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

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

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

4 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 and burn slower.
   d. form more slowly but burn out faster.

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

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

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

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

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

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

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

12 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. 33 watts per square meter.
   c. 900,000 watts per square meter.
   d. 30000 watts per square meter.
   e. 1.1 watts per square meter.

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

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

15 The formation of large molecules in interstellar clouds helps the clouds to collapse by

a. making dust grains stick together.
b. causing the gas to take up less space.
c. stopping ultraviolet light.
d. absorbing radio waves.
e. converting heat into radio waves.

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

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

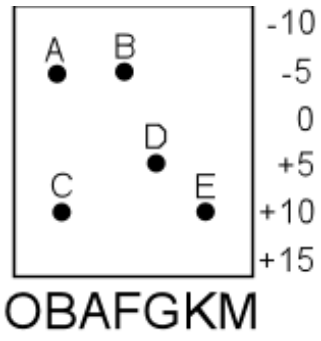
17 A star is seen to move by $0.4$ seconds of arc between March 1, 1999 and September 1, 1999 and then back to its starting point on March 1, 2000. What is the parallax angle for this star?

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

18 A nova occurs when

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

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




20 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.

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

a. 1.

b. 6.

c. 16.

d. 21.

e. 11.

22 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.

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

a. at the top.

b. on the left side.

c. on the right side.

d. at the bottom.

24 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. 100 parsecs.

b. 1000 parsecs.

c. 5 parsecs.

d. 1 parsec.

e. 10 parsecs.

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

a. a constellation.

b. an asterism.

c. a galaxy.

d. a globular cluster.

e. an open cluster.

26 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 an X-ray burst.

c. absorbs gamma rays.

d. generates a neutrino burst.

e. generates a gamma ray burst.

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

a. causes a gamma-ray burst.

b. starts a supernova explosion.

c. releases a burst of neutrinos.

d. starts the collapse of the star's core.

e. triggers a nova.

28 A globular cluster usually consists of

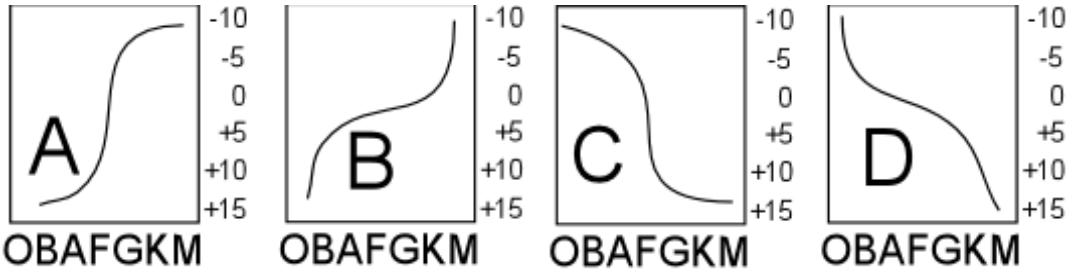
a. Billions of stars together.

b. Millions of stars together.

c. Glowing gas and newborn stars.

d. A single dead star surrounded by glowing gas.

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




30 Our sun is roughly at the center of

a. the entire Milky Way Galaxy.

b. a globular cluster.

c. the visible part of the Milky Way.

31 The constellation Sagittarius is where the Milky Way

a. splits into two bands.

b. is thinnest.

c. cannot be found.

d. has its most northern point.

e. is thickest.

32 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. $3.853''$/yr.

c. $3853''$/yr.

d. $1.9265''$/yr.

e. $0.26''$/yr.

33 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. 20 years.

b. 1.8 years.

c. 0.55 years.

d. 12 years.

e. 6 years.

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

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

36 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.

37 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.

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

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

40 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. emerge into a different part of space.
c. cannot escape without exceeding the speed of light.
d. immediately crash onto the surface of a collapsing star.
e. achieve a stable orbit around it.

41 Black holes

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

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

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

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

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

# Answer Key: Fall 2007 AHX3B

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

37 Choice b. (similar in size to a neutron star.)

38 Choice b. (100,000 parsecs.)

39 Choice d. (B4V)

40 Choice b. (emerge into a different part of space.)

41 Choice d. (have been detected because infalling matter emits X-rays.)

42 Choice c. (10 parsecs.)

43 Choice d. (K5)

# Solutions

1 Module 045: Star Colors and Classes Question 045.22
2 Module 047: Star Formation Question 047.23
3 Module 048: The Quiet Deaths of Ordinary Stars Question 048.44
4 Module 047: Star Formation Question 047.41
5 Module 048: The Quiet Deaths of Ordinary Stars Question 048.13
6 Module 047: Star Formation Question 047.34
7 Module 049: Supernova Explosions Question 049.21
8 Module 045: Star Colors and Classes 045.11
9 Module 048: The Quiet Deaths of Ordinary Stars Question 048.24
10 Module 050: Neutron Stars Question 050.12
11 Module 049: Supernova Explosions Question 049.61
12 Module 044: Stellar Magnitudes 044.11
13 Module 049: Supernova Explosions Question 049.12
14 Module 050: Neutron Stars Question 050.32
15 Module 047: Star Formation Question 047.12
16 Module 048: The Quiet Deaths of Ordinary Stars Question 048.51
17 Module 043: Stellar Parallax Question 043.22
18 Module 048: The Quiet Deaths of Ordinary Stars Question 048.61
19 Module 046: The Hertzsprung-Russell Diagram Question 046.15
20 Module 049: Supernova Explosions Question 049.32
21 Module 044: Stellar Magnitudes 044.23
22 Module 052: The Milky Way Question 052.33
23 Module 046: The Hertzsprung-Russell Diagram Question 046.24
24 Module 046: The Hertzsprung-Russell Diagram Question 046.54
25 Module 047: Star Formation Question 047.52
26 Module 049: Supernova Explosions Question 049.42
27 Module 049: Supernova Explosions Question 049.52
28 Module 052: The Milky Way Question 052.22
29 Module 046: The Hertzsprung-Russell Diagram Question 046.36
30 Module 052: The Milky Way Question 052.42
31 Module 052: The Milky Way Question 052.14
32 Module 043: Stellar Parallax Question 043.42
33 Module 043: Stellar Parallax Question 043.34
34 Module 050: Neutron Stars Question 050.23
35 Module 043: Stellar Parallax Question 043.12
36 Module 048: The Quiet Deaths of Ordinary Stars Question 048.32

37 Module 051: Black Holes Question 051.13

38 Module 044: Stellar Magnitudes 044.43

39 Module 046: The Hertzsprung-Russell Diagram Question 046.43

40 Module 051: Black Holes Question 051.32

41 Module 051: Black Holes Question 051.21

42 Module 044: Stellar Magnitudes 044.31

43 Module 045: Star Colors and Classes Question 045.32