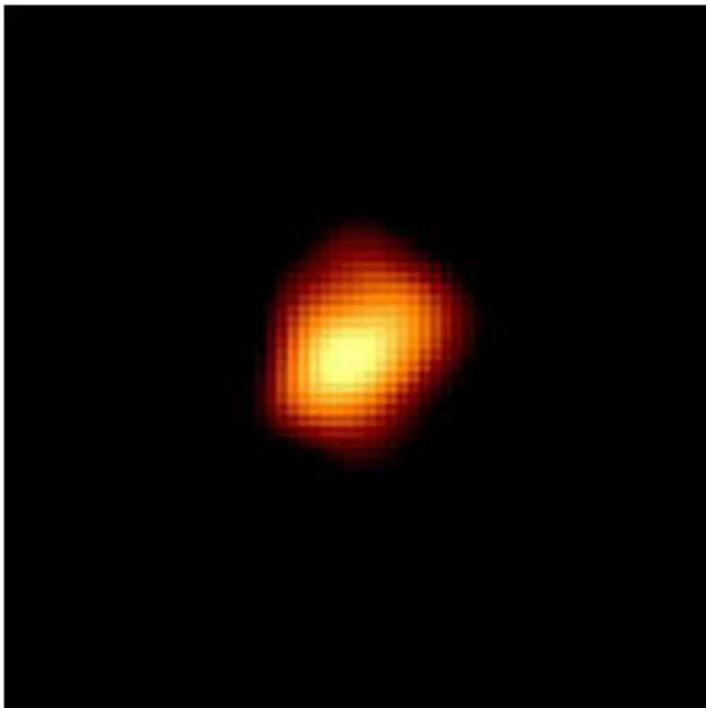
BVF Astro Test

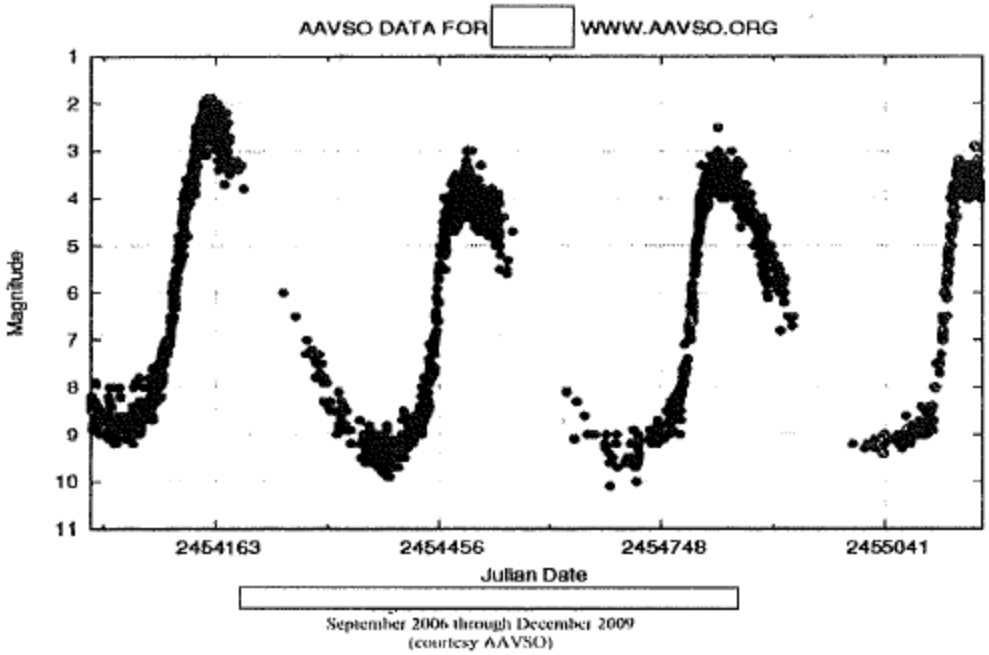
We will start with some questions on deep sky objects that arc projected and printed here in black and white, but you may split the test so that one or you can proceed with solving problems. The lights will be low for the projection for just 20 minutes. Problems should be written out with any necessary formula (s), a line or substitution, and a BOXED answer with units and correct significant units.


I.

1. This highly pixilated image of a star approximately 200 light years distant from Earth was generated by what visible light telescope system? _____

2. Identify this star (image I) _____

3. What type of object is this? _____
a) An x-ray black hole binary system
b) a planetary nebula and while dwarf
c) an accreting white dwarf and its red giant binary partner
d) A supermassive black hole centered in a Seyfert galaxy
e) A nebular quasar



4. What is thought to be the reason for the magnitude changes in the light curve?
a) Isotopes or helium produced by the dying star
b) Expansion and contraction or the star's core
c) Reversible titanium oxide formation in the stellar atmosphere
d) An eclipsing low luminosity binary star
e) Loss of light to an adjacent black hole

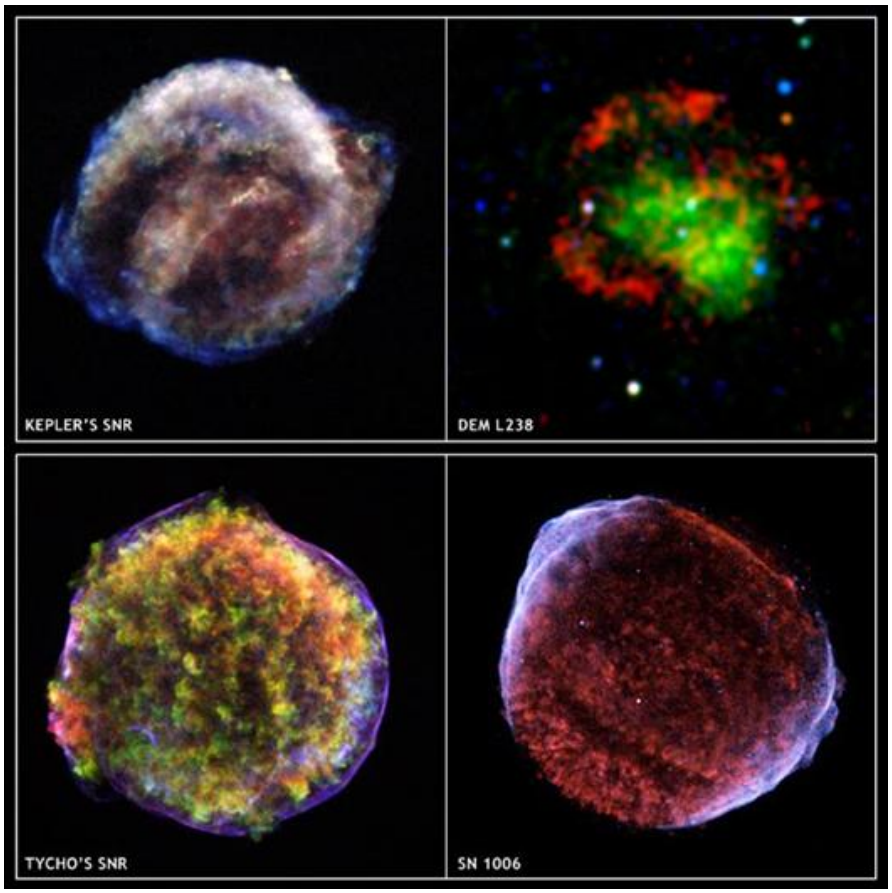

II.

5. What does this second image (image II) suggest about the object (this is a wide scale image of the object in ultraviolet light, note: the object in the lower left corner is a distant galaxy).
a. the object is emitting a stream of ultraviolet radiation
b. the object is emitting neutrino's inducing ultraviolet from interstellar H
c. the object is a comet vaporizing as it approaches a nearby star
d. the object is generating a glowing bow-wave as it moves at 130 km/s
e. the object is inducing a magnetic field which accelerates dark matter

 III.

6. What is the DSO above (image III.)

7. What makes this one unique?
a) it's the nearest of these objects
b) its center is the hotest of these objects discovered
c) it subtends the largest angle of the sky
d) it is the largest or these objects seen to date
e) it is the most massive of these objects yet found



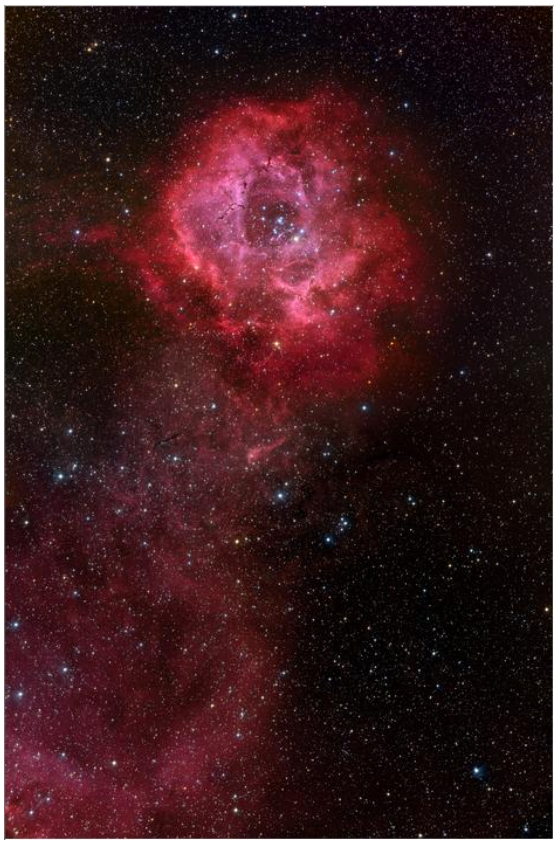
IV.

8. These four objects were recorded (image IV) by the _____x-ray Observatory.

9. The image in the upper right of image IV is denoted _____

10. Kepler's SNR and the upper right image are shown to have less uniform emission patterns than Tycho's SNR and SN 1006. This suggests that the upper two objects result from stars that are
a. hotter b. colder c. younger d. older e. more massive

11. What does NGC stand for as a designation of deep sky objects?



V.

12. What is the common name for this object (V)? _____

13. Why does this object have several NGC numbers?

a. It was identified by several independent observers during the 20th century
b. Each number designates n star in the nebula
c. 19th century observers thought it was several disconnected nebula
d. It has been re-numbered by Russian, American, and Chinese observers
e. None of these

VI.

14. What is the designation of this object? _____

15. What event occurred at this location in 2010 that had been noted before at the same location?
_____

16. Based in part on cooling from 10^{38} Kelvin during expansion to a temperature of 2.73 K, we predict the age of the Universe to be
a. 7000 years
b. 4.6 billion years
c. 13.6 billion years
d. 15 Billion years
e. 21 Trillion years

17. The cosmic microwave background radiation was discovered in 1963 was found to result from a time about 13.6 billion years ago
a. At the time of the Big Bang
b. $1/1000^{th}$ of a second after the Big Bang
c. 3 minutes after the Big Bang
d. 380,000 years after the Big Bang
e. 4.6 Billion years after the Big Bang

18. A group or stars in the Romulan cluster in the Milky Way has a main sequence brightness 49 times brighter than the Remean cluster of stars. How much closer are the Romulans?
a. They are 49 times closer, so they are 1/49 the distance of the Remeans.
b. They are 490 times closer, so they are 1/490 the distance of the Remeans.
c. They are 7 times closer, so they are 1/7 the distance of the Remeans.
d. They are 2401 times closer, so they're 1/2401 the distance of the Remeans.

19. Why doesn't iron fusion occur in collapsing main sequence stars?
a. There is no release of binding energy in the process
b. there are no heavier elements than iron
c. nickel fuses into iron
d. meteorites are mostly carbonaceous

20. If the core of a star surviving a supernova exceeds 3 M(sun) it is most likely to form
a. white dwarf
b. black hole
c. neutron star
d. iron

21. The visible disk of the Galaxy is about 100,000 light years in diameter and 2000 light years thick. If about 5 supernovae explode in the galaxy each century, how often would you expect to see a supernova within 1000 light years of the sun?

22. If the Hubble's law constant (H_0) = 50 km/s/Mpc, what speed is a galaxy observed to be 8 billion light-years away moving away from us?

23. A Type Ia supernova occurs in a distant galaxy. Focusing the light from the galaxy onto a photometer in the Hubble Space Telescope we determine that the flux is 9.02×10^{-17} W/m^2. Knowing that all type Ia supernovae produce a luminosity of about 1.0×10^{10} L(sun), how distant is this galaxy in light years?

24. What is the approximate surface temperature of a star 100 times brighter than our sun?

25. When our Sun collapses into a white dwarf it will lose 50.0% of its mass and shrink to a radius 1% of its main sequence size. Assuming the lost mass carries away no angular momentum, what would the Sun's new rotation rate be in rad/s? Assume the sun currently rotates in 30 Days.

[UPLOADER'S NOTE: ANSWERS FOR THE ENTIRE MATH SECTION (#21 – 25) ARE OF QUESTIONABLE ACCURACY.]

Key

1. Hubble Telescope
2. Mira or omicron ceti
3. C
4. C
5. D
6. NGC 2440
7. B
8. Chandra
9. DEM L238 [UPLOADER'S NOTE: NO, THIS QUESTION IS NOT TESTING YOUR ABILITY TO READ – AT COMPETITION THE LABEL FOR DEM L238 WAS COVERED ON THE PROJECTION, BUT NOT ON THE TEST ITSELF.]
10. C [UPLOADER'S NOTE: E MAY ALSO BE AN ACCEPTABLE ANSWER, EVEN THOUGH THE KEY DOESN'T MARK IT AS ONE, SINCE STARS WITH MORE MASS HAVE SHORTER LIFESPANS.]
11. New General Catalogue
12. The Rosette Nebula
13. C
14. U Scorpii or NGC 6334
15. A nova
16. C
17. D
18. C
19. A
20. B

(4 Pts. Each)

21. Every 3750 y
22. 1×10^5 parsecs [UPLOADER'S NOTE: YES, PARSECS ARE A UNIT OF DISTANCE, EVEN THOUGH THE QUESTION ASKS FOR VELOCITY – NOT EXACTLY SURE WHAT WAS UP WITH THIS.]
23. 6 billion ly
24. 5×10^{-2} rad/s
25. 10,000 – 15,000 K (accept in this range)

Extraneous significant digits -.5, lack of digits -1