OpenStax Astronomy, Ch.21: WS Problems (Apr-2021)

Review Questions

1. Why is star formation more likely to occur in cold molecular clouds than in regions where the temperature of the interstellar medium is several hundred thousand degrees?

2. Why have we learned a lot about star formation since the invention of detectors sensitive to infrared radiation?

3. Describe what happens when a star forms. Begin with a dense core of material in a molecular cloud and trace the evolution up to the time the newly formed star reaches the main sequence.

4. Describe how the T Tauri star stage in the life of a low-mass star can lead to the formation of a Herbig-Haro (H-H) object?

5. Two protostars, one 10 times the mass of the Sun and one half the mass of the Sun are born at the same time in a molecular cloud. Which one will reach the main sequence stage, where it is stable and getting energy from fusion, first?

6. Compare the scale (size) of a typical dusty disk around a forming star with the scale of our solar system.

7. Why is it so hard to see planets around other stars and so easy to see them around our own?

8. Why did it take astronomers until 1995 to discover the first exoplanet orbiting another star like the Sun?

9. Which types of planets are most easily detected by Doppler measurements? By transits?

10. List three ways in which the exoplanets we have detected have been found to be different from planets in our solar system.

11. List any similarities between discovered exoplanets and planets in our solar system.

12. What revisions to the theory of planet formation have astronomers had to make as a result of the discovery of exoplanets?

13. Why are young Jupiters easier to see with direct imaging than old Jupiters?

14. Suppose you wanted to observe a planet around another star with direct imaging. Would you try to observe in visible light or in the infrared? Why? Would the planet be easier to see if it were at 1 AU or 5 AU from its star?

15. Why were giant planets close to their stars the first ones to be discovered? Why has the same technique not been used yet to discover giant planets at the distance of Saturn?

16. An exoplanetary system has two known planets. Planet X orbits in 290 days and Planet Y orbits in 145 days. Which planet is closest to its host star? If the star has the same mass as the Sun, what is the semi-major axis of the orbits for Planets X and Y?