1 The star alpha-Centauri C has moved across the sky by 3853 seconds of arc during the last thousand years - slightly more than one full degree of arc. Its proper motion is

a. $38.53''$/yr.
b. $3853''$/yr.
c. $0.26''$/yr.
d. $3.853''$/yr.
e. $1.9265''$/yr.

2 In the core of a high-mass star, the formation of 'degenerate neutron matter' which consists entirely of neutrons that touch one another

a. releases a burst of neutrinos.
b. causes a gamma-ray burst.
c. triggers a nova.
d. starts the collapse of the star's core.
e. starts a supernova explosion.

3 When the iron nuclei in the core of an evolved high-mass star start to come apart, they

a. release energy and raise the core temperature.
b. trigger a new round of nuclear fusion.
c. absorb energy and limit the core temperature.
d. cause the core to expand.

4 The reason that the Crab Pulsar is slowing down is

a. that it is getting older.
b. tidal friction due to the gravity of a nearby star.
c. that it is running out of nuclear fuel.
d. its magnetic field is dragging through nearby gas.
e. that it is losing electric charge.

5 The constellation Sagittarius is where the Milky Way

a. cannot be found.
b. splits into two bands.
c. has its most northern point.
d. is thickest.
e. is thinnest.

6 A star is seen to move by 0.4 seconds of arc between March 1, 1999 and September 1, 1999 and then back to its starting point on March 1, 2000. What is the parallax angle for this star?

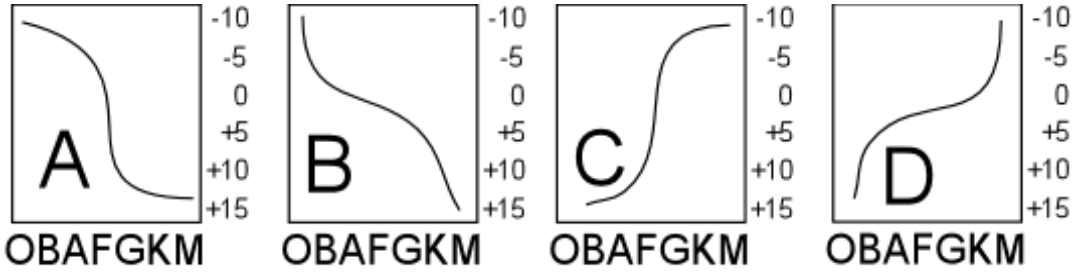
a. 0.1 seconds of arc.
b. 0.8 seconds of arc.
c. 0.4 seconds of arc.
d. 0.2 seconds of arc.
e. 0.3 seconds of arc.

7 Stars with more than 15 times the mass of our Sun usually evolve from the main sequence to red giants
   a. in several stages, some with almost constant temperature.
   b. without pausing while getting brighter at almost constant temperature.
   c. in several stages, but none with almost constant temperature.
   d. without pausing while getting cooler at almost constant brightness.

8 In an evolved high-mass star, when the electrons combine with protons to form a pure neutron core, the reaction
   a. absorbs gamma rays.
   b. generates a neutrino burst.
   c. generates an X-ray burst.
   d. generates a gamma ray burst.
   e. absorbs neutrinos.

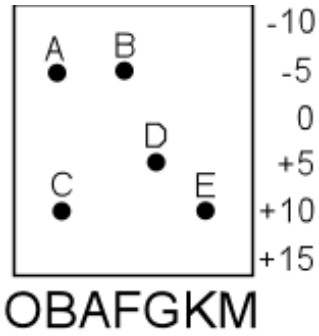
9 Stars that are much more massive than our Sun
   a. form faster but burn slower.
   b. form faster and burn out faster.
   c. form more slowly but burn out faster.
   d. form more slowly and burn slower.

10 Which of the following pictures is the most like the main sequence on a Hertzsprung-Russell Diagram?



11 The position of a protostar on an HR diagram changes because
   a. the mass of the protostar changes.
   b. the size and temperature of the protostar change.
   c. the protostar moves.
   d. the protostar gets older.

12 In the Hertzsprung-Russell Diagram shown, which point represents a star of type B with absolute magnitude -5?



13 A few hundred stars, close to each other in space, but arranged in an irregular formation is probably
   a. a constellation.
   b. a galaxy.
   c. an asterism.
   d. a globular cluster.
   e. an open cluster.

14 When the core of a star collapses while inside the star, the result is a
   a. gamma-ray burst.
   b. type II supernova.
   c. type I supernova.
   d. ordinary nova.

15 A star whose apparent brightness is 10^{-6} times that of a first magnitude star would have magnitude
   a. 21.
   b. 6.
   c. 16.
   d. 11.
   e. 1.

16 One conclusion that was drawn from the gradual slowing of the radio signals from the Crab Nebula was that they were probably
   a. from a source moving toward us.
   b. from a source moving away from us.
   c. an obvious hoax.
   d. of artificial origin.
   e. of natural origin.

17 A nova occurs when
   a. the core of a star suddenly collapses.
   b. a star runs out of fuel.
   c. a white dwarf steals fuel from a neighbor.
   d. a star blows off its outer envelope.
   e. a red giant begins to burn helium.

18 The formation of large molecules in interstellar clouds helps the clouds to collapse by
   a. absorbing radio waves.
   b. making dust grains stick together.
   c. stopping ultraviolet light.
   d. converting heat into radio waves.
   e. causing the gas to take up less space.

19 When the helium fuel runs out at the center of a horizontal branch star, it
   a. returns to the main sequence.
   b. explodes as a supernova.
   c. swells up and becomes a red supergiant.
   d. begins to collapse to a white dwarf star.
   e. stops burning and becomes a brown dwarf.

20 In a Hertzsprung-Russell diagram, the hottest stars are found
   a. on the left side.
   b. at the top.
   c. on the right side.
   d. at the bottom.

21 In comparison to Cepheid variables, RR Lyra variable stars are
   a. less luminous and more common.
   b. more luminous and more common.
   c. less luminous and less common.
   d. more luminous and less common.

22 The photosphere of a protostar
   a. is where photons are last scattered.
   b. is where the temperature is a maximum.
   c. does not exist since only stars have photospheres.
   d. is where the pressure drops to zero.
   e. is the outer boundary of the collapsing cloud.

23 The star 36-Ophiuchus is six parsecs from our Sun. The light from this star in the “serpent holder” constellation has been traveling for approximately
   a. 1.8 years.
   b. 20 years.
   c. 6 years.
   d. 12 years.
   e. 0.55 years.

24 A black hole that has formed from the collapse of a star is expected to be
   a. 100 times the size of a neutron star.
   b. similar in size to a neutron star.
   c. less than 1/10 the size of a neutron star.

25 A globular cluster usually consists of
   a. A single dead star surrounded by glowing gas.
   b. Glowing gas and newborn stars.
   c. Billions of stars together.
   d. Millions of stars together.

26 The Earth's motion around the Sun causes
   a. nearby stars to shift back and forth once a year.
   b. all stars to jump randomly around.
   c. all stars to move away from a point in the constellation Hercules.
   d. nearby stars to shift steadily in the same direction.

27 Which of the following spectral types corresponds to a star on the main sequence?
   a. O2Ia
   b. A2Ib
   c. B4V
   d. K2III
   e. G2IV

28 The 'helium flash' refers to
   a. the end of hydrogen burning in a star's core.
   b. the onset of the red subgiant stage.
   c. the explosive ignition of a star's helium core.
   d. the onset of the red giant stage.
   e. the end of helium burning in a star's core.

29 Which of the following colors indicates the hottest star?
   a. peach.
   b. orange.
   c. red.
   d. yellow.
   e. blue.

30 The apparent brightness of our Sun is roughly 1000 watts per square meter. At a distance of 30 times the Earth-Sun distance, the apparent brightness of our Sun would be
   a. 1000 watts per square meter.
   b. 30000 watts per square meter.
   c. 900,000 watts per square meter.
   d. 1.1 watts per square meter.
   e. 33 watts per square meter.

31 Our sun is roughly at the center of
   a. the visible part of the Milky Way.
   b. a globular cluster.
   c. the entire Milky Way Galaxy.

32 The red subgiant stage of a star is best described by
   a. constant temperature and brightness.
   b. increasing temperature and increasing brightness.
   c. dropping temperature and increasing brightness.
   d. increasing temperature and decreasing brightness.
   e. dropping temperature and constant brightness.

33 Your starship is pulled in to what appears to be a black hole. It is really a wormhole if you
   a. immediately crash onto the surface of a collapsing star.
   b. can no longer get signals out.
   c. cannot escape without exceeding the speed of light.
   d. achieve a stable orbit around it.
   e. emerge into a different part of space.

34 A star with a distance modulus of zero is at a distance of
   a. 1000 parsecs.
   b. 1 parsec.
   c. 100 parsecs.
   d. 10,000 parsecs.
   e. 10 parsecs.

35 Our Sun is a G2V star with absolute magnitude 4.8. Suppose that a star of spectral type G2V is observed to have apparent magnitude -0.2. How far away is it?
   a. 1000 parsecs.
   b. 100 parsecs.
   c. 1 parsec.
   d. 10 parsecs.
   e. 5 parsecs.

36 A star is found to have absolute magnitude 4 and apparent magnitude 24. How far away is it?
   a. 10 parsecs.
   b. 10,000 parsecs.
   c. 100,000 parsecs.
   d. 20 parsecs.
   e. 200 parsecs.

37 Black holes
   a. have been detected because infalling matter emits X-rays.
   b. cannot be detected because they emit no radiation.
   c. have been detected because they block starlight.
   d. have been detected as pulsing radio sources.

38 A star that forms an iron core most likely has a mass of
   a. between 1 and 4 solar masses.
   b. more than 20 solar masses.
   c. less than one solar mass.
   d. between 15 and 20 solar masses.

39 The formation of a new white dwarf is usually accompanied by a
   a. supernova explosion.
   b. nova.
   c. helium flash.
   d. planetary nebula.
   e. dust cloud.

40 A steady X-ray signal with sudden bursts lasting a few seconds each is probably caused by

a. an isolated neutron star.
b. a supermassive star.
c. a white dwarf in a binary system.
d. a main sequence star.
e. a neutron star in a binary system.

41 The size of a typical white dwarf star is comparable to the size of

a. a red giant star.
b. an asteroid.
c. the Earth.
d. our solar system.
e. our Sun.

42 Which of the following spectral types corresponds to the star with the lowest surface temperature?

a. G0
b. G5
c. K5
d. K0

43 Which of the following spectral classes corresponds to the lowest surface temperature (on this list)?

a. B
b. G
c. A
d. K
e. F

Answer Key: Fall 2007 AHX3A

1 Choice d. ($3.853''$/yr.)
2 Choice e. (starts a supernova explosion.)
3 Choice c. (absorb energy and limit the core temperature.)
4 Choice d. (its magnetic field is dragging through nearby gas.)
5 Choice d. (is thickest.)
6 Choice d. (0.2 seconds of arc.)
7 Choice d. (without pausing while getting cooler at almost constant brightness.)
8 Choice b. (generates a neutrino burst.)
9 Choice b. (form faster and burn out faster.)
10 Choice b. (B)
11 Choice b. (the size and temperature of the protostar change.)
12 Choice a. (A)
13 Choice e. (an open cluster.)
14 Choice b. (type II supernova.)
15 Choice c. (16.)
16 Choice e. (of natural origin.)
17 Choice c. (a white dwarf steals fuel from a neighbor.)
18 Choice d. (converting heat into radio waves.)
19 Choice c. (swells up and becomes a red supergiant.)
20 Choice a. (on the left side.)
21 Choice a. (less luminous and more common.)
22 Choice a. (is where photons are last scattered.)
23 Choice b. (20 years.)
24 Choice b. (similar in size to a neutron star.)
25 Choice d. (Millions of stars together.)
26 Choice a. (nearby stars to shift back and forth once a year.)
27 Choice c. (B4V)
28 Choice c. (the explosive ignition of a star's helium core.)
29 Choice e. (blue.)
30 Choice d. (1.1 watts per square meter.)
31 Choice a. (the visible part of the Milky Way.)
32 Choice e. (dropping temperature and constant brightness.)
33 Choice e. (emerge into a different part of space.)
34 Choice e. (10 parsecs.)
35 Choice c. (1 parsec.)
36 Choice c. (100,000 parsecs.)

37 Choice a. (have been detected because infalling matter emits X-rays.)

38 Choice d. (between 15 and 20 solar masses.)

39 Choice d. (planetary nebula.)

40 Choice e. (a neutron star in a binary system.)

41 Choice c. (the Earth.)

42 Choice c. (K5)

43 Choice d. (K)

Solutions

1 Module 043: Stellar Parallax Question 043.42
2 Module 049: Supernova Explosions Question 049.52
3 Module 049: Supernova Explosions Question 049.32
4 Module 050: Neutron Stars Question 050.23
5 Module 052: The Milky Way Question 052.14
6 Module 043: Stellar Parallax Question 043.22
7 Module 049: Supernova Explosions Question 049.21
8 Module 049: Supernova Explosions Question 049.42
9 Module 047: Star Formation Question 047.41
10 Module 046: The Hertzsprung-Russell Diagram Question 046.32
11 Module 047: Star Formation Question 047.34
12 Module 046: The Hertzsprung-Russell Diagram Question 046.15
13 Module 047: Star Formation Question 047.52
14 Module 049: Supernova Explosions Question 049.61
15 Module 044: Stellar Magnitudes 044.23
16 Module 050: Neutron Stars Question 050.12
17 Module 048: The Quiet Deaths of Ordinary Stars Question 048.61
18 Module 047: Star Formation Question 047.12
19 Module 048: The Quiet Deaths of Ordinary Stars Question 048.32
20 Module 046: The Hertzsprung-Russell Diagram Question 046.24
21 Module 052: The Milky Way Question 052.33
22 Module 047: Star Formation Question 047.23
23 Module 043: Stellar Parallax Question 043.34
24 Module 051: Black Holes Question 051.13
25 Module 052: The Milky Way Question 052.22
26 Module 043: Stellar Parallax Question 043.12
27 Module 046: The Hertzsprung-Russell Diagram Question 046.43
28 Module 048: The Quiet Deaths of Ordinary Stars Question 048.24
29 Module 045: Star Colors and Classes 045.11
30 Module 044: Stellar Magnitudes 044.11
31 Module 052: The Milky Way Question 052.42
32 Module 048: The Quiet Deaths of Ordinary Stars Question 048.13
33 Module 051: Black Holes Question 051.32
34 Module 044: Stellar Magnitudes 044.31
35 Module 046: The Hertzsprung-Russell Diagram Question 046.54
36 Module 044: Stellar Magnitudes 044.43

37 Module 051: Black Holes Question 051.21

38 Module 049: Supernova Explosions Question 049.12

39 Module 048: The Quiet Deaths of Ordinary Stars Question 048.44

40 Module 050: Neutron Stars Question 050.32

41 Module 048: The Quiet Deaths of Ordinary Stars Question 048.51

42 Module 045: Star Colors and Classes Question 045.32

43 Module 045: Star Colors and Classes Question 045.22