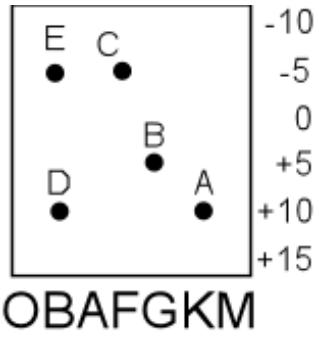
1 The Earth's motion around the Sun causes
   a. all stars to jump randomly around.
   b. all stars to move away from a point in the constellation Hercules.
   c. nearby stars to shift back and forth once a year.
   d. nearby stars to shift steadily in the same direction.

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

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. type I supernova.
   b. type II supernova.
   c. ordinary nova.
   d. gamma-ray burst.

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

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

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

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

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

10 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.

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

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

13 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.

14 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.

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

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

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

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

19 When the iron nuclei in the core of an evolved high-mass star start to come apart, they
   a. absorb energy and limit the core temperature.
   b. cause the core to expand.
   c. trigger a new round of nuclear fusion.
   d. release energy and raise the core temperature.

20 Which of the following spectral classes corresponds to the lowest surface temperature (on this list)?
   a. B
   b. F
   c. K
   d. G
   e. A

21 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. 0.55 years.
   b. 12 years.
   c. 20 years.
   d. 1.8 years.
   e. 6 years.

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

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

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

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

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

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

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

29 The constellation Sagittarius is where the Milky Way

a. cannot be found.

b. is thickest.

c. has its most northern point.

d. is thinnest.

e. splits into two bands.

30 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. 0.3 seconds of arc.

c. 0.2 seconds of arc.

d. 0.4 seconds of arc.

e. 0.8 seconds of arc.

31 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. 1.1 watts per square meter.

c. 900,000 watts per square meter.

d. 30000 watts per square meter.

e. 33 watts per square meter.

32 The reason that the Crab Pulsar is slowing down is

a. that it is running out of nuclear fuel.

b. that it is losing electric charge.

c. its magnetic field is dragging through nearby gas.

d. that it is getting older.

e. tidal friction due to the gravity of a nearby star.

33 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. 10 parsecs.

b. 100 parsecs.

c. 1 parsec.

d. 1000 parsecs.

e. 5 parsecs.

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

a. K5

b. G5

c. G0

d. K0

35 Which of the following spectral types corresponds to a star on the main sequence?

a. G2IV
b. A2Ib
c. O2Ia
d. K2III
e. B4V

36 The position of a protostar on an HR diagram changes because

a. the size and temperature of the protostar change.
b. the mass of the protostar changes.
c. the protostar gets older.
d. the protostar moves.

37 Stars that are much more massive than our Sun

a. form faster but burn slower.
b. form more slowly but burn out faster.
c. form faster and burn out faster.
d. form more slowly and burn slower.

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

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

39 In a Hertzsprung-Russell diagram, the hottest stars are found

a. at the top.
b. at the bottom.
c. on the left side.
d. on the right side.

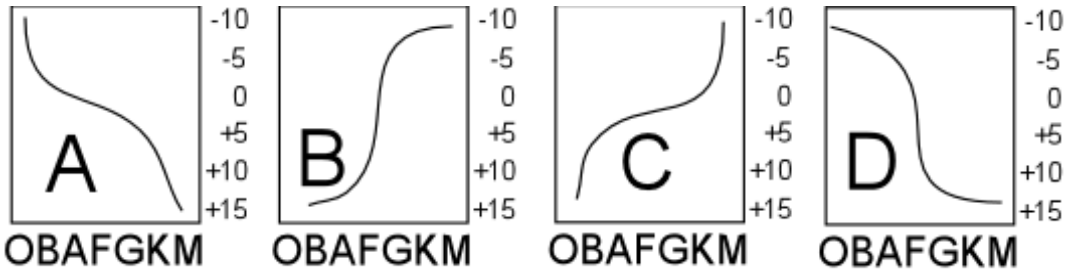
40 The photosphere of a protostar

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

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

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

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



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

Answer Key: Fall 2007 AHX3D

1 Choice c. (nearby stars to shift back and forth once a year.)
2 Choice a. (between 15 and 20 solar masses.)
3 Choice c. (C)
4 Choice b. (type II supernova.)
5 Choice b. (without pausing while getting cooler at almost constant brightness.)
6 Choice c. (Millions of stars together.)
7 Choice e. (converting heat into radio waves.)
8 Choice d. (10 parsecs.)
9 Choice e. (an open cluster.)
10 Choice a. (have been detected because infalling matter emits X-rays.)
11 Choice a. (100,000 parsecs.)
12 Choice d. (dropping temperature and constant brightness.)
13 Choice c. (the explosive ignition of a star's helium core.)
14 Choice b. (similar in size to a neutron star.)
15 Choice c. (less luminous and more common.)
16 Choice b. (blue.)
17 Choice d. (planetary nebula.)
18 Choice e. (of natural origin.)
19 Choice a. (absorb energy and limit the core temperature.)
20 Choice c. (K)
21 Choice c. (20 years.)
22 Choice b. (swells up and becomes a red supergiant.)
23 Choice e. (emerge into a different part of space.)
24 Choice c. (the Earth.)
25 Choice a. (the visible part of the Milky Way.)
26 Choice e. (a white dwarf steals fuel from a neighbor.)
27 Choice a. (generates a neutrino burst.)
28 Choice d. ($3.853''$/yr.)
29 Choice b. (is thickest.)
30 Choice c. (0.2 seconds of arc.)
31 Choice b. (1.1 watts per square meter.)
32 Choice c. (its magnetic field is dragging through nearby gas.)
33 Choice c. (1 parsec.)
34 Choice a. (K5)
35 Choice e. (B4V)
36 Choice a. (the size and temperature of the protostar change.)

37 Choice c. (form faster and burn out faster.)

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

39 Choice c. (on the left side.)

40 Choice a. (is where photons are last scattered.)

41 Choice c. (16.)

42 Choice a. (A)

43 Choice e. (starts a supernova explosion.)

Solutions

1 Module 043: Stellar Parallax Question 043.12
2 Module 049: Supernova Explosions Question 049.12
3 Module 046: The Hertzsprung-Russell Diagram Question 046.12
4 Module 049: Supernova Explosions Question 049.61
5 Module 049: Supernova Explosions Question 049.21
6 Module 052: The Milky Way Question 052.22
7 Module 047: Star Formation Question 047.12
8 Module 044: Stellar Magnitudes 044.31
9 Module 047: Star Formation Question 047.52
10 Module 051: Black Holes Question 051.21
11 Module 044: Stellar Magnitudes 044.43
12 Module 048: The Quiet Deaths of Ordinary Stars Question 048.13
13 Module 048: The Quiet Deaths of Ordinary Stars Question 048.24
14 Module 051: Black Holes Question 051.13
15 Module 052: The Milky Way Question 052.33
16 Module 045: Star Colors and Classes 045.11
17 Module 048: The Quiet Deaths of Ordinary Stars Question 048.44
18 Module 050: Neutron Stars Question 050.12
19 Module 049: Supernova Explosions Question 049.32
20 Module 045: Star Colors and Classes Question 045.22
21 Module 043: Stellar Parallax Question 043.34
22 Module 048: The Quiet Deaths of Ordinary Stars Question 048.32
23 Module 051: Black Holes Question 051.32
24 Module 048: The Quiet Deaths of Ordinary Stars Question 048.51
25 Module 052: The Milky Way Question 052.42
26 Module 048: The Quiet Deaths of Ordinary Stars Question 048.61
27 Module 049: Supernova Explosions Question 049.42
28 Module 043: Stellar Parallax Question 043.42
29 Module 052: The Milky Way Question 052.14
30 Module 043: Stellar Parallax Question 043.22
31 Module 044: Stellar Magnitudes 044.11
32 Module 050: Neutron Stars Question 050.23
33 Module 046: The Hertzsprung-Russell Diagram Question 046.54
34 Module 045: Star Colors and Classes Question 045.32
35 Module 046: The Hertzsprung-Russell Diagram Question 046.43
36 Module 047: Star Formation Question 047.34

37 Module 047: Star Formation Question 047.41

38 Module 050: Neutron Stars Question 050.32

39 Module 046: The Hertzsprung-Russell Diagram Question 046.24

40 Module 047: Star Formation Question 047.23

41 Module 044: Stellar Magnitudes 044.23

42 Module 046: The Hertzsprung-Russell Diagram Question 046.35

43 Module 049: Supernova Explosions Question 049.52