

Graveney Astrophysics Course 2010

Apparent Magnitude

In 1856 Norman Robert Pogson invented the scale of apparent magnitude we use to classify the brightness of stars. The Ancient Greeks used a scale of 1 to 6 to classify stars. Pogson defined the ratio of brightness between magnitude 1 and 6 as a factor of 100. He based his scale on Polaris with a magnitude of 2. This has since changed as Polaris is now known to be a variable star.

Questions:

1. Find the apparent magnitude of Sirius and Polaris?
2. The ratio of brightness between a magnitude 1 and a magnitude 2 star is close to 2. It is given the name the Pogson Ratio. What is the actual value of the Pogson Ratio and how was it defined?
3. If the difference in apparent magnitude of two stars is 3, how much brighter is the brightest star?
4. Find the ratio of brightness between Sirius and Polaris?
5. Absolute Magnitude is defined as the magnitude of a star at a standard distance of 10pc from the Sun. The relationship between apparent and absolute magnitude is given by

$$m - M = 5 \log_{10}(d/10\text{pc}) \quad \text{where } d \text{ is the distance to star in parsec.}$$

Given the distance to Sirius has been measured as 2.6pc find the absolute magnitude (M) of Sirius given the apparent magnitude you quoted in question 1.

6. Polaris has a parallax of 0.00756 arcseconds. Find its distance from the Sun in parsec and hence find its absolute magnitude given the apparent magnitude you quoted in question 1.

Telescopes:

7. A convex lens of focal length 5cm is used to view an object 20cm in front of the lens. Where will the image be formed? Will the image be real or virtual, inverted or upright?
8. A refracting telescope is built from two convex lenses in normal adjustment. Given the objective has a focal length of 35cm and the eye piece lens has a focal length of 5cm, what will be the angular magnification of the telescope?
9. For a refracting telescope with aperture diameter 10cm using visible light, what is the maximum resolving power of the telescope?