

Introduction to Astronomy

Summary Questions Week 8

25 November 2019

1. What are astrometric binaries; what are spectroscopic binaries and how are they complementary?

Solution:

Astrometric binaries are binary star systems where *only one of the stars can be detected*, but the binary nature can be derived because of the *observed motion of this star around its companion*. Spectroscopic binaries are binary star systems where the binarity is derived from *spectroscopy* and specifically from the changes in *Doppler shift* as the companion stars go around their orbits. These two types are complementary because astrometric binaries only give information about the *orbit projected on the plane of the sky*, while the spectroscopic binaries give information on the *orbit projected along the line of sight, i.e. perpendicular to the plane of the sky*.

2. An Algol-type binary is a binary system with a cool giant and a hot dwarf. What does the light curve look like?

Solution:

The light curve is *mostly flat*, but shows *two dips: one shallow dip when the dwarf travels in front of the giant and one deep dip when the giant passes in front of the dwarf*. Both of the dips have a *flat bottom*.

3. When investigating stellar structure, which parameters are of importance? (Name at least five.)

Solution:

The following parameters are of importance to stellar structure: pressure (p), temperature (T), mass (M), luminosity (L), metallicity (Z), density (ρ), opacity, energy generation rate.

4. What is practically the difference between the pp-chain and the CNO-cycle?

Solution:

The CNO-cycle *is more efficient*, but *can only operate at sufficiently high temperatures ($T \gtrsim 10^7$ K)*.

5. What is the mass function for binary stars and why is it useful?

Solution:

The mass function is a combination of the mass ratio ($M_2/M_1 = a_1/a_2$) and Kepler's third law ($PM_{\text{Tot}} = a^3$). It is useful because it provides an easy measure that can be used to constrain the masses of binary systems while taking into account any projection effects.