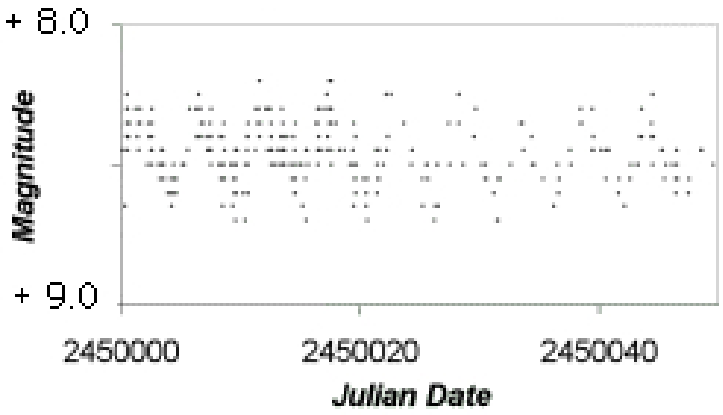
TEAM NAME _____ TEAM #_____

NSO Astronomy C Event 2007 – Lab Station 2 Questions

The following questions refer to the objects labeled **A** thorough **F** in the star field images. Place all answers on the answer page and hand in along with this question set. You may write on the pages.

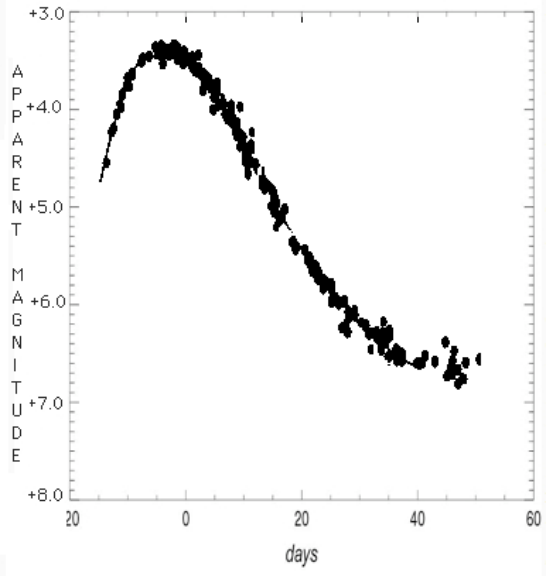
NOTE: There are several star field images. Two of them are for orientation and reference (**Star Field 0** and **Star Field Magnitude Reference**). The remaining 16 images are of the same star field. Even though some of the objects are too faint to be seen on the star fields, you have enough information to answer the questions referring to these objects. Besides the star fields, there is also a **Period-Luminosity Graph**. There are also graphs and images contained within this question set. Sometimes the axes may not be labeled, or you may think there is not enough information to answer the questions. Any information that may seem to be missing can be determined from consulting all of the information provided at this station.

The light curve below shows measurements of the apparent magnitude of **Object A**.



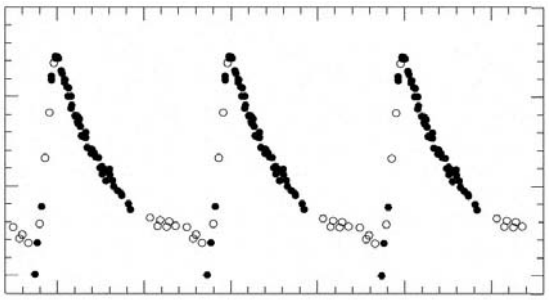
1. What is the Period of Object A (in days)?
2. What is the maximum apparent magnitude of Object A?
3. What is the minimum apparent magnitude of Object A?
4. What is the average apparent magnitude of Object A?
5. What is the average absolute magnitude of Object A?
6. What is the distance to Object A (in pcs)?

The light curve below shows measurements of the apparent magnitude of **Object B**.



7. What is the distance to Object B (in pcs)?

The light curve below shows measurements of the apparent magnitude of **Object C**.



8. Is Object C or Object B closer to the observer?

The absorption spectrum for **Object D**, which is a main sequence star, is shown below.

9. Is Object D closer to Object A, Object B, Object C, or the Sun?

Object E is a planetary nebula with a measured expansion velocity of 1.0 km/s and angular diameter of 20 arc minutes. Several hypotheses were proposed for the distance and age of the nebula:
a) 3.4×10^{10} km away & 1,000 years old
b) 3.4×10^{10} km away & 2,000 years old
c) 3.4×10^{12} km away & 1,000 years old
d) 3.4×10^{12} km away & 2,000 years old
e) 3.4×10^{14} km away & 1,000 years old
f) 3.4×10^{14} km away & 2,000 years old

10. Which of these hypotheses best corresponds to the measurements?

Object F is an eclipsing binary star system in which the brighter star (Star I) totally blocks the light from the dimmer star (Star II) during eclipse.

11. What is the period of Object F (in days)?
12. What is the period of the eclipse of Star II by Star I if it begins at JD 2454231.5 (in days)?
13. What is the period of the eclipse of Star I by Star II if it begins at JD 2454239.5 (in days)?
14. What is the maximum apparent magnitude Object F?
15. How many times brighter is Star I than Star II?

The parallax of **Object F** was measured to be 0.01 arc seconds.

16. What is the distance to Object F (in pcs)?
17. If Star I is on the main sequence, what is its spectral class?

The wavelength of a hydrogen line in the spectrum of **Star I** was measured to have an average value of 486.100 nm, a maximum value of 486.254 nm, and a minimum value of 485.946 nm.

18. What is the orbital velocity of Star I (in km/s)?
19. What is the radius of Star II (in km)?
20. If Star I has a mass of 1.5 solar masses, what is the mass of Star II (in solar masses)?