II stars? In what sense can the stars of one population be regarded as the "children" of the other population?
13. What are thermal pulses in AGB stars? What causes them? What effect do they have on the luminosity of the star?
14. How can an astronomer tell the difference between a planetary nebula and a planet?
15. What is a white dwarf? Does it produce light in the same way as a star like the Sun?

Chp 11-Discussion Questions. Inferring Patterns in Star Life Cycles

1. Some science-fiction movies show stars suddenly becoming dramatically brighter when they are "born" (that is, when thermonuclear fusion reactions begin in their cores). Discuss whether or not this is a reasonable depiction.
2. Eventually the Sun's luminosity will increase to the point where Earth can no longer sustain life. Discuss what measures a future civilization might take to preserve itself from such a calamity.

Chp 11-Collaborative Group Exercises. Inferring Patterns in Star Life Cycles

1. Imagine that your group walks into a store that specializes in selling antique clothing. Prepare a list of observable characteristics that you would look for to distinguish which items were from the early, middle, and late twentieth century. Also, write a paragraph that specifically describes how this task is similar to how astronomers understand the evolution of stars.
2. Consider advertisement signs visible at night in your community and provide specific examples of ones that are examples of the three different types of nebulae that astronomers observe and study. If an example does not exist in your community, creatively design an advertisement sign that could serve as an example.

3. The inverse relationship between a star's mass and its main-sequence lifetime is sometimes likened to automobiles in that the more massive vehicles, such as commercial semi–tractor-trailer trucks, need to consume significantly more fuel to travel at highway speeds than more lightweight and economical vehicles. As a group, create a table called "Maximum Vehicle Driving Distances," much like Table 11-1: Approximate Main-Sequence Lifetimes, by making estimates for any five vehicles of your group's choosing. The table's column headings should be (1) vehicle make and model; (2) estimated gas tank size; (3) cost to fill tank; (4) estimated mileage (in miles per gallon); and (5) number of miles driven on a single fill-up.