STUDY QUESTIONS #5

ORIGIN OF THE SOLAR SYSTEM

1. Explain why the rocky planets formed in the inner solar system and the gas giants formed in the outer solar system.

2. The average velocity of gas atoms depends on what factors?

3. What was Jupiter's role in forming the asteroid belt and what consequences did it have?

LIGHT

1. Which fundamental force of nature is responsible for light?

2. What is light made of?

3. When light travels in material, such as glass, does it speed up or slow down?

4. What are four characteristics that describe a wave?

5. Is there sound in outer space? Why or why not?

6. We give names to different wavelengths of electromagnetic radiation. List these in order from shortest to longest wavelength: uv, radio, ir, visible, gamma-ray, x-ray.

7. Which has more energy per wavelength, x-ray or visible?

8. Explain what color is.

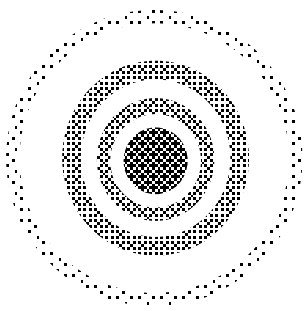
9. What is the relationship of wavelength and frequency?

10. What is the relationship of frequency and energy?

11. Name 3 different kinds of waves in nature. What does each one travel in?

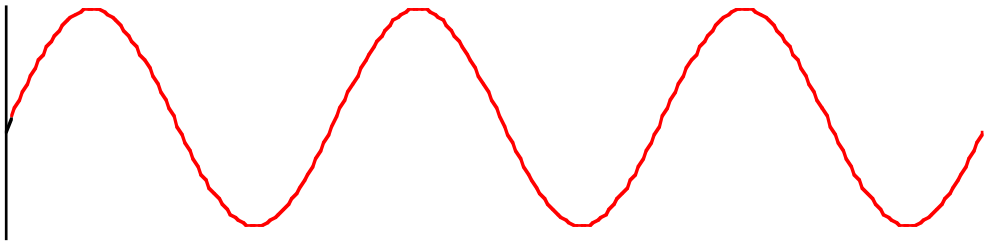
12. Why do stars twinkle?

13. When starlight passes through an opening, such as the tube of a telescope, instead of looking like a pinpoint, the image looks more like the one on the right. Why?



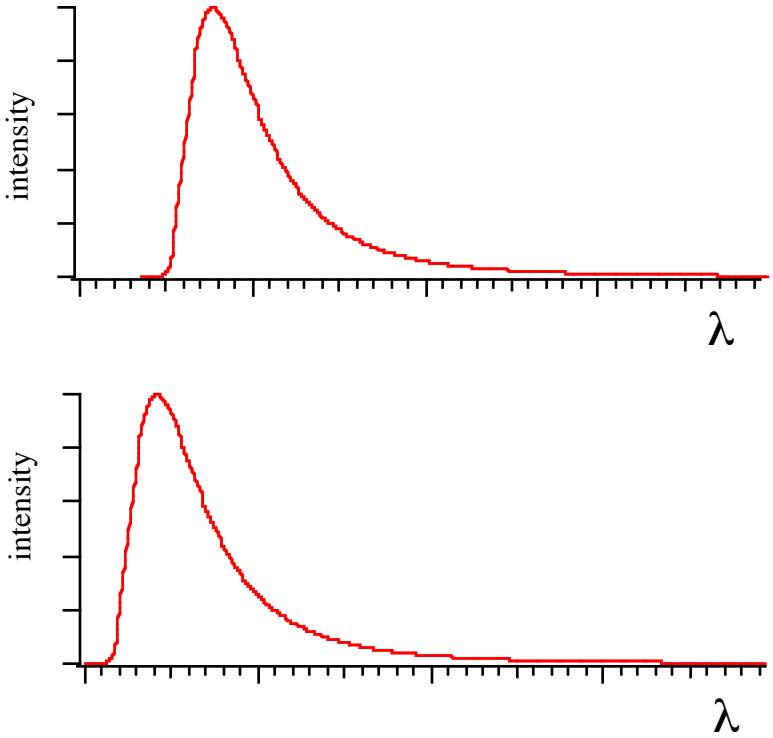
14. All things radiate light, but different things radiate a different amount of light at each wavelength, for example, the sun radiates most of its light in the visible region and you radiate mostly in the far infrared. What determines how much an object radiates at each wavelength?

15. In the constellation Orion, the star Betelgeuse is orange-red in color, and another star in the constellation, Bellatrix, is blue. What does that tell you about the nature of each of these stars?



16. The wave in the figure above passes you in 3 seconds. What is the wavelength (use a ruler, in centimeters)? What is the frequency? What is the velocity of this wave?

17. Two blackbody curves are plotted on the right. The y-axis is intensity and the x-axis is wavelength, increasing left to right. With this information alone, which curve represents the hotter body?



18. What is resolution, and on what factors does it depend?

19. Which has the better resolution, a 4 m radio telescope or a 4 m optical telescope?

20. What do radio telescopes and optical telescopes have in common? How are they different?

21. Why does the 2.4 m Hubble Space telescope give images with better resolution than a 2.4 m telescope on the ground?

22. You have been studying a star and you find that it gives out most of its light at a wavelength of 0.7 μ (which is the wavelength for red). What temperature is the surface of the star? Use the following equation called Wien's Law:

    $T = \frac{2900}{\lambda_\mu}$ where T is the temperature in Kelvins and the wavelength is in microns.

23. What is the meaning of 0 Kelvin?