Data-Sheet

Krittika-The Astronomy Club of IIT Bombay

"You will find that help will always be given at Hogwarts, to those who ask for it"
- *Albus Percival Wulfric Brian Dumbledore*

Question 1

The coordinates of S2707 and V1509 in an alt-azimuth system defined on the planet are:

S2707: (altitude = 67°41'06", azimuth=125°30'27")

V1509: ((altitude=24°19'47", azimuth=90°24'16"))

Distance from S2707 to V1509 is 8.8 kpc.

The relevant datafile is `CepheidData.txt`. The columns are the barycentric corrected times in days (if you don't understand what barycenter correction is, it is fine. It has already been done! Use what is given to you as the time axis) and the magnitude of the Cepheid in the Johnson-Cousins V band filter.

The Period-Luminosity Relation to use is:

$$M_V = -2.43 \log_{10}(\mathrm{P} - 1) - 4.05$$

where M_V is the absolute magnitude in the V filter, and P is the period in days

Question 2

The standard spectra of the star S2707 is given in `StandardSpectra.txt`. The spectra as observed from M'hrshi is given in `SpectraStar.txt`. Don't worry about correcting for distance, this has already been done (Very Extensive Database of Archives from the Novan Territory is also very smart.)

Also important to note is the extinction curve given in `Extinction.txt`. This gives extinction in magnitude due to ISM as a function of wavelength. Assume that it is the same for both S2707 and V1509.

Question 3

The following are known:
Mass of S2707 = 1.989×10^{30} kg
Radius of S2707 = 6.95×10^{8} m
Mass of BITI = 5.972×10^{24} kg
Radius of BITI = 6.4×10^{6} m
Orbital Distance of BITI from S2707 = 1.496×10^{11} m
Absolute Magnitude of S2707 = +4.83 (in the V filter)

Find the transit light curve at a distance of 10pc from the S2707-BITI system.

Question 4

The data is collected as follows:
The CCD, which has 60×60 pixels is exposed for 0.1s intervals and the values noted for each pixel. This is continued for 100 seconds, and so we finally have 1000 images. These images are not focussed with a lens, so distant objects (like GRBs) cannot be localized on a number of pixels.
However, the detector is sensitive to charged particles, which can appear as localized occurances in the detector image.
The folder `XRayCCD` contains the 1000 images, in a text format.