Snowyew's Astronomy Test

INSTRUCTIONS

Calculations and work must be shown when applicable. Make sure to use the appropriate number of significant figures as well as the correct units. **Failure to do so will result in point deductions from each question**.

Since topics are predicted to be the same, DSOs are from last year's list.

Tie breaker questions will be marked with a blue asterisk (*).

School: _____

Names: _____

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THEORY (2pts/question):

1. Brown dwarves usually have a radius similar to which planet?

2. Name 4 spectral classes of brown dwarves:

3. How are high mass brown dwarves distinguished from low mass stars?

4. What is the upper mass limit for brown dwarves in Jupiter masses?

5. Describe the Kelvin-Helmholtz mechanism. Then name two planets in our solar system that exhibits this mechanism.

6. What is the most common explanation scientists give for finding hot Jupiters at extremely small orbits around their parent star?

Young T Tauris have (6.)_____ in their atmospheres. They are (7.) (regular/ irregular)

variable stars and are found near (8.) _____ clouds.

For the following questions, circle True or False. If False, explain why.

10. (T/F) Our Solar System is in a Superbubble.

11. (T/F) Bok globules are a type of Reflection Nebulae.

12. (T/F) Population III stars have been observed

13. (T/F) Population II stars are located near the center of the galaxy.

14. (T/F) Beryllium is usually not a long term product of thermonuclear burning in Main Sequence stars due to its instability.

15. (T/F) Main sequence stars cannot regulate their temperature.

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Open clusters are (16.) (Young/ old/ neither), and are characterized by (high/ low) mass and have (18.) (high/ low) metallicity. The opposite is true for a(n) (19.) _____ cluster.

20. Describe how an ionization front forms*:

HII regions are areas of (21.) (limited/ normal/ intense) star formation. Large blue stars emit lots of (22.) _____ that ionize the surrounding gas. (23.) _____ can blow the cloud apart and leave behind clusters of young stars.

After a star forms from a nebula, the collapsing cloud (24.)_____ and it begins to rotate. This causes the cloud to thin out and form a (25.) _____ around the star, which is the birthplace of planets. Eventually, instabilities within the disk will cause portions of it to (26.)_____ into chunks that (27.) _____ the surrounding material while growing bigger and bigger. The bigger these chunks of dust get, the (28.) _____ material they attract. These are called (29.)_____, or the beginnings of planets.
A planetary system begins reaching maturity when the objects revolving around it have built up (30.) _____ and (31.)_____ objects and cleared out much of the disk's (32.)_____. In application to our solar system, this process is called the (33.) _____.

34. Emission nebulas are usually around _____% Hydrogen.

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CALCULATIONS (4pts/question):

35. A planet Z has a radius 5390km and radiates 1.27×10^{17}W. What is its surface temperature in ˚C? Could this planet support life assuming a pressure of 1atm (assuming presence of liquid water is the sole criteria)? *

36. Planet X and Planet Y are orbiting the same star. If Planet X has an orbital period 7x that of Planet Y, what is the orbital radius of Planet Y in terms of Planet X? (simplify – don't leave radicals in denominator)

37. What is the combined mass of binary stars A and B if the time it takes for one orbit is 23.8 years and the distance between them is 42.6AU? (give answer in solar masses)

38. How far away is Star C if the star has shifted 0.53arcseconds in 1year? (give answer in AU)

39. What is the luminosity of a star with radius 4.93×10^{9}m and temperature 6380K? (give answer in both solar luminosities and Watts)

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40. Imagine that two stars have the same radius but the second star is three times as hot as the first star.

a. If the peak of the blackbody spectrum of the first star is at a wavelength of 537 nm, at what wavelength does the blackbody spectrum of the second star have a peak? (give answer in nm)

b. For the stars described above, how many times brighter is the second star than the first?

41. While travelling through space, you find a new planet in a faraway galaxy with strange life forms on it. Before landing on the planet, you decide to make some measurements and calculations. After circling the planet a few times while making some measurements, you find that the mass of the planet is 7.92×10^{25}kg and the planet's radius is 2.43×10^{4}km.

a. You are very concerned about landing your airship and do not want to descend too fast. What is the acceleration due to gravity at the surface of the planet? (give answer in m/s^2)

b. You are concerned about how you will move about on the planet due to the effects of gravity. If you are 54.4 kg, calculate your weight in N on the planet.

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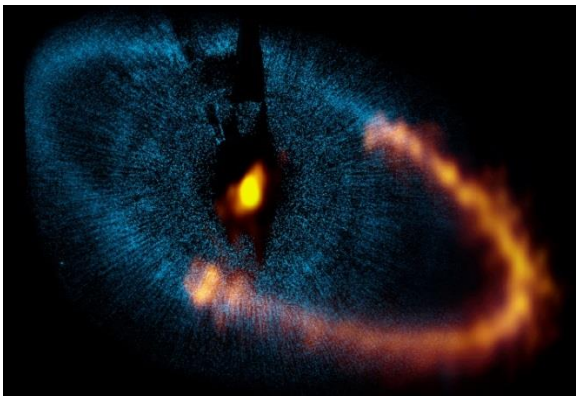
IDENTIFICATION (2pts/question):

Identify the following pictures and answer the questions about them.

42. 

43. What constellation does this star belong to?

44. How is this star distinguishable from the rest of the stars in its constellation?

45. This star is known to be surrounded by (no/ a single/ two/ several) debris disks.

46. _____ is this star's first _____ exoplanet.

47. Name 2 peculiarities regarding the exoplanet mentioned in #46.

48. Some scientists believe the exoplanet mentioned above is not a planet but a:

49. This star has (more/ less/ as much) metal than/as the sun.

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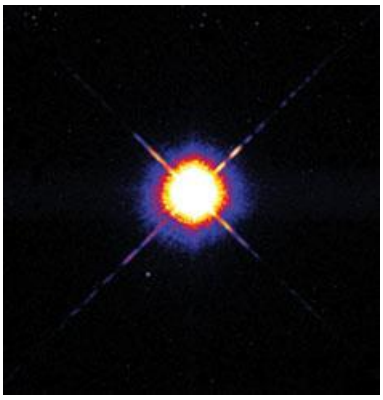
50.  (Messier designation)
51. What are the 4 types of clusters/nebulae to this entity (be specific)?

52. What is the common name for this entity?

53. What does its name from #52 mean?

54. 

55. What kind of star is this?

56. This star's surface has an abundance of what compound?

57. This star is a substellar companion for what star?

58. What kind of instrument was used in the discovery of this star?

59. How does this instrument work?

60. Why is this instrument necessary?

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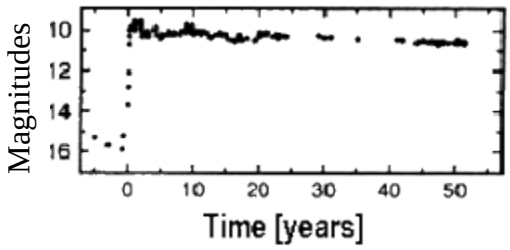
61. What does this light curve depict?

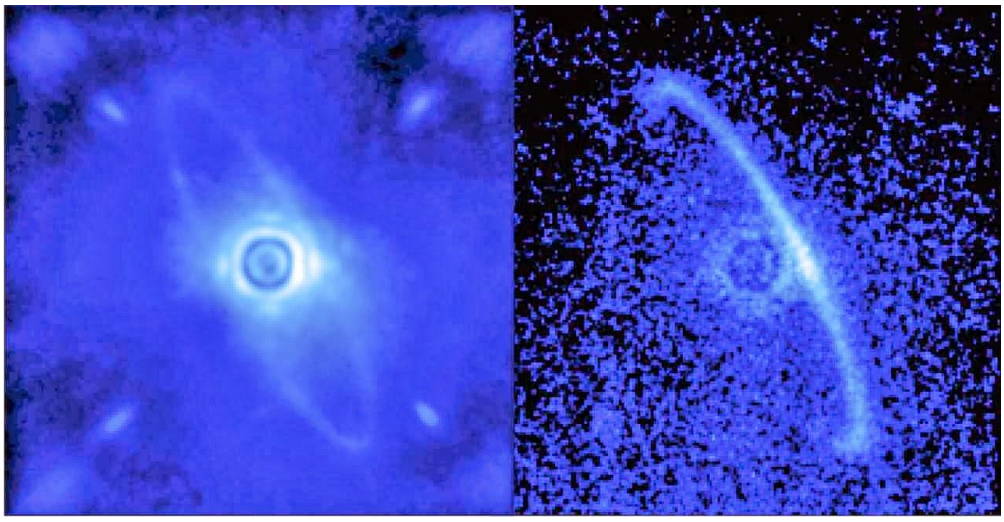


62. What causes this phenomenon to occur?*

63. Stars that exhibit this phenomenon are (pre-main / main / post-main) sequence.

64. The stars that exhibit this phenomenon experience a(n) (minimal/ small/ average/ large/ extreme) change in magnitude and spectral type.

65. These stars are always associated with _____ nebulae.

66. 

This star is the (67.)_____ brightest star in the constellation (68.)_____.

69. This star exhibits a(n) _____ of infrared emission as compared to normal stars of its type.

70. What element has been discovered in abundance in the debris disk around this star?