Reminder - This test is longer than yours will be.

Write the color of your test booklet on the top of your bubble sheet!
Be sure to fill in your name and ID#
Also, please follow the standard bubble-sheet drill:
- use a #2 pencil
- completely fill in the circles
- If you want to change an answer, be sure to completely erase the old one

1. A star leaves the main sequence when
   A) the core starts fusing helium by the triple alpha process.
   B) its core of hydrogen is depleted.
   C) photo-disintegration starts to take place.
   D) the "helium flash" occurs.

2. Deep within the Sun, the pressure is
   A) greater than near the surface. **B)** less than near the surface. **C)** the same as near the surface.

3. Interstellar clouds are
   A) slightly less dense than air at sea level on Earth.
   B) more dense than air at sea level on Earth.
   C) much less dense than air at sea level on Earth.
   D) about the same density as air at sea level on Earth.

4. When part of an interstellar cloud contracts, astronomers call the newly forming star
   A) a red giant.
   B) an emission nebula.
   C) a galactic cluster.
   D) a protostar.
   E) a main sequence star.

5. Three M-class stars are identified as being main sequence, giant, and supergiant stars, respectively. In what physical property do they differ?
   A) luminosity **B)** color index **C)** surface temperature **D)** parallax **E)** spectral class

6. A supernova is an event that occurs
   A) at the end of the red giant stage of a high mass star.
   B) near the end of the main sequence life of a high mass star.
   C) near the beginning of the main sequence life of a low mass star.
   D) near the end of the main sequence life of a low mass star.
   E) near the beginning of the main sequence life of a high mass star.

7. How does an emission nebula appear in a visible light photograph?
   A) emission nebulae are invisible at visible wavelengths
   B) dark cloud silhouetted against the background of stars
   C) glowing cloud of blue and yellow light
   D) glowing cloud of red light

8. The evolution of a star like the Sun is
   A) main sequence star, white dwarf, red giant.
   B) main sequence star, red giant, white dwarf.
   C) white dwarf, main sequence star, red giant.
   D) white dwarf, red giant, main sequence star.
   E) red giant, white dwarf, main sequence star.

9. The evolutionary track of a star refers to its
- **A)** change in position on the H-R diagram.
- **B)** motion across the celestial sphere as it ages.
- **C)** changes in size as it ages.
- **D)** Both A and B above.
- **E)** All of the above.

10. The spectra of spectroscopic binaries changes regularly due to
- **A)** changes in the temperatures of the stars as they revolve.
- **B)** changes in the size of the stars as they revolve.
- **C)** changes in the absolute magnitudes of the stars as they revolve.
- **D)** the Doppler effect.
- **E)** A, B, and C above.

11. The visible surface of the Sun is called the
A) limb. **B)** heliosurf. **C)** corona. **D)** photosphere. **E)** chromosphere.

12. The factor that determines the length of a star's main sequence lifetime is the star's
- **A)** distance from the center of the galaxy.
- **B)** mass.
- **C)** spectral type.
- **D)** content of carbon.
- **E)** surface temperature.

13. Relative to most other stars, a white dwarf is
A) cool and dim. **B)** cool and bright. **C)** hot and dim. **D)** hot and bright.

14. A typical white dwarf star
- **A)** is too small to be observed from the Earth.
- **B)** has a mass about like the Sun and is about half the Sun's diameter.
- **C)** has a mass slightly less than the Sun and is about the size of the Earth.
- **D)** Has a mass about one-hundredth of the Sun and is about the size of the Earth.
- **E)** None of the above.

15. Nebulae are
- **A)** dust and gas clouds within our solar system.
- **B)** interstellar dust and gas clouds.
- **C)** dust and gas clouds on planets.
- **D)** Both A and C above.

16. We learn the age of a star cluster by
- **A)** plotting the stars of the cluster on an H-R diagram.
- **B)** studying the reflection of light from stars in the cluster.
- **C)** observing supernovae within the cluster.
- **D)** determining the number of stars within the cluster.
- **E)** studying the Doppler shift of radio waves from it.

17. The solar wind is

A) gas flowing across the surface of the Sun.
B) material flowing from the Sun out into space.
C) the motion of granules across the Sun's surface.
D) the motion of sunspots across the Sun's surface.
E) Both C and D above.

18. A regular "wobble" in the path of a star is evidence that it
A) is a Cepheid variable.
B) has a companion revolving around it.
C) is a red giant.
D) is a pulsar.
E) is a dying star.

19. Stars on the main sequence that have a great mass are
A) bright and cool.
B) dim and cool.
C) bright and hot.
D) dim and hot.
E) Any of the above; there is no regular relationship.

20. Type I supernovae are produced
A) by the helium flash in a 4 to 5 solar mass star.
B) when a high mass star gets to the iron fusion limit.
C) when a star collapses to a neutron star.
D) when accretion on a white dwarf from a companion star heats it to its fusion point.

21. The Chandrasekhar limit is
A) the most mass a neutron star can have.
B) the least mass a black hole can have.
C) the most mass a white dwarf can have.
D) the least mass a white dwarf can have.
E) Two of the above.

22. The two most abundant elements in the Sun, with the most abundant listed first, are
A) carbon, hydrogen
B) hydrogen, helium
C) The answer is not known.
D) helium, hydrogen
E) hydrogen, carbon

23. What measurement is used in order to determine experimentally the distance to a (relatively nearby) star?
A) The absolute luminosity of the star.
B) The time required for light to get here from the star.
C) The question is misleading; this distance cannot be determined experimentally.
D) The apparent luminosity of the star.
E) Changes in the position of the star relative to background stars as the Earth moves.

24. Granulation is caused by
A) helium rising from the center of the Sun.
B) hydrogen rising from the center of the Sun.
C) convection of material near the surface.
D) differential rotation.
E) prominences.

25. Cepheid variables are important as
- **A)** size indicators.
- **B)** mass indicators.
- **C)** distance indicators.
- **D)** speed indicators.
- **E)** None of the above.

26. Convection of heat occurs when energy is transferred by
- **A)** motion of the particles of the material from one place to another
- **B)** increased vibration being passed from one atom (or molecule) to another.
- **C)** electromagnetic radiation.

27. The method of spectroscopic parallax uses as one of its tools
- **A)** calculations of space velocity.
- **B)** stellar parallax.
- **C)** the H-R diagram.
- **D)** measurements of radial velocity.
- **E)** calculations of stellar masses.

28. The Sun is a
- **A)** M-type main sequence star.
- **B)** B-type main sequence star.
- **C)** white dwarf.
- **D)** red giant.
- **E)** G-type main sequence star.

29. Which of the following type stars are at the greatest distance from Earth?
A) B type. **B)** G type. **C)** A type. **D)** No general statement can be made. **E)** F type.

30. A star reaches the beginning of its main sequence life when
- **A)** it is a protostar.
- **B)** nuclear reactions start.
- **C)** it begins to become a red giant.
- **D)** it starts to collapse.

31. A star on the main sequence obtains its energy from
A) magnetic forces. **B)** gravitation. **C)** fusion. **D)** fission. **E)** electrical forces.

32. A nova is caused by
- **A)** the death of a massive star and the formation of a black hole.
- **B)** the fusion of iron in the core of a massive star.
- **C)** the infall of material into a black hole.
- **D)** the collapse of a protostar.
- **E)** the transfer of material onto a white dwarf in a double star system.

33. Of the following, which is easiest to determine for a given star?
- **A)** absolute luminosity
- **B)** No general statement can be made.
- **C)** apparent luminosity
- **D)** They are equally easy to determine.

34. The contraction of an interstellar cloud to become a star is caused by
- **A)** magnetic forces.
- **B)** electric forces.
- **C)** nuclear forces.
- **D)** gravitational forces.
- **E)** Both A and B above, for they are closely related.

35. What is the primary factor that determines whether part of a collapsing interstellar cloud will become a star or a planet?
A) Age **B)** Velocity **C)** Chemical composition **D)** Speed **E)** Mass

36. Stars are formed from
A) the collapse of galaxies.
B) the expansion of white dwarfs.
C) the expansion of dense objects such as black holes.
D) the collapse of interstellar clouds.
E) the collapse of constellations.

37. Reflection nebulae appear
A) red because of the scattering of blue light by the particles of the nebulae.
B) blue because of the scattering of blue light by the particles of the nebulae.
C) blue because of the scattering of red light by the particles of the nebulae.
D) red because of the scattering of red light by the particles of the nebulae.

38. More massive stars _____ than less massive stars.
A) stay a shorter time on the main sequence
B) No general statement can be made relating mass to the length of time on the main sequence.
C) stay longer on the main sequence

39. The number of sunspots
A) has been increasing since they were first recorded.
B) change with a cycle of about eleven years.
C) change with a cycle of about 104 years.
D) has been decreasing since they were first recorded by Galileo.

40. Solar flares cause
A) a probable increase in the solar wind, but not one that is measurable.
B) an increase in the solar wind that sometimes affects communication on Earth.
C) the Sun to get noticeably brighter to the naked eye.
D) the Sun to get noticeably dimmer to the naked eye.

41. If a star's absolute magnitude is numerically equal to its apparent magnitude, what do we know about the star?
A) The question is misleading; it is impossible for the two magnitudes to be equal.
B) It is 1 parsec from us.
C) It is 1 light year from us.
D) It is 10 parsecs from us.
E) The star is a main sequence star.

42. How are the interior elements of a highly evolved high-mass star arranged late in its lifetime, but before the collapse of its iron core?
A) the interior would consist almost entirely of carbon, with a small iron core

49. A brown dwarf is
A) a starlike object whose mass is too small to maintain nuclear fusion.
B) the stage of the life of a star between the white dwarf and black dwarf stages.
C) the stage of the life of a star between the red giant and white dwarf stages.
D) the remains of a planet.

50. What do we need to know to determine the size of a star?
A) Its temperature and absolute magnitude.
B) Its radial velocity and apparent magnitude.
C) Its temperature and age.
D) Its temperature and radial velocity.
E) Knowledge of none of the above will allow the determination.

51. What product of the fusion reaction occurring in the core of the Sun is directly observable?
A) positrons **B)** photons **C)** helium **D)** neutrinos

52. An H-R diagram plots
A) temperature vs. distance.
B) temperature vs. absolute magnitude.
C) stellar mass vs. distance.
D) temperature vs. space velocity.
E) distance vs. space velocity.

53. Which of the following shows the given stars in correct order of size from smallest to largest?
A) white dwarf, main sequence star, neutron star, red giant
B) main sequence star, white dwarf, neutron star, red giant
C) white dwarf, main sequence star, red giant, neutron star
D) white dwarf, neutron star, main sequence star, red giant
E) neutron star, white dwarf, main sequence star, red giant

54. Which of the following stars is closest to the Sun?
A) The answer cannot be determined from the information given.
B) A star with a parallax angle of 0.32 arcseconds.
C) A star with a parallax angle of 0.16 arcseconds.

55. Close up photos of the Sun sometime show "loops" above its visible surface. Astronomers call these
A) extensions. **B)** excitations. **C)** hyperextensions. **D)** prominences **E)** granulations.

56. The OBAFGKM classification of a star is determined by the star's
A) temperature. **B)** distance. **C)** space velocity. **D)** luminosity class. **E)** parallax angle.

57. Clusters of stars are important to astronomers because
A) they give astronomers a direct measurement of the age of the Sun.
B) they are the most likely places to contain dark nebulae.
C) the stars in them are about the same mass.
D) the stars in them are about the same age.
E) Both C and D above.

58. The source of energy that makes a protostar warm (or hot) is
A) nuclear fusion. **B)** nuclear fission. **C)** fossil fuel. **D)** gravity. **E)** chemical energy.

59. M-type stars are _____ than B-type stars.
- **A)** longer lived on the main sequence
- **B)** shorter lived on the main sequence
- **C)** less massive
- **D)** Both A and C above.
- **E)** Both B and C above.

60. As a star changes from a main sequence star to become a red giant,
- **A)** it moves across the sky.
- **B)** it gets larger and cooler.
- **C)** it leaves behind remnants.
- **D)** Both A and B above.
- **E)** Both A and C above.

61. A Type II supernova is produced when
- **A)** a star undergoes the helium flash.
- **B)** the collapse of a star's nucleus causes a shock wave that blows off the surrounding envelope of the star.
- **C)** an F or G type main sequence star evolves explosively to the supergiant stage.
- **D)** hydrogen is exhausted from the core of a star.

62. How can a cool star have a great absolute luminosity?
- **A)** The star can be a nearby star.
- **B)** It can be a main sequence star.
- **C)** The question is misleading; most cool stars have a high absolute luminosity.
- **D)** It can't.
- **E)** The star can be a very large star.

63. Fundamentally, solar energy comes from
- **A)** chemical reactions.
- **B)** nuclear fission.
- **C)** nuclear fusion.
- **D)** Both B and C, for they are the same.
- **E)** Both A and B, for they are the same.

64. Sunspots are
- **A)** hotter and brighter than surrounding regions.
- **B)** cooler and brighter than surrounding regions.
- **C)** hotter and darker than surrounding regions.
- **D)** cooler and darker than surrounding regions.
- **E)** Two of the above, depending upon the type of sunspots.

65. Assuming that each of the following stars is on the main sequence, which has the greatest absolute luminosity?
- **A)** B type star
- **B)** G type star
- **C)** A type star
- **D)** The answer cannot be determined from the information given.
- **E)** K type star

66. The supernova SN1987A was unusual because
- **A)** it originated with a blue supergiant.
- **B)** neutrinos from the explosion were observed on Earth.

C) it is the only supernova for which the precursor star is known.
D) All of the above.
E) None of the above.

67. Why are brown dwarfs so difficult to detect?
A) They are only found in cold molecular clouds, which block their light from reaching us.
B) They lack an internal fusion energy source and so are very dim.
C) They tend to congregate only near very large stars and so are not noticed.
D) Their color makes them blend in with the background light from emission nebulae.
E) They all lie outside the plane of the Galaxy, making them hard to see against the background of globular clusters.

68. Why do stars tend to form in groups?
A) When stars begin to form they gravitationally attract each other.
B) Star clusters form after star formation is completed and stars start to swirl around each other.
C) A large interstellar cloud fragments into smaller clouds that eventually form stars.
D) Stars do not normally form in groups.

69. When four hydrogen nuclei fuse to form one helium nucleus,
A) the resulting mass of the helium is exactly the same as the original mass of the hydrogen.
B) The question is phony; such a reaction does not take place.
C) the resulting mass of the helium is less than the original mass of the hydrogen.
D) the resulting mass of the helium is greater than the original mass of the hydrogen.

70. How do astronomers know that stars (and thus planetary systems) form out of concentrations of interstellar material?
A) Detailed high-resolution photographs have revealed the presence of protostellar and protoplanetary disks in star-forming regions of nebulae.
B) All of the pieces of evidence listed here contribute to this conclusion.
C) Groups of stars nearest to molecular clouds tend to be younger than those farther away from such clouds.
D) Emission nebulae have been shown to contain young stars.
E) It is completely a matter of conjecture, as none of these steps can be observed experimentally.

71. Which of the following is not true?
A) As a star evolves, it moves from the bottom of the main sequence to the top of the main sequence on an H-R diagram.
B) A supernova is an exploding star.
C) A single star during its lifetime may be a red giant at one time and a white dwarf later.
D) Stars move from the main sequence to the red giant region on an H-R diagram.
E) None of the above is the answer because all are true.

72. When a star is in hydrostatic equilibrium,
- **A)** the downward forces on each layer are balanced by upward force so the star neither expands nor contracts.
- **B)** it is contracting rapidly.
- **C)** the star's energy is trapped inside, so none is released from the surface.
- **D)** it is expanding rapidly.
- **E)** Two of the above.

73. Solar neutrino detectors are located
- **A)** on high mountains or in space so that solar neutrinos can reach them.
- **B)** in deep mines below the Earth, to sheild them from cosmic rays.
- **C)** in dry climates, for humidity deflects solar neutrinos.
- **D)** in space so that solar neutrinos can reach them.
- **E)** anywhere on Earth's surface, for solar neutrinos easily penetrate the atmosphere.

74. Red giants are more luminous than white dwarf stars because
- **A)** red giants are closer.
- **B)** The statement is not true. White dwarfs are more luminous.
- **C)** red giants are hotter.
- **D)** red giants are much larger.
- **E)** None of the above.

75. A planetary nebula is
- **A)** dust and gas orbiting a planet far from its surface.
- **B)** dust and gas orbiting close to a planet's surface.
- **C)** gas blown off a dying star.
- **D)** None of the above.

76. Light passing through the interstellar medium is
- **A)** made more red by the scattering of blue light by the medium
- **B)** made more blue by the scattering of red light by the medium.
- **C)** made more red by the addition of red light from the medium
- **D)** made more blue by the addition of blue light from the medium.

77. What remains after a supernova?
- **A)** A main sequence star
- **B)** A white dwarf
- **C)** A neutron star or a black hole
- **D)** Nothing
- **E)** Any of the above, depending on the mass of the original star.

78. Which of the following statements is true about binary-star systems?
- **A)** It is impossible to observe one star actually cross in front of the other.
- **B)** They are all too far from Earth to be separated from each other telescopically.

C) They are not the most complex star systems observable; triple, quadruple, and even more complex systems have been found.
D) They all have very long orbital periods (well above an Earth-year in duration).
E) Their spectral lines are not affected significantly by their mutual orbits.

79. Stars in an open cluster are
A) about the same mass.
B) all about the same age.
C) of far different ages and masses.
D) about the same age and same mass.

80. _____ cause shock waves to trigger interstellar clouds to collapse into protostars.
A) Radiation from newly formed stars
B) Shock waves moving around the galaxy
C) Bursts of material from massive stars
D) Radiation from supernovae
E) Any of the above could be possible causes.

81. Which of the following statements is <u>not</u> true about the sunspots?
A) They typically measure about 10,000 km across (larger than the radius of the Earth!).
B) They cluster at high latitudes when solar activity is at a minimum.
C) They are distributed approximately uniformly over the Sun's surface in position and in time.
D) They appear in larger numbers at about the time of the solar maximum.
E) They reach maximum numbers at roughly 11-year intervals.

82. A modern hypothesis that fits the data for the sunspot cycle
A) relies on the changing magnetic field of the Sun.
B) relies on the changing gravitational field of the Sun.
C) holds that the rate of fusion within the Sun changes with the same frequency.
D) is not able to explain why the location of the greatest density of spots changes during the cycle.
E) Both A and E above.

83. From which of the following star systems can be derive the most information about the stars?
A) Spectroscopic binaries
B) Eclipsing binaries
C) Composite spectrum binaries
D) Astrometric binaries
E) Visual binaries

84. Most stars are
A) red giants.
B) white dwarfs.
C) No general statement can be made.
D) supergiants.
E) main sequence stars.

85. As a star becomes a red giant, the core contracts and heats up. Why does hydrogen not start fusing again in the core?
A) There is not enough hydrogen left.
B) The question is misleading; hydrogen fusion does begin again.
C) The core does not get hot enough.
D) The core is too small.

86. "The rate at which electromagnetic energy is being emitted" is a definition of

A) emissivity. **B)** refractivity. **C)** albedo. **D)** luminosity. **E)** reflectivity.

87. As stars evolve, they move on the H-R diagram. This means that they
A) change their distance from the Sun.
B) move across the celestial sphere.
C) change in brightness and/or temperature.
D) change in temperature, but not in brightness.
E) change in brightness, but not in temperature.

88. Which of the following shows the layers of the Sun correctly from inner to outer?
A) chromosphere, corona, photosphere
B) photosphere, corona, chromosphere
C) corona, chromosphere, photosphere
D) corona, photosphere, chromosphere
E) photosphere, chromosphere, corona

89. The most massive element that can be formed by fusion with a release of energy is
A) carbon. **B)** helium **C)** uranium. **D)** oxygen. **E)** iron.

90. A parsec is the
A) distance light travels in one second.
B) distance the Earth moves in its orbit in one second.
C) distance of a star when its parallax angle is one arc-second.
D) angle through which the Earth moves in its orbit in one second.
E) angle through which the Earth turns on its axis in one second.

Ignore the "Origin" lines, that is for a different book.

Answer Key -- Fall'03 Test #3

1. B its core of hydrogen is depleted.
   Origin: Chapter 14....56
2. A greater than near the surface.
   Origin: Chapter 11....82
3. C much less dense than air at sea level on Earth.
   Origin: Chapter 13....56
4. D a protostar.
   Origin: Chapter 13....77
5. A luminosity
   Origin: Fall'02 Test #3....84
6. A at the end of the red giant stage of a high mass star.
   Origin: Chapter 15....75
7. D glowing cloud of red light
   Origin: Fall'02 Test #3....86
8. B main sequence star, red giant, white dwarf.
   Origin: Chapter 14....91
9. A change in position on the H-R diagram.
   Origin: Chapter 13....65
10. D the Doppler effect.
    Origin: Chapter 12....103
11. D photosphere.
    Origin: Chapter 11....91
12. B mass.
    Origin: Chapter 13....92
13. C hot and dim.
    Origin: Chapter 14....87
14. C has a mass slightly less than the Sun and is about the size of the Earth.
    Origin: Chapter 14....58
15. B interstellar dust and gas clouds.
    Origin: Chapter 13....42
16. A plotting the stars of the cluster on an H-R diagram.
    Origin: Chapter 14....50
17. B material flowing from the Sun out into space.
    Origin: Chapter 11....96
18. B has a companion revolving around it.
    Origin: Chapter 12....96
19. C bright and hot.
    Origin: Chapter 12....59
20. D when accretion on a white dwarf from a companion star heats it to its fusion point.
    Origin: Chapter 14....59
21. C the most mass a white dwarf can have.
    Origin: Chapter 14....47
22. B hydrogen, helium
    Origin: Chapter 11....103

23. E Changes in the position of the star relative to background stars as the Earth moves.
Origin: Chapter 12....69
24. C convection of material near the surface.
Origin: Chapter 11....94
25. C distance indicators.
Origin: Chapter 12....51
26. A motion of the particles of the material from one place to another
Origin: Chapter 11....54
27. C the H-R diagram.
Origin: Chapter 12....81
28. E G-type main sequence star.
Origin: Chapter 12....62
29. D No general statement can be made.
Origin: Chapter 12....48
30. B nuclear reactions start.
Origin: Chapter 14....82
31. C fusion.
Origin: Chapter 13....66
32. E the transfer of material onto a white dwarf in a double star system.
Origin: Chapter 14....79
33. C apparent luminosity
Origin: Chapter 12....63
34. D gravitational forces.
Origin: Chapter 13....43
35. E Mass
Origin: Chapter 13....89
36. D the collapse of interstellar clouds.
Origin: Chapter 13....44
37. B blue because of the scattering of blue light by the particles of the nebulae.
Origin: Chapter 13....57
38. A stay a shorter time on the main sequence
Origin: Chapter 14....70
39. C change with a cycle of about 104 years.
Origin: Chapter 11....97
40. B an increase in the solar wind that sometimes affects communication on Earth.
Origin: Chapter 11....99
41. D It is 10 parsecs from us.
Origin: Chapter 12....68
42. C an onion-like set of layers would form, with the heaviest elements contained in shells within progressively lighter ones
Origin: Fall'03 Test #3....89
43. C Its temperature
Origin: Chapter 12....76
44. D B type
Origin: Chapter 12....90
45. A The distance between the stars and their period of revolution.
Origin: Chapter 12....102

46. D No; points near the equator rotate in the least time.
Origin: Chapter 11....49
47. C dimmer at its limb because we see to a lesser depth at the limb.
Origin: Chapter 11....93
48. C can outshine the entire galaxy in which it occurs.
Origin: Chapter 14....64
49. A a starlike object whose mass is too small to maintain nuclear fusion.
Origin: Chapter 14....97
50. A Its temperature and absolute magnitude.
Origin: Chapter 12....52
51. D neutrinos
Origin: Fall'02 Test #3....85
52. B temperature vs. absolute magnitude.
Origin: Chapter 12....78
53. E neutron star, white dwarf, main sequence star, red giant
Origin: Chapter 15....60
54. B A star with a parallax angle of 0.32 arcseconds.
Origin: Chapter 12....70
55. D prominences
Origin: Chapter 11....56
56. A temperature.
Origin: Chapter 12....77
57. D the stars in them are about the same age.
Origin: Chapter 13....90
58. D gravity.
Origin: Chapter 13....46
59. D Both A and C above.
Origin: Chapter 13....68
60. B it gets larger and cooler.
Origin: Chapter 13....95
61. B the collapse of a star's nucleus causes a shock wave that blows off the surrounding envelope of the star.
Origin: Chapter 15....86
62. E The star can be a very large star.
Origin: Chapter 12....60
63. C nuclear fusion.
Origin: Chapter 11....59
64. D cooler and darker than surrounding regions.
Origin: Chapter 11....62
65. A B type star
Origin: Chapter 12....92
66. D All of the above.
Origin: Chapter 15....87
67. B They lack an internal fusion energy source and so are very dim.
Origin: Fall'03 Test #3....90
68. C A large interstellar cloud fragments into smaller clouds that eventually form stars.
Origin: Fall'02 Test #3....87

69. C the resulting mass of the helium is less than the original mass of the hydrogen.
Origin: Chapter 11....76
70. B All of the pieces of evidence listed here contribute to this conclusion.
Origin: Fall'03 Test #3....88
71. A As a star evolves, it moves from the bottom of the main sequence to the top of the main sequence on an H-R diagram.
Origin: Chapter 15....58
72. A the downward forces on each layer are balanced by upward force so the star neither expands nor contracts.
Origin: Chapter 11....53
73. B in deep mines below the Earth, to sheild them from cosmic rays.
Origin: Chapter 11....90
74. D red giants are much larger.
Origin: Chapter 12....61
75. C gas blown off a dying star.
Origin: Chapter 14....55
76. A made more red by the scattering of blue light by the medium
Origin: Chapter 13....52
77. C A neutron star or a black hole
Origin: Chapter 15....74
78. C They are not the most complex star systems observable; triple, quadruple, and even more complex systems have been found.
Origin: Fall'03 Test #3....87
79. B all about the same age.
Origin: Chapter 13....67
80. E Any of the above could be possible causes.
Origin: Chapter 13....70
81. C They are distributed approximately uniformly over the Sun's surface in position and in time.
Origin: Fall'03 Test #3....86
82. A relies on the changing magnetic field of the Sun.
Origin: Chapter 11....98
83. B Eclipsing binaries
Origin: Chapter 12....97
84. E main sequence stars.
Origin: Chapter 12....80
85. A There is not enough hydrogen left.
Origin: Chapter 14....76
86. D luminosity.
Origin: Chapter 11....60
87. C change in brightness and/or temperature.
Origin: Chapter 13....64
88. E photosphere, chromosphere, corona
Origin: Chapter 11....95
89. E iron.
Origin: Chapter 15....96
90. C distance of a star when its parallax angle is one arc-second.
Origin: Chapter 12....55