

cifutielu's Astronomy Test 2014

Directions and Information

This is a LONG test, 77 questions in all. Use your time wisely.

Do all of the problems. Each one is worth one point. If you do not know the answer to a problem (or if you are running out of time), guess.

Circle your answers. Write them on the test booklet. There is not a separate answer document.

There are four parts to this test. Two of these parts are multiple choice, and the other two parts are free-response questions.

The answers to the mathematical problems must be rounded to three significant figures. Points will be removed if answers are not rounded correctly.

Finally, and most importantly, have fun!

Part One: Qualities of Variable Stars

For questions 1-6 match each variable to its qualities.

- A. Semiregular Variable
- B. T Tauri Variables
- C. Cepheid Variables
- D. S Doradus Variables
- E. RR Lyrae Variables
- F. Mira Variables

1. ____ Unstable supergiants that have a temperature between 10,000 and 25,000 degrees Kelvin and a luminosity 250,000 to 1,000,000 times that of the Sun's.

2. ____ Pre-main sequence stars that are very young (less than a million years old) and have a mass that is between a fifth and a third of the Sun's mass.

3. ____ Giants/supergiants whose periods range from 20 to 2000 days.

4. ____ Have regular pulsations, and are old stars that are metal poor and have low mass (about $\frac{1}{2}$ times that of the Sun's).

5. ____ Supergiants that are 4 to 20 times more massive than the Sun and are 100,000 times more luminous.

6. ____ Red giants with a pulsation period greater than 100 days and are less than two solar masses massive.

For questions 7-14 write the variable that answers the question. Use the variables posted above. Do not write the letter: write the variable name. A variable can be used more than once. Some questions have more than one answer

7. Which variable is found in the F, G, K, and M spectral types?

8. Which variable will, within a few million years, expel its outer envelope as a planetary nebula and become a white dwarf?

9. Which variable is found mainly in globular clusters?

10. Which variable is also known as a Luminous Blue Variable (LBV)?

11. Which variable has an average absolute magnitude of 0.75?

12. Which variables have regular pulsations?

13. Which variable is in the very late stages of evolution?

14. Which variable has an F spectral type and a G spectral type?

Part Two: Deep Space Objects

The following Deep Space Objects will be used. Note that these are not the official deep space objects for the 2014-15 Science Olympiad season.

R Andromedae

SN 1604

WZ Cassiopeia

P Cygni

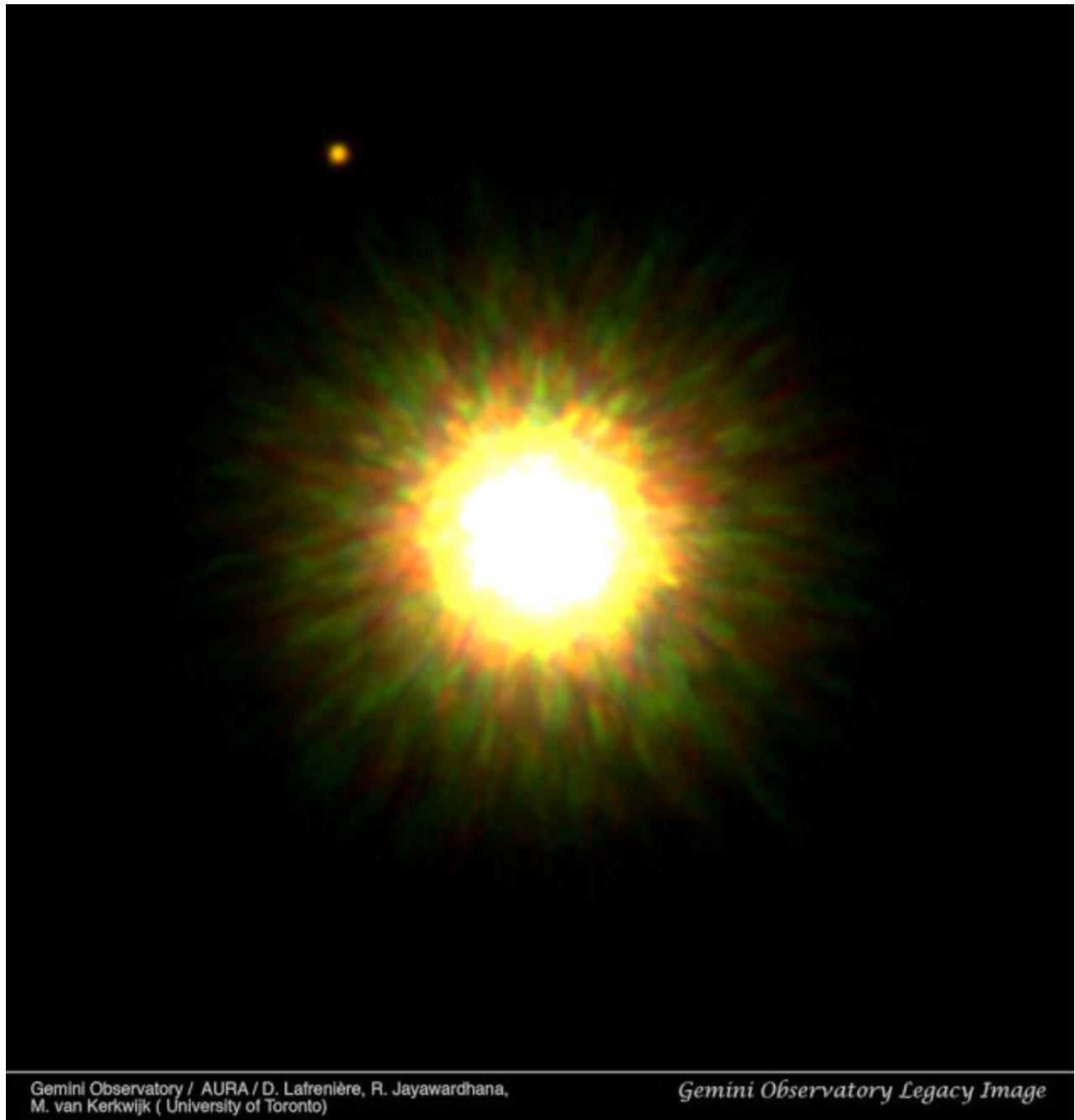
S Doradus

RS Puppis

1RXS J160929.1-210524

SN 2014J

Use the following images for questions 15-23



15. What is the name of this object?

16. What type of variable or supernova is this object classified as?

17. How far is this object from Earth in parsecs?

18. How old is this object?

19. What type of object lies in the left hand corner of the image?

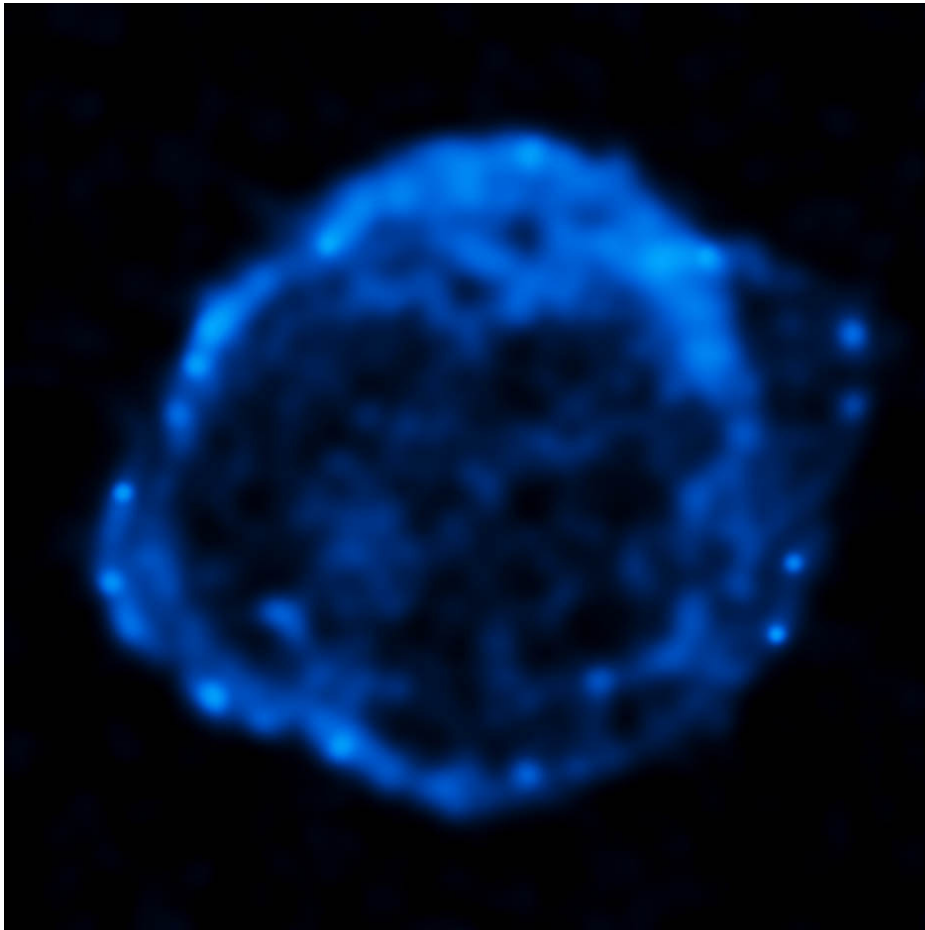
20. Does the object in question 19 have a name? If it does have a name, write down the name. If it does not have a name, write "No".

21. Does this object orbit the larger object? If it does, how far does it orbit in astronomical units (AU) and in miles (use scientific notation and three significant figures for the miles answer)? If it does not orbit the larger object, write "No".s

22. In Kelvin, provide the temperature and its range.

23. What type of light created this image?

Use the following image for questions 24-35



24. What is the name of this object as written in this test?

25. Who is the person that this object is named after? Provide the first and last name.

26. What is this object's peak magnitude?

27. How long was this object visible during the daytime shortly after its discovery?

28. What is this object's galactic coordinates?

29. What galaxy does this object lie in?

30. How far is this object from Earth in light years?

31. How long was this object visible to the naked eye?

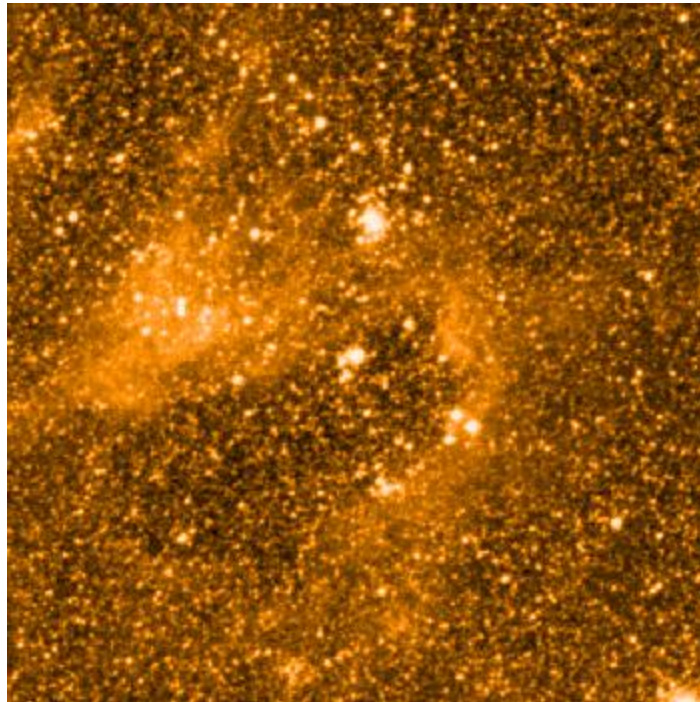
32. Which planets was this object brighter than at its peak brightness?

33. How did this object form?

34. What limit was crossed, causing this object to form?

35. What type of light created this image?

Use the following image for questions 36-47



36. What object lies at the center of this image?

37. What open cluster does this object lie in?

38. What galaxy does this object lie in?

39. What type of variable is the object?

40. What type of star is it? (examples: dwarf, giant, etc.)

41. What is the absolute magnitude of this object?

42. True or false: This object exhibits long, slow changes in brightness.

43. What is the normal temperature of this object in Kelvin?

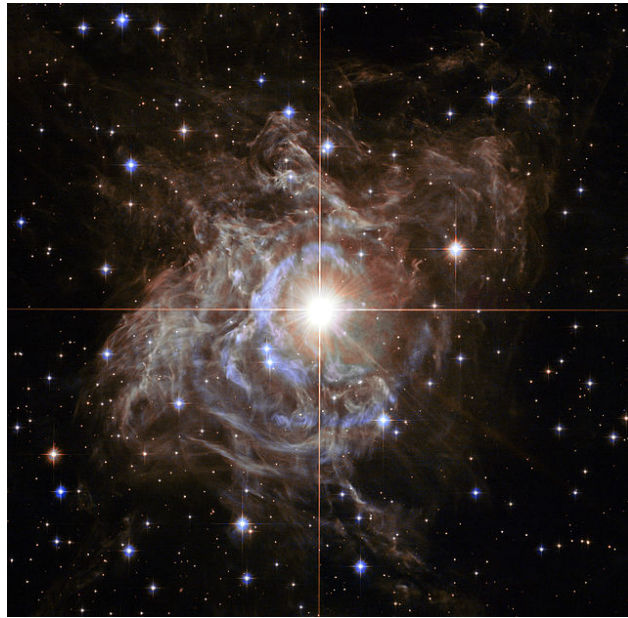
44. During an outburst, the temperature of this object falls below how many degrees Kelvin?

45. What is this object's spectral type?

46. True or false: this object is visible to the naked eye.

47. Why is this object visible/not visible?

Use the following image for questions 48-55



48. What is the name of this object?

49. What type of variable is this object?

50. How far away is this object from Earth in light years?

51. Was the distance to this object calculated accurately? Why or why not?

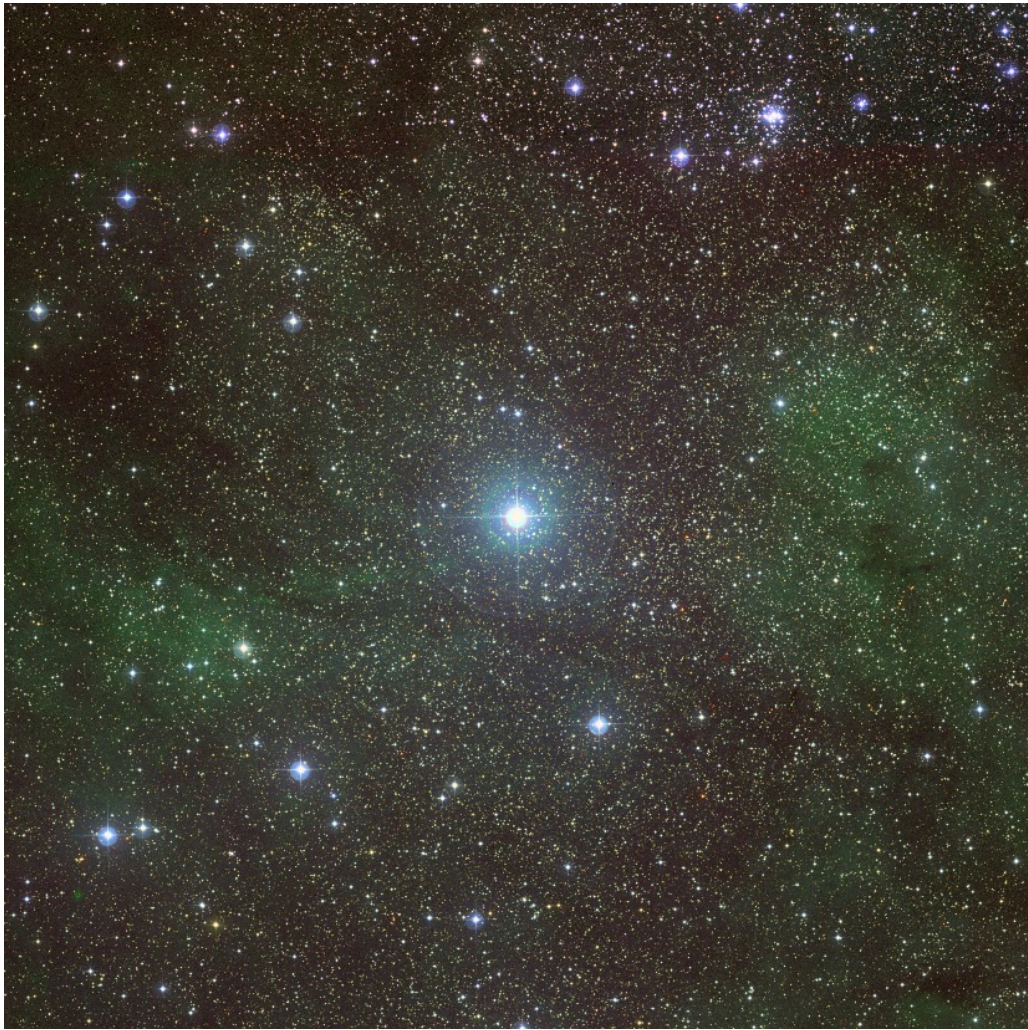
52. What is the solar mass of the star?

53. How is this star important in calculating distances?

54. How long is the period of the star?

55. What type of light created this image?

Use the following image for questions 56-62



56. What is the name of this object?

57. What type of variable is it?

58. Which object found in this test is this object similar to?

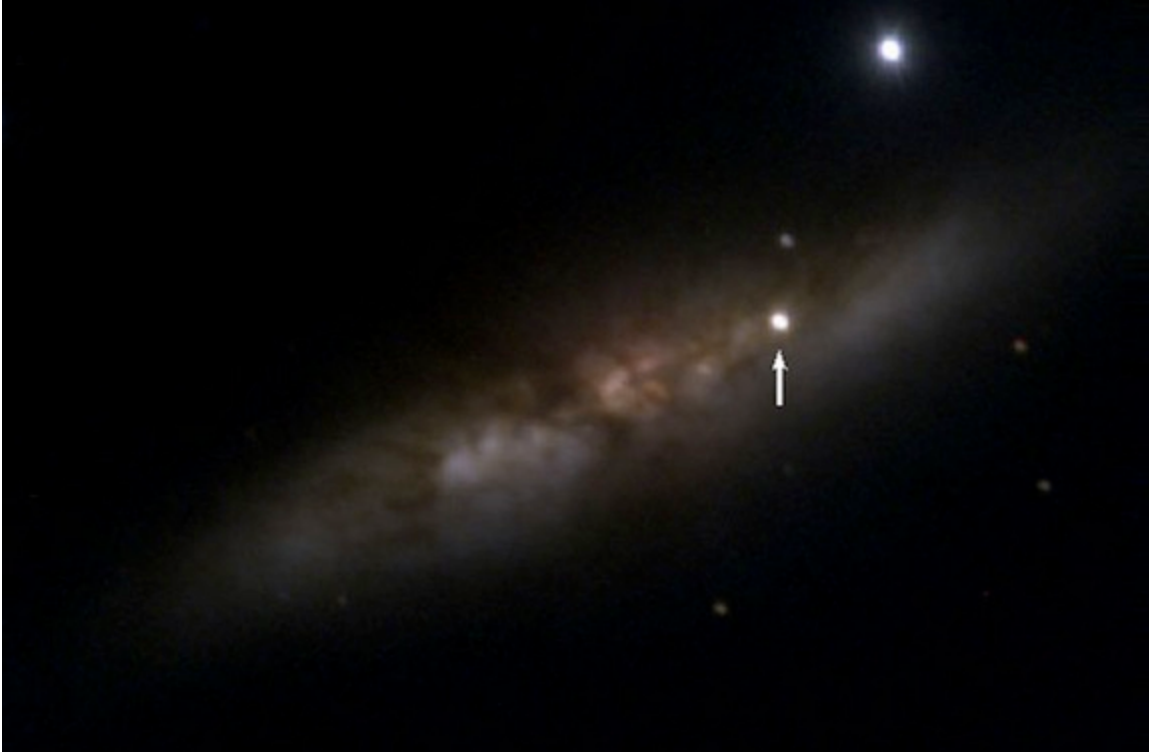
59. True or false: A star similar to this object would be found in a globular cluster.

60. What is the current apparent magnitude of this object?

61. What is one proposal for the cause of P Cygni's eruptions?

62. What type of light created this image?

Use the following image for questions 63-65



63. What is the name of the object being pointed at by the arrow?

64. What type of object is it? (**BE SPECIFIC**)

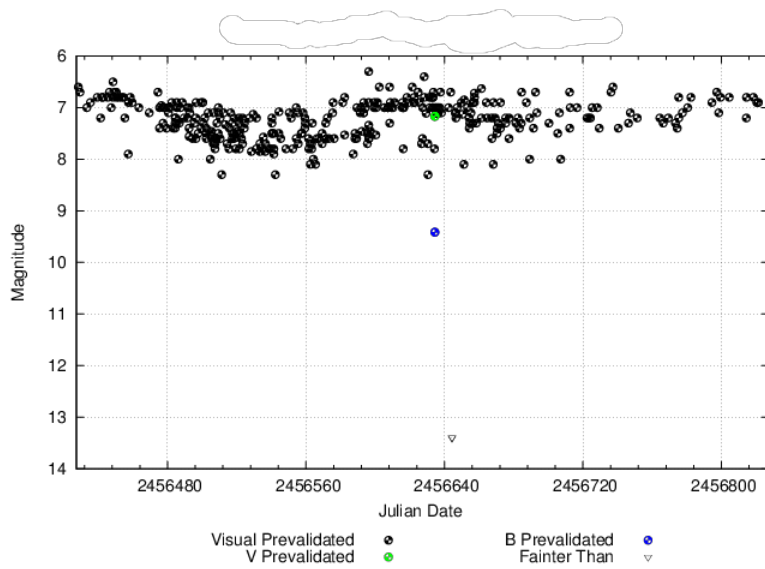
65. In what galaxy is this object in?

Part Three: Light Curves

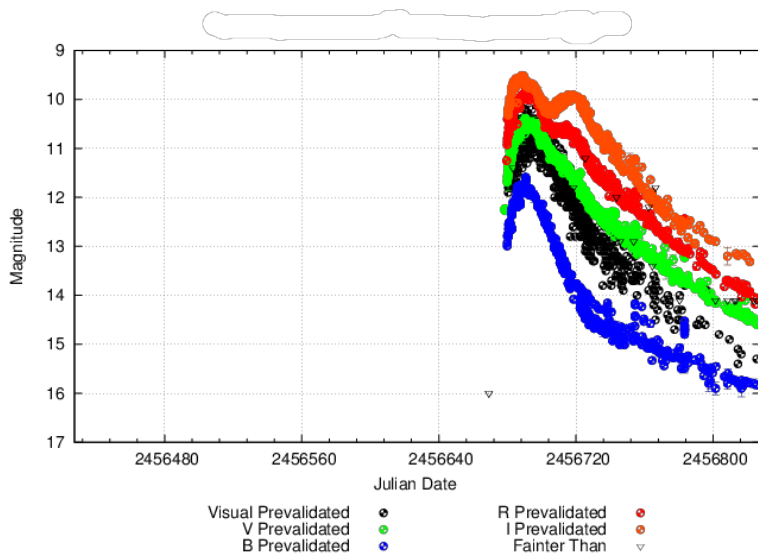
Match the light curve to its DSO. The curves are from the AAVSO website.

- A. *R Andromedae*
- B. *WZ Cassiopeia*
- C. P Cygni
- D. *S Doradus*
- E. *RS Puppis*
- F. *SN 2014J*

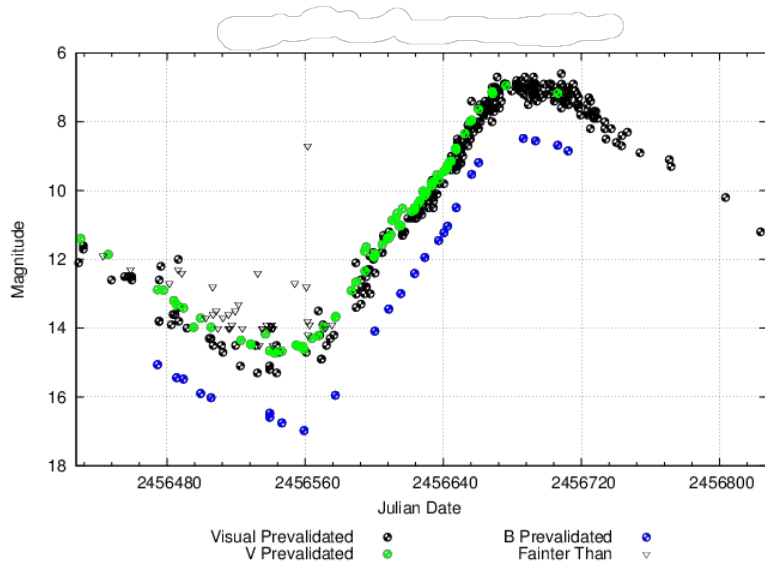
66.



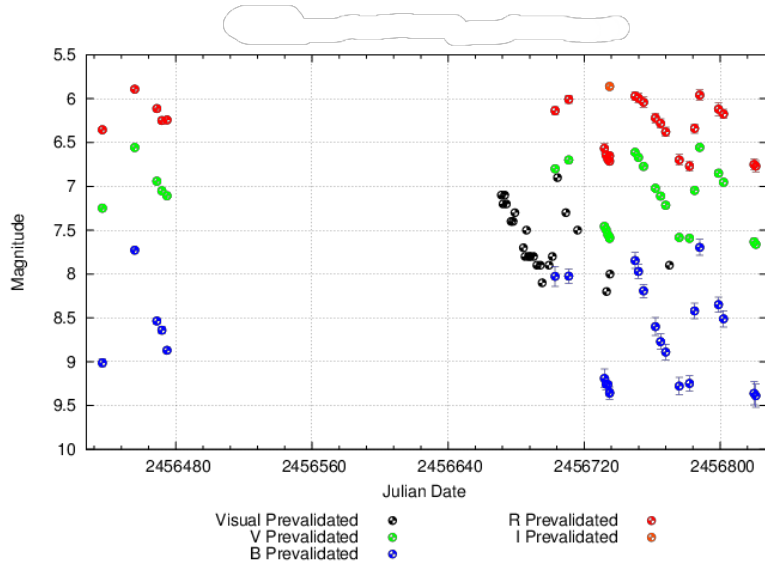
67.



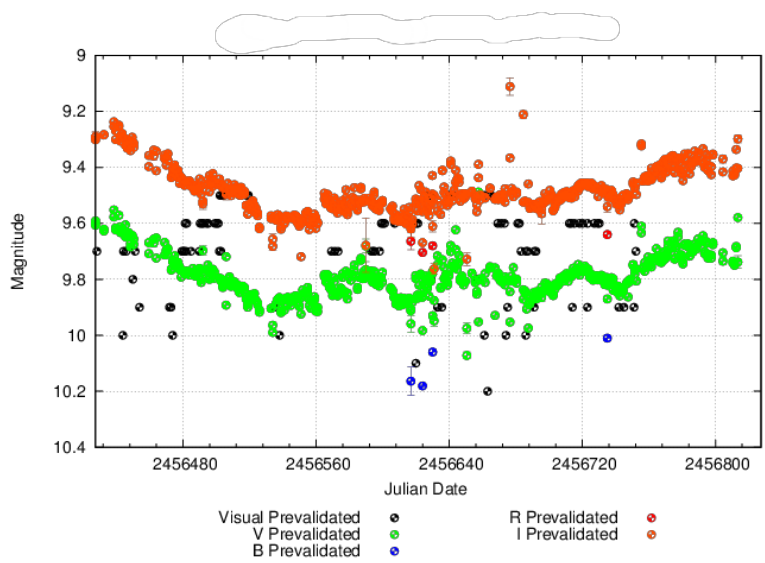
68.



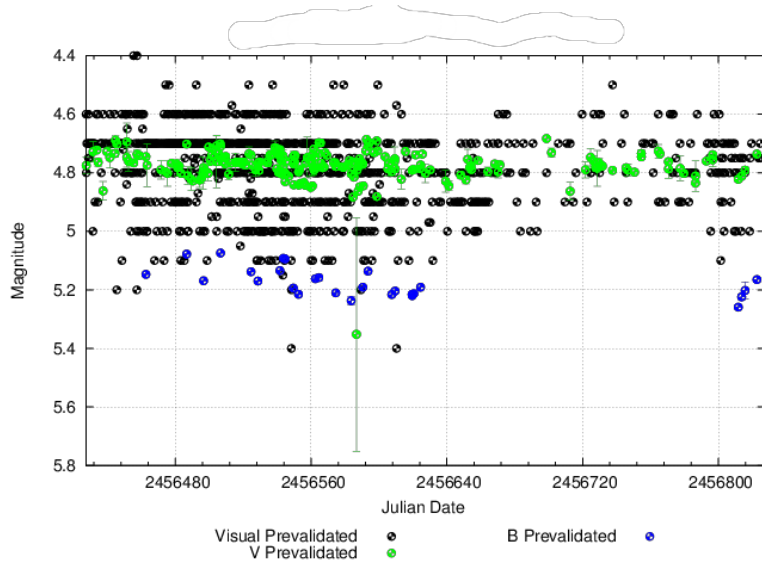
69.



70.



71.



Part Four: Mathematical Problems

Use the following mathematical formulas to solve the upcoming math problems pertaining to astronomy.

Distance Modulus Formula

Parallax Formula

Kepler's Laws of Planetary Motion/Mass of Binary System

SHOW ALL WORK. IF YOU HAVE NO ROOM, PLEASE USE THE SCRATCH PAPER. IF THERE IS NO WORK, NO POINTS WILL BE AWARDED FOR THE PROBLEM.

72. A star has a distance modulus of 4.2. Find the distance to the star in parsecs. Round to three significant figures.

73. A star is 75 parsecs from Earth and has an absolute magnitude of 2. Find the star's apparent magnitude. Round to three significant figures.

74. The star Gliese 581 has a parallax of 160.91 mas. How far is the star from Earth in parsecs? Round to three significant figures.

75. A planet is 5 AU from its star. What is the planet's period in years? Round to three significant figures.

76. The average separation between two stars in a binary system is 4 AUs and have an orbital period of 3 years. What is the mass of the binary star system in solar masses? Round to three significant figures.

77. In a binary star system, the total mass of the stars is 25 solar masses and the orbital period is .5 years. Find the distance between the stars in astronomical units. Round to three significant figures.

Use this sheet for scratch work

Use this sheet for scratch work

