Activity II: Earth, Moon, and Some Basic Physics

April 14, 2021

1 Introduction and Objective

In this activity you will work in groups to answer the following questions regarding the Earth, the Moon, and some basic physics.

essential concepts

For each statement, circle or fill in the blank with the most appropriate term(s).

1. A planet that has a perfectly circular orbit has an eccentricity of 0.
2. The Ptolemaic model of the Solar System employed a complex series of deferents and epicycles to explain planetary motion.
3. Light is a wave, but it is also a particle according to the explanation of blackbody radiation by Max Planck (and Albert Einstein).
4. When waves overlap, they combine constructively or destructively.
5. When the Moon is becoming more visible over the course of its revolution around Earth, we refer to this as waxing.
6. Stellar parallax can be used to determine the distances to only relatively close stars.

7. The most abundant element in Earth's atmosphere is Nitrogen.

8. The symbol T refers to the period of a wave or orbit.

9. The symbol λ refers to the wavelength of a wave.

10. Planets that orbit farther from the Sun take more time to complete one orbital period, which is a consequence of Kepplers second law.

11. The heliocentric model of the Solar System can explain phases of Venus, which the Ptolemaic model cannot explain.

12. The equation $c = \lambda f$ implies that light of high frequency has a small wavelength.

13. The blackbody curve physicists derived in the 19th century is called Rayleigh Jeans law and it predicted that the intensity of blackbody radiation for small wavelengths should be infinity.

14. The prediction referred to in the previous problem (that the intensity of light emitted by a blackbody approaches infinity for small wavelengths) is called ultraviolet catastrophe

$open - ended\ questions$

1. The red giant Betelgeuse has a parallax angle of about 4.5×10^{-3} arcseconds. About how far away is it, in light years? What is its parallax angle in degrees?

$$distance = \frac{1}{\theta} \tag{1}$$

$$distance = \frac{1}{\left(\frac{1}{4500}\right)^{\circ} \times \frac{\pi}{180}} \tag{2}$$

$$distance = \frac{810000}{\pi} \tag{3}$$

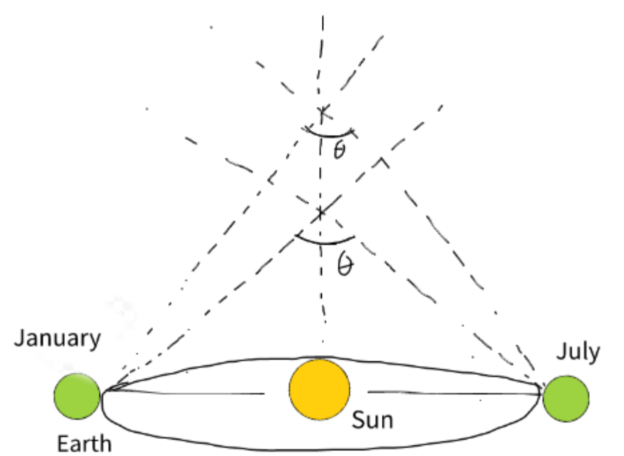
$$distance = \frac{810000}{\pi} \tag{4}$$

$$distance = 257831 \text{ AU} = 4.07 \text{ light-years} \tag{5}$$

The parallax angle is 4.5 $\times 10^{-3}$ which is

$$\left(\frac{1}{4500}\right)^{\circ} \tag{6}$$

2. Suppose you are using stellar parallax to determine the distances to stars. Will the stars that have the smallest parallax angles be the closest or farthest stars? Draw a diagram to illustrate.
   Closer stars will have larger parallax angle and farther stars will have smaller parallax angle.



As you can imagine, the farther the star, the tighter the angle.

3. State and describe three ways that our atmosphere protects and incubates life on Earth.
   (a) The earths atmosphere blocks X-rays, Gamma rays and ultraviolet light, which are very harmful to us.
   (b) The greenhouse effect keeps earths surface temperature at a comfortable level where life can thrive.
   (c) Convection creates wind and weather. Which life needs in order to survive. Like how plants need rain water.