

Pennsylvania State Science Olympiad Competition 2004  
Astronomy - Division C Event

PART A:

Figures I through VII on the following sheet are spectra of some Type V stars.

List them in order of decreasing temperature (1).

List them in order of decreasing strength of their Hydrogen lines (2).

Which spectrum would most likely have been produced by star B from figure X (3)?

Of stars C and E in figure X, which is more likely to have produced the spectrum in figure II (4)? Why (5)?

Of the stars labeled on figure X: Which two are the two hottest (6)?

Which are the two brightest (7)?

Which has the largest radius (8)?

Which is most like our sun (9)?

Approximately how much longer will this star remain on the main sequence (10)?

Is star A or B brighter (11)? How many times brighter (12)?

Does star A or C radiate more energy per unit area (13)? How many times more (14)?

Does star A or F have a larger radius (15)? How many times larger (16)?

At what wavelength does star E radiate the most energy (17)?

Both Star D and star B appear equally bright in the night sky; which is farther away from the observer (18)? How many times farther (19)?

Of the two light curves in Section 2, which was produced by a cataclysmic variable star (20)? Specifically what type of cataclysmic variable (21)?

Approximately how much time elapsed after its maximum before the luminosity of the star that produced figure IX reached half of that maximum value (22)?

What is the period of the star that produced figure VIII (23)?

Another star of the same type with twice the period appears equally bright in the night sky.

Is that star farther away from or closer to the observer than the star that produced figure VIII (24)?

Galaxies X and Y appear equally bright in the night sky, when a radio spectrum of both are taken, the 21cm line of galaxy X is twice as wide as that of galaxy Y. Which has a greater absolute luminosity (25)? How many times greater (26)? According to Hubble's law, which will have the greater recessional velocity (27)? How many times greater (28)?

A system of binary stars has a period T. What will the period be if all other variables are held constant and their separation is doubled (29)? If the sum of their masses is doubled (30)?

## PART B:

Use the Image Set to answer the following:

List the H-R diagrams A, B, C and D in order of youngest to oldest (**\_31\_**).

Which one of the H-R diagrams contains blue stragglers? (**\_32\_**).

H-R diagrams A and B represent objects located in what part of the galaxy? (**\_33\_**)

H-R diagrams C and D represent objects located in what part of the galaxy? (**\_34\_**)

Which diagrams contain only Population II objects? (**\_35\_**)

Place images E, H, J, M, N in order of closest to furthest. (**\_36\_**)

Place images F, L, and M in an evolutionary sequence ending with the final end product. (**\_37\_**) What is the end product called? (**\_38\_**) This type of end product is used to measure distances to what types of objects? (**\_39\_**)

What is the most common method(s) of measuring the distance to objects like those in image S? (**\_40\_**) Image H? (**\_41\_**)

What two methods are used to measure the distance to objects like those in image J? (**\_42\_**)

Which image(s) represent an irregular galaxy (or galaxies)? (**\_43\_**) Spiral galaxy (or galaxies)? (**\_44\_**) Barred spiral galaxy? (**\_45\_**) Interacting galaxy (or galaxies)? (**\_46\_**)

Which image represents a method of measuring distances using a Cepheid? (**\_47\_**)

What is the name and location of the object in image K? (**\_48\_**)

What is the name and location of the object in image L? (**\_49\_**)

What is the name and location of the object in image M? (**\_50\_**)

TEAM NAME \_\_\_\_\_  
TEAM NUMBER \_\_\_\_\_

Pennsylvania State Science Olympiad Competition 200  
Astronomy - Division C Event

ANSWER SHEET PART A:

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|------------|------------|
| 1.) _____  | 17.) _____ |
| 2.) _____  | 18.) _____ |
| 3.) _____  | 19.) _____ |
| 4.) _____  | 20.) _____ |
| 5.) _____  |            |
| 6.) _____  | 21.) _____ |
| 7.) _____  | 22.) _____ |
| 8.) _____  | 23.) _____ |
| 9.) _____  | 24.) _____ |
| 10.) _____ | 25.) _____ |
| 11.) _____ | 26.) _____ |
| 12.) _____ | 27.) _____ |
| 13.) _____ | 28.) _____ |
| 14.) _____ | 29.) _____ |
| 15.) _____ | 30.) _____ |
| 16.) _____ |            |

ANSWER SHEET PART B:

- |            |            |
|------------|------------|
| 31.) _____ | 41.) _____ |
| 32.) _____ | 42.) _____ |
| 33.) _____ | 43.) _____ |
| 34.) _____ | 44.) _____ |
| 35.) _____ | 45.) _____ |
| 36.) _____ | 46.) _____ |
| 37.) _____ | 47.) _____ |
| 38.) _____ | 48.) _____ |
| 39.) _____ | 49.) _____ |
| 40.) _____ | 50.) _____ |