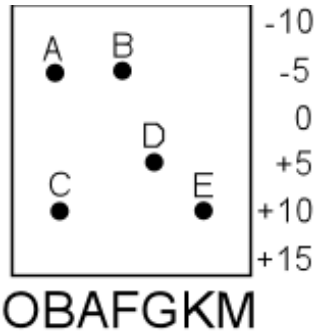
1 A steady X-ray signal with sudden bursts lasting a few seconds each is probably caused by
   a. a supermassive star.
   b. a neutron star in a binary system.
   c. a white dwarf in a binary system.
   d. an isolated neutron star.
   e. a main sequence star.

2 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. 6 years.
   c. 20 years.
   d. 12 years.
   e. 0.55 years.

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



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

5 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.

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

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

8 The size of a typical white dwarf star is comparable to the size of
   a. the Earth.
   b. our Sun.
   c. a red giant star.
   d. our solar system.
   e. an asteroid.

9 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. 5 parsecs.
   c. 100 parsecs.
   d. 1 parsec.
   e. 10 parsecs.

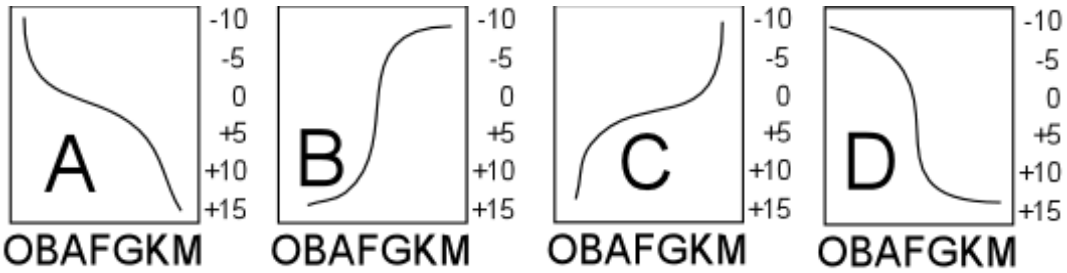
10 A star that forms an iron core most likely has a mass of
   a. more than 20 solar masses.
   b. between 1 and 4 solar masses.
   c. less than one solar mass.
   d. between 15 and 20 solar masses.

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

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

13 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 away from us.
   b. of artificial origin.
   c. from a source moving toward us.
   d. of natural origin.
   e. an obvious hoax.

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



15 The 'helium flash' refers to

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

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

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

17 A few hundred stars, close to each other in space, but arranged in an irregular formation is probably

a. an asterism.
b. a galaxy.
c. an open cluster.
d. a constellation.
e. a globular cluster.

18 When the helium fuel runs out at the center of a horizontal branch star, it

a. swells up and becomes a red supergiant.
b. explodes as a supernova.
c. stops burning and becomes a brown dwarf.
d. begins to collapse to a white dwarf star.
e. returns to the main sequence.

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

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

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

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

22 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 as pulsing radio sources.
   d. have been detected because they block starlight.

23 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. 0.3 seconds of arc.
   b. 0.4 seconds of arc.
   c. 0.8 seconds of arc.
   d. 0.1 seconds of arc.
   e. 0.2 seconds of arc.

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

25 The constellation Sagittarius is where the Milky Way
   a. splits into two bands.
   b. cannot be found.
   c. is thickest.
   d. has its most northern point.
   e. is thinnest.

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

27 Stars that are much more massive than our Sun

a. form faster and burn out faster.

b. form faster but burn slower.

c. form more slowly but burn out faster.

d. form more slowly and burn slower.

28 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. $3853''$/yr.

b. $38.53''$/yr.

c. $3.853''$/yr.

d. $0.26''$/yr.

e. $1.9265''$/yr.

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

a. G0

b. K0

c. G5

d. K5

30 A globular cluster usually consists of

a. Millions of stars together.

b. Glowing gas and newborn stars.

c. Billions of stars together.

d. A single dead star surrounded by glowing gas.

31 The photosphere of a protostar

a. does not exist since only stars have photospheres.

b. is the outer boundary of the collapsing cloud.

c. is where the pressure drops to zero.

d. is where photons are last scattered.

e. is where the temperature is a maximum.

32 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.

33 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. 1.1 watts per square meter.

b. 1000 watts per square meter.

c. 30000 watts per square meter.

d. 900,000 watts per square meter.

e. 33 watts per square meter.

34 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.

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

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

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

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

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

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

41 A star with a distance modulus of zero is at a distance of

a. 100 parsecs.
b. 10,000 parsecs.
c. 1000 parsecs.
d. 10 parsecs.
e. 1 parsec.

42 A star whose apparent brightness is 10^{-6} times that of a first magnitude star would have magnitude

a. 16.
b. 11.
c. 21.
d. 1.
e. 6.

43 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. less than 1/10 the size of a neutron star.
c. similar in size to a neutron star.

Answer Key: Fall 2007 AHX3C

1 Choice b. (a neutron star in a binary system.)
2 Choice c. (20 years.)
3 Choice b. (B)
4 Choice c. (type II supernova.)
5 Choice c. (absorb energy and limit the core temperature.)
6 Choice a. (on the left side.)
7 Choice d. (the size and temperature of the protostar change.)
8 Choice a. (the Earth.)
9 Choice d. (1 parsec.)
10 Choice d. (between 15 and 20 solar masses.)
11 Choice e. (blue.)
12 Choice b. (B4V)
13 Choice d. (of natural origin.)
14 Choice a. (A)
15 Choice a. (the explosive ignition of a star's helium core.)
16 Choice d. (starts a supernova explosion.)
17 Choice c. (an open cluster.)
18 Choice a. (swells up and becomes a red supergiant.)
19 Choice e. (K)
20 Choice a. (its magnetic field is dragging through nearby gas.)
21 Choice c. (emerge into a different part of space.)
22 Choice a. (have been detected because infalling matter emits X-rays.)
23 Choice e. (0.2 seconds of arc.)
24 Choice d. (generates a neutrino burst.)
25 Choice c. (is thickest.)
26 Choice d. (dropping temperature and constant brightness.)
27 Choice a. (form faster and burn out faster.)
28 Choice c. ($3.853''$/yr.)
29 Choice d. (K5)
30 Choice a. (Millions of stars together.)
31 Choice d. (is where photons are last scattered.)
32 Choice d. (without pausing while getting cooler at almost constant brightness.)
33 Choice a. (1.1 watts per square meter.)
34 Choice a. (nearby stars to shift back and forth once a year.)
35 Choice b. (planetary nebula.)
36 Choice b. (less luminous and more common.)

37 Choice a. (converting heat into radio waves.)

38 Choice c. (a white dwarf steals fuel from a neighbor.)

39 Choice d. (100,000 parsecs.)

40 Choice b. (the visible part of the Milky Way.)

41 Choice d. (10 parsecs.)

42 Choice a. (16.)

43 Choice c. (similar in size to a neutron star.)

Solutions

1 Module 050: Neutron Stars Question 050.32
2 Module 043: Stellar Parallax Question 043.34
3 Module 046: The Hertzsprung-Russell Diagram Question 046.11
4 Module 049: Supernova Explosions Question 049.61
5 Module 049: Supernova Explosions Question 049.32
6 Module 046: The Hertzsprung-Russell Diagram Question 046.24
7 Module 047: Star Formation Question 047.34
8 Module 048: The Quiet Deaths of Ordinary Stars Question 048.51
9 Module 046: The Hertzsprung-Russell Diagram Question 046.54
10 Module 049: Supernova Explosions Question 049.12
11 Module 045: Star Colors and Classes 045.11
12 Module 046: The Hertzsprung-Russell Diagram Question 046.43
13 Module 050: Neutron Stars Question 050.12
14 Module 046: The Hertzsprung-Russell Diagram Question 046.35
15 Module 048: The Quiet Deaths of Ordinary Stars Question 048.24
16 Module 049: Supernova Explosions Question 049.52
17 Module 047: Star Formation Question 047.52
18 Module 048: The Quiet Deaths of Ordinary Stars Question 048.32
19 Module 045: Star Colors and Classes Question 045.22
20 Module 050: Neutron Stars Question 050.23
21 Module 051: Black Holes Question 051.32
22 Module 051: Black Holes Question 051.21
23 Module 043: Stellar Parallax Question 043.22
24 Module 049: Supernova Explosions Question 049.42
25 Module 052: The Milky Way Question 052.14
26 Module 048: The Quiet Deaths of Ordinary Stars Question 048.13
27 Module 047: Star Formation Question 047.41
28 Module 043: Stellar Parallax Question 043.42
29 Module 045: Star Colors and Classes Question 045.32
30 Module 052: The Milky Way Question 052.22
31 Module 047: Star Formation Question 047.23
32 Module 049: Supernova Explosions Question 049.21
33 Module 044: Stellar Magnitudes 044.11
34 Module 043: Stellar Parallax Question 043.12
35 Module 048: The Quiet Deaths of Ordinary Stars Question 048.44
36 Module 052: The Milky Way Question 052.33

37 Module 047: Star Formation Question 047.12

38 Module 048: The Quiet Deaths of Ordinary Stars Question 048.61

39 Module 044: Stellar Magnitudes 044.43

40 Module 052: The Milky Way Question 052.42

41 Module 044: Stellar Magnitudes 044.31

42 Module 044: Stellar Magnitudes 044.23

43 Module 051: Black Holes Question 051.13