National Science Olympiad
Astronomy C Division Event
19 May 2007
Wichita State University
Wichita, Kansas

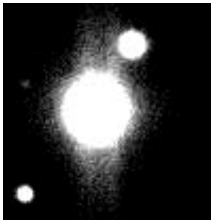

TEAM NUMBER_____
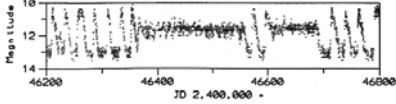
TEAM NAME_____

INSTRUCTIONS:

1) Please turn in <u>ALL MATERIALS</u> at the end of this event.

**2) Do not forget to put your <u>TEAM NAME</u> and <u>TEAM NUMBER</u> at
   the top of Lab Station and Answer Pages.**

**3) This event and the answer key will be available on the Wright Center website:
   http://www.tufts.edu/as/wright_center/fellows/sci_olympiad/sci_olympiad_astro.html**

4) Good Luck! And May the Stars be With You!

SECTION A: Use Image Set A on Page 3 to answer the questions in this section.

(_1_) The star in the center of this image is β Lyrae. Use Image **1** to determine what classification of variable star/system this is.
(_2_) Study Image **2**. How is this star/system changing?
(_3_) What is the most probably reason for this change?
(_4_) Which other diagram (**Set A**) shows a star/system within the same variable star classification as β Lyrae?
(_5_) What is the specific name for this variable star/system?
(_6_) Why does the diagram for this star/system have a different shape from β Lyrae?

(_7_) The light curve to the left is for what specific deep sky object (variable star)?
(_8_) What classification of variable star is it?
(_9_) What type of activity or process is thought to cause the "standstill" in the light curve for this object?
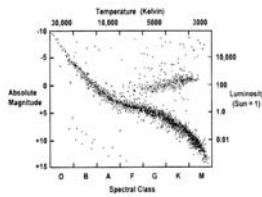(_10_) Which Image (**Set A**) is a light curve from this same group of variable star types?
(_11_) What is the name of the deep sky object (variable star) that produces this light curve?
(_12_) Name the components of the systems that produce this type of variable star activity and resulting light curves.

(_13_) The two stars that make up the overcontact binary W Ursae Majoris pictured to the left have estimated masses of 0.99 solar masses and 0.62 solar masses. What is the average separation between the two stars in kilometers?
(_14_) The solar radii of the two stars in this system are estimated to be 1.14 and 0.83. Show that these values and your calculation for the average separation are consistent with the statement that this is an overcontact binary.

(_15_) Plot the following data on the H-R Diagram on **Answer Page 2** and use the plotted information and **Image Set A** to answer questions 16 through 27.

	Parallax	Apparent Magnitude	Spectral Class
Star A:	0.00028	4.1 – 6.2	F8 – K0
Star B:	0.00476	6.0 – 10.3	M5 – M8
Star C:	0.00077	9.7 – 10.8	A7 – F5

(_16_) Star A is what type of variable star?
(_17_) On Image Sheet A which light curve is produced by this type of variable?
(_18_) Which image is an example of this type of variable, and what is the scientific name of this DSO?
(_19_) What is the evolutionary stage of this object?
(_20_) What is the image number for the DSO that is an example of the next evolutionary sequence for this object?
(_21_) Which spectra is representative of Star A?
(_22_) Which spectra is representative of the next evolutionary sequence for Star A?

(_23_) Star B is what type of variable star?
(_24_) Which image on Image Sheet A contains an example of this type of variable?
(_25_) Which image shows a light curve produced by this type of variable?
(_26_) Star C is what type of variable?
(_27_) On Image Sheet A which light curve is produced by this type of variable?

Below are 6 light curves (**A** through **F**) acquired from a variety of sources. For each of the light curves:
(_28_) Determine the type of variability.
(_29_) Calculate the period. If the period is less than one day, give the answer in hours.
(_30_) List the variables that can be observed with the unaided eye.
(_31_) Does graph B or graph D contain the more massive star?
(_32_) Which graph contains the least bright object?

NOTE: Study the overall behavior of the star(s) – different colored or shaped symbols do NOT represent more than one object – they may represent more than one set of observations; though some of the graphs may show the behavior of one or more stars.

A.

B.

C.

D.

E.

F.