

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

- 2 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. an obvious hoax.
 - c. of artificial origin.
 - d. from a source moving toward us.
 - e. from a source moving away from us.

- 3 When a large interstellar cloud collapses, it usually
 - a. fragments into several smaller clouds which then form stars.
 - b. remains together and collapses to a single large star.
 - c. forms a large ring that fragments to form a ring of stars.
 - d. remains together and spits out several stars.

- 4 The HR diagram of a young, open cluster typically shows
 - a. the entire main sequence still present.
 - b. only the lower part of the main sequence still present.
 - c. only the middle part of the main sequence still present.
 - d. only the upper part of the main sequence still present.

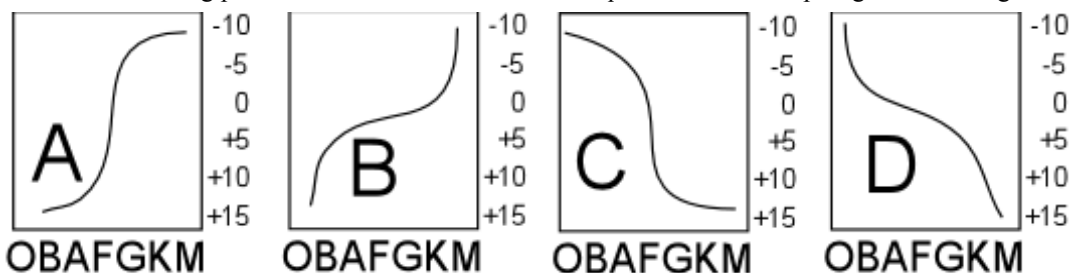
- 5 As seen from far above the Earth's North Pole, the Earth orbits the Sun counter clockwise and
 - a. Mercury orbits the Sun clockwise.
 - b. Pluto orbits the Sun clockwise.
 - c. No planet orbits the Sun clockwise.
 - d. the Jovian planets orbit the Sun clockwise.

- 6 Suppose that you lift an object by exerting an upward force of 20 Newtons on it. If gravity exerts a force of 10 Newtons downward on the object, what is the total force on the object?
 - a. 200 Newtons downward
 - b. 20 Newtons upward
 - c. 10 Newtons downward
 - d. 10 Newtons upward
 - e. 20 Newtons downward

- 7 The X-rays that reveal the possible presence of a black hole are the result of
 - a. gravitons converted to photons by the hole.
 - b. starlight accelerated in the hole's gravity.
 - c. matter heating up as it falls toward the hole.
 - d. vibrations of the hole's event horizon.

- 8 Orbiting Infrared Observatories usually have limited life primarily because
- they run out of coolant.
 - their orbits decay.
 - they run out of maneuvering fuel.
 - funds to operate them run out.
 - they run out of electric power.
- 9 The number of near-Earth asteroids is large because they
- are in stable orbits and have nowhere else to go.
 - are left over from the formation of our Moon.
 - are kicked out of the asteroid belt by Jupiter's gravity.
 - are the remains of a destroyed planet near the Earth.
- 10 How long will it take for a star that is near the Celestial Equator to move by one degree relative to the earth?
- 15 minutes.
 - 4 minutes.
 - 5 minutes.
 - 6 2/3 minutes.
 - 30 minutes.
- 11 Relative to the Milky Way family of stars, our sun is
- at the center.
 - neither at the center nor at the edge.
 - at the extreme edge.
- 12 The star delta-Eridani shows a heliocentric stellar parallax of almost exactly 1/9 seconds of arc. The distance from our Sun to delta-Eridani is
- 9 parsecs.
 - 4.5 parsecs.
 - 18 parsecs.
 - 4 parsecs.
 - 1/9 parsecs.

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



- 14 Kepler was an early advocate of the Copernican Theory. When he applied it to Tycho's observations, it
- was as accurate as the observations.
 - failed and was completely discarded.
 - worked perfectly.
 - failed but led to a better theory.

- 15 Which of the following three systems is regarded as the most normal for a terrestrial planet?
- Venus, with no moons at all.
 - Earth, with a moon larger than the dwarf planet Pluto.
 - Mars, with two moons each the size of an asteroid.
- 16 A large asteroid impact causes the extinction of whole species mainly by the effects of the
- smoke and dust: It blocks the sunlight.
 - light and heat: It incinerates them.
 - noise: It scares them to death.
 - blast and shock wave: It blows them away.
- 17 In our Sun, the convection zone is located
- above the central region but well below the surface.
 - near the surface.
 - at the very center.
- 18 The Law of Inertia states that a moving object will
- keep moving if no force acts on it.
 - keep moving if a force pushes it.
 - stop if no force acts on it.
 - never stop.
 - always stop.
- 19 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
- 0.26"/yr.
 - 1.9265"/yr.
 - 3853"/yr.
 - 38.53"/yr.
 - 3.853"/yr.
- 20 By making extensive observations of planetary motion, Tycho Brahe
- disproved Ptolemy's theory of planetary motion.
 - provided only a lot of accurate data.
 - proved that Copernicus was right.
 - discovered new planets.
 - explained how planets move.
- 21 Within our own Milky Way Galaxy, our sun is a typical member of
- Population II.
 - either Population I or II.
 - Population I.
- 22 Convection currents in the Earth's Mantle
- are responsible for land tides.
 - cause mass extinctions.
 - are responsible for moving the tectonic plates.
 - happen but do not affect the crust.
 - do not happen because solid rock does not move.

- 23 During a meteor shower, shooting stars seem to be coming from
- the celestial north pole.
 - all parts of the sky.
 - the equant.
 - the celestial equator.
 - the radiant.
- 24 At the center of our Milky Way galaxy, neighboring stars are typically
- much farther apart than neighbors of our sun.
 - about the same distance apart as neighbors of our sun.
 - much closer together than neighbors of our sun.
- 25 A solar sail is a large sheet of light-reflecting plastic spread on an extremely low-mass framework and attached to a spacecraft. Sunlight exerts a force on the sail and moves the spacecraft. Suppose the spacecraft has a total mass of 100kg (including the sail) and sunlight exerts a total force of 2N on the sail. What will be the acceleration of the spacecraft?
- 0.2m/s^2
 - 0.02m/s^2
 - 100m/s^2
 - 50m/s^2
 - 2m/s^2
- 26 Which layer of the Earth has a thickness of only about ten miles?
- The crust.
 - The mantle.
 - The liquid part of the iron core.
- 27 The red supergiant phase of a star is caused by
- the exhaustion of helium at its core.
 - the exhaustion of hydrogen at its core.
 - the ignition of hydrogen at its core.
 - the collapse of its core.
 - the ignition of helium at its core.
- 28 The mass of a carbon atom is 12.00amu while the mass of a helium-4 atom is 4.003amu. If three atoms of helium fuse to form carbon, how much mass is converted into energy?
- 0.006amu
 - 0.009amu
 - 0.004amu
 - 0.012amu
 - 0.002amu
- 29 Which of the following spectral types corresponds to the star with the lowest surface temperature?
- K0
 - G0
 - K5
 - G5

- 30 Galaxies are organized into clusters and other large non-uniform structures that
- stop with superclusters (of clusters), which are themselves uniformly distributed.
 - apparently continue to larger and larger structures without end.
 - stop with tapestries (made of voids and filaments), which are themselves uniformly distributed.
 - stop with voids and filaments (made of superclusters), which are themselves uniformly distributed.
- 31 Which of Kepler's Laws governs how a particular planet speeds up and slows down?
- Orbits are Ellipses.
 - The Law of Inertia.
 - The Equal Area Law.
 - The Period-Radius Relation.
 - The Law of Averages.
- 32 Comets are made of
- concrete and marble.
 - ice and frozen gas.
 - styrofoam and poster paint.
 - gold and silver.
 - rock and iron.
- 33 The origin of the energy that is released in a supernova explosion is
- matter-antimatter annihilation.
 - nuclear energy stored in the star.
 - rotational energy in the core.
 - gravitational energy from the core collapse.
- 34 We can use the pointer stars in Orion to locate a point in the sky near the
- East Celestial Pole.
 - Celestial Equator.
 - North Celestial Pole.
 - Star Sirius.
 - South Celestial Pole.
- 35 The Lunar Regolith is
- the layer just above the core.
 - another name for the lunar crust.
 - a rock layer just beneath the lunar surface.
 - a layer of dirt on the lunar surface.
 - the soft part of the lunar core.
- 36 The twisting of magnetic field lines by the Sun's differential rotation causes
- sunspots.
 - sun dogs.
 - solar granules.
 - solar eclipses.
 - solar gravity.

- 37 The epicenters of earthquakes are located
- mostly near the Earth's equator.
 - mostly along continental boundaries.
 - mostly in the centers of oceans.
 - mostly along the edges of moving plates.
 - at random places on the Earth's surface.
- 38 A star whose apparent brightness is 10^{-6} times that of a first magnitude star would have magnitude
- 6.
 - 16.
 - 1.
 - 21.
 - 11.
- 39 A galaxy that is a featureless flattened ball of stars would be called a type
- E0.
 - Sa.
 - S0.
 - E7.
 - Sb.
- 40 Suppose that the color and behavior of a star identify it as a type that we know has absolute magnitude -3 . If the star's apparent magnitude is found to be 2, how far away is it?
- 1000 parsecs.
 - 10 parsecs.
 - 5 parsecs.
 - 100 parsecs.
 - 50 parsecs.
- 41 Galaxies A and B are 100Mpc from us while galaxy C is 200Mpc from us. From the viewpoint of galaxy A, we are moving away while
- B and C both move closer.
 - C moves away and B moves closer.
 - B and C both move away.
 - B moves away and C moves closer.
- 42 The Greenhouse Effect is important because it suggests an effect on
- the Earth's climate.
 - shielding UV light from the Sun.
 - the availability of greenhouses.
 - near-Earth asteroids.
 - the Earth's rotation.
- 43 Which of the following spectral classes corresponds to the highest surface temperature (on this list)?
- B
 - F
 - G
 - A
 - K

- 44 A nearby cluster of several thousand galaxies is called
- The Local Group.
 - The Virgo Cluster.
 - The Andromeda cluster.
 - The Milky Way.
- 45 High tide should occur
- when the Moon is overhead and when the Moon is over the opposite side of the Earth.
 - only when the Moon is overhead.
 - when the Moon is setting.
 - when the Moon is rising.
 - only when the Moon is over the opposite side of the Earth.
- 46 The frequency of a wave is defined to be
- The number of crests that pass in one second.
 - The number of seconds that it takes for a crest to pass.
 - The distance from one crest to the next.
 - The time for a set of crests to pass divided by the number of crests.
 - The distance from a maximum to a minimum.
- 47 Suppose that you drop two objects from the same height at the same time. Both objects are heavy enough to be unaffected by air resistance. If one object is twice as heavy as the other, Aristotle predicted that
- the heavier object would hit the ground long before the lighter one.
 - both objects would hit the ground at the same time.
 - the lighter object would hit the ground long before the heavier one.
- 48 In a Hertzsprung-Russell diagram, white dwarf stars such as Sirius B are
- at the lower right.
 - at the upper left.
 - at the upper right.
 - at the lower left.
- 49 The layer of the atmosphere that absorbs most of the ultraviolet radiation from the Sun is the
- ionosphere.
 - stratosphere.
 - mesosphere.
 - troposphere.
 - ozone layer.
- 50 The dust tail of a comet
- is a ball around the nucleus.
 - is curved and fuzzy-looking.
 - shoots out in random directions..
 - consists of straight streamers.

- 51 Rising pressure at the center of a collapsing cloud usually
- stops the collapse.
 - blows the cloud apart.
 - makes the collapse go faster.
 - causes the cloud to fragment.
 - prevents the cloud from fragmenting.
- 52 The spiral arms of a galaxy such as our Milky Way contain stars that are orbiting around the galactic center. One current theory is that these spiral arms are places where
- stars crowd closer together than usual and then move on.
 - the orbital motion of the stars has wound a bar shape into a spiral.
 - intense magnetic fields confine the stars.
- 53 The Large Magellanic Cloud is an example of a galaxy of type
- Irr II
 - Sc
 - SBC
 - Peculiar
 - Irr I
- 54 Once a star has evolved onto the Main Sequence in the HR Diagram, it
- drifts slowly toward lower mass and brightness.
 - moves both up and down the sequence.
 - evolves up the sequence toward higher brightness.
 - stays at the same point until it runs out of fuel.
- 55 If the frequency of electromagnetic radiation goes from 2×10^{14} Hz to 6×10^{14} Hz, the energy of each individual photon in the radiation
- is multiplied by 3.
 - is divided by 2.
 - is divided by 3.
 - does not change.
 - is multiplied by 2.
- 56 Stellar Parallax is caused by
- the finite speed of light.
 - the actual motion of stars relative to their neighbors.
 - the motion of the Earth around the Sun.
 - turbulence in the Earth's atmosphere.
 - the motion of our Sun relative to its neighbors.
- 57 Neutron stars are often observed as
- pulsars.
 - asteroids.
 - quasars.
 - Tau Tauri stars.
 - novas.

- 58 The idea that a supernova is preceded by a huge burst of neutrinos is
- a prediction that has now been observed.
 - a prediction that has not yet been observed.
 - no longer believed to be correct.
 - a purely theoretical idea that cannot be tested.
- 59 Pressure waves are transmitted through
- solids but not liquids.
 - liquids but not solids.
 - both solids and liquids.
- 60 Kepler found that planetary orbits are
- circles with the Sun off-center.
 - ellipses with the Sun at one focus.
 - ellipses with the Sun at the center.
 - circles with the Sun at the center.
- 61 The formation of a new white dwarf is usually accompanied by a
- helium flash.
 - nova.
 - supernova explosion.
 - dust cloud.
 - planetary nebula.
- 62 The mass that is distributed in different parts of our Milky Way Galaxy is estimated by
- measuring how stars orbit the center of the galaxy.
 - counting visible stars and adding up their masses.
 - measuring the temperature of the interstellar gas.
 - measuring the bending of starlight by unseen objects.
 - measuring how much hydrogen there is from its emissions.
- 63 The most convincing argument in favor of a large black hole at the center of the Milky Way Galaxy is
- its large mass.
 - its power or luminosity.
 - its large mass in a small region.
 - the fact that it is at the center.
- 64 The winter solstice occurs when the Sun is
- farthest South of the Celestial Equator.
 - closest to the Earth.
 - farthest from the Earth.
 - on the Celestial Equator.
 - farthest North of the Celestial Equator.

- 65 The Doppler shift of familiar spectral lines from gas clouds and stars in our galaxy measures their
- distances from the Sun.
 - directions of motion in the galaxy.
 - orbital velocities within the galaxy.
 - relative ages.
 - masses.
- 66 In a region of the atmosphere in which the temperature rises with increasing altitude
- you expect no changes.
 - you expect rapid changes.
- 67 The motion of the Moon around the Earth causes
- The seasons.
 - Dandruff.
 - Daily motions in the Heavens.
 - Meteor Showers.
 - The phases of the Moon.
- 68 Because mirrors only use one surface, they have a big advantage over lenses: They can be
- filled with more holes.
 - made out of metal.
 - thinner and larger in diameter.
 - thicker and stronger.
 - made more accurately.
- 69 In the reaction chain that powers our Sun, the first nucleus to form is
- He-4 (two protons and two neutrons).
 - ?-2 (two neutrons stuck together).
 - D (one proton, one neutron).
 - He-3 (two protons and one neutron).
 - C-12 (six protons and six neutrons).
- 70 Which of the following levels of the Sun's atmosphere has the highest temperature?
- transition zone.
 - chromosphere.
 - corona.
 - photosphere.
- 71 The iron core of an evolved massive star collapses because
- the weight of the rest of the star goes away.
 - the weight of the rest of the star increases.
 - its temperature rises faster when iron nuclei come apart.
 - its temperature suddenly goes to zero.
 - its temperature rise stops when iron nuclei come apart.

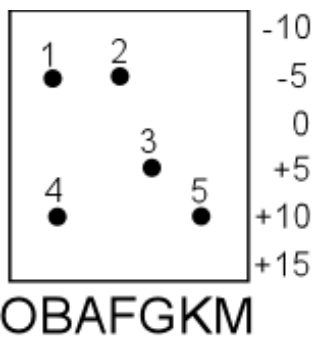
72 On a HR diagram, a visible white dwarf star is in the

- lower right corner.
- main sequence.
- lower left corner.
- upper right corner.
- upper left corner.

73 Cepheid variable stars with the same luminosity usually

- are at the same distance from us.
- belong to the same star cluster.
- have the same apparent magnitude.
- have similar periods.

74 In the Hertzsprung-Russell diagram shown, point number 3 could be a



- B0 star of absolute magnitude 10.
- B0 star of absolute magnitude -5.
- F0 star of absolute magnitude -5.
- F9 star of absolute magnitude 5.
- K2 star of absolute magnitude 10.

75 A nova occurs when

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

76 The Lunar Maria are actually

- oceans of water.
- oceans of carbon disulfide.
- ancient dust storms.
- ancient lava flows.
- the original lunar surface.

77 The Kuiper Belt is mostly located

- beyond the orbit of Neptune.
- between the orbits of Uranus and Neptune.
- between the orbits of Mars and Jupiter.
- between the orbits of Jupiter and Uranus.

- 78 The dark matter in our own galaxy is currently thought to be mostly
- cold gas and dust.
 - brown dwarfs.
 - something else.
- 79 Our Sun's location in the Milky Way is closest to the
- Sagittarius Arm.
 - Norma Arm.
 - Cygnus Arm.
 - Scutum-Crux Arm.
 - Orion Arm.
- 80 When the number of sunspots is greatest, the energy output of the Sun is
- decreased because the spots radiate less.
 - increased because solar activity is greater.
 - unaffected because the spots are small.
- 81 A type I supernova occurs when
- a white-dwarf collapses.
 - a white-dwarf flares briefly.
 - the core of a star collapses.
 - material falls onto a neutron star.
 - two neutron stars merge.
- 82 The first telescope was built by
- A Dutchman
 - Newton
 - Tycho Brahe
 - Galileo
- 83 An eclipse of the Sun is caused by
- the Sun's shadow falling on the Earth.
 - the Earth's shadow falling on the Sun.
 - the Moon's shadow falling on the Earth.
 - the Moon's shadow falling on the Sun.
 - the Earth's shadow falling on the Moon.
- 84 You see a reflecting telescope with a short, stubby tube and the eyepiece at the back. This telescope uses the
- Cassegrain Focus.
 - Prime Focus.
 - Coudé Focus
 - Newtonian Focus.

- 85 When an interstellar cloud fragment does not have enough mass to form a star powered by nuclear fusion, but gets hot enough to glow for a while, it is called
- a planet.
 - a class M object.
 - a yellow dwarf.
 - a brown dwarf.
 - a white dwarf.
- 86 The problem of stars "twinkling" due to atmospheric turbulence
- can be corrected by using a more powerful eyepiece.
 - can only be corrected by putting telescopes in space.
 - cannot be corrected.
 - can be corrected by going to larger telescope mirrors.
 - can be corrected by using a guide star.
- 87 Detecting too few neutrinos from the Sun was a problem because it meant that
- government grant money would be lost.
 - some part of the theory was wrong.
 - the detectors were not working.
- 88 Take Hubble's constant to be 65km/s/Mpc . If the red-shift of an object indicates that it is moving away from us at 260km/s , how far away is it?
- 0.25Mpc .
 - 10Mpc .
 - 4Mpc .
 - 260Mpc .
 - 0.1Mpc .
- 89 Copernicus said that the Earth and planets orbiting the Sun caused
- The retrograde motion of the planets.
 - The rising and setting of the Moon.
 - The rising and setting of the Sun.
 - The daily motions in the heavens.
 - The phases of the Moon.
- 90 Icy objects condensed from the outskirts of the Solar Nebula to form
- the Kuiper belt.
 - the asteroid belt.
 - The Oort Cloud.
 - The moons of the Jovian Planets.
 - the interstellar dust.
- 91 A steady X-ray signal with sudden bursts lasting a few seconds each is probably caused by
- a neutron star in a binary system.
 - a supermassive star.
 - a white dwarf in a binary system.
 - a main sequence star.
 - an isolated neutron star.

- 92 Light with an emission spectrum is usually generated by
- a hot, rarefied gas.
 - light from hot dense material passing through a rarefied gas.
 - a cold, rarefied gas.
 - hot, dense material.
- 93 Newton's explanation of Kepler's Laws relied upon a force that
- acts only on planets.
 - acts only on heavenly bodies.
 - acts on all objects.
 - acts only on inorganic matter.
 - acts on planets but not on comets.
- 94 Which of the following types of radiation has the lowest frequency on this list.
- ultraviolet light.
 - infrared light.
 - X-Rays.
 - microwaves.
 - red light.
- 95 The high tides drawn up by the Moon's gravity run ahead of the Moon's motion because of
- the effect of the Sun's gravity.
 - dragging by the Earth's magnetic field.
 - the finite speed of gravity.
 - friction with the rotating Earth.
 - the delayed response of the ocean.
- 96 Jupiter failed to become a star because
- It was made from the wrong material.
 - The Sun's ignition blew all the gas away.
 - The Sun's gravity prevented it from growing.
 - When Jupiter ignited, the Sun blew it out.
 - It was too far from the Sun.
- 97 Once you know to look for it, you will see that different stars have different colors. Which of the following star colors indicates the highest surface temperature?
- Green.
 - Yellow.
 - Red.
 - Blue.
 - Peach.
- 98 A star that forms an iron core most likely has a mass of
- less than one solar mass.
 - more than 20 solar masses.
 - between 1 and 4 solar masses.
 - between 15 and 20 solar masses.

- 99 Hubble's constant is not very accurately determined. For the most accepted value of 65km/s/Mpc the Hubble expansion time is about 13 billion years. If the correct value of Hubble's constant is actually 100km/s/Mpc, the Hubble expansion time would
- be less than 13 billion years.
 - be greater than 13 billion years.
 - still be 13 billion years.
- 100 Suppose that a flash of lightning from a cloud 5000 meters away is followed by a clap of thunder two seconds later. Assume that the light arrived in a negligible time and calculate the speed of the sound waves.
- 2m/s
 - 2500m/s
 - 1250m/s
 - 1000m/s
 - 5000m/s
- 101 Electrons that are bound to the nucleus of an atom (so that energy is needed to remove them) can have
- only certain isolated negative energies.
 - any negative energy at all.
 - any positive energy at all.
 - only certain isolated positive energies.
- 102 The distances to the farthest galaxies can be measured using
- radar ranging.
 - cepheid variable stars.
 - heliocentric parallax.
 - the Tulley-Fisher relation.
 - Hertzsprung-Russel diagrams.
- 103 The red line of a spectrum is normally at a wavelength of 656 nm. In the light of a star that is moving away from us, we might expect to see that red line at a wavelength of
- 656nm.
 - 660nm.
 - 650nm.
- 104 The mass of Sgr A* has been determined by observing
- the intensity of X-ray emissions from it.
 - the motions of stars near it.
 - interstellar space probes in orbit around it.
 - fluctuations in radio emissions from it.
- 105 The total luminosity, at all wavelengths, of the source Sgr A* is approximately
- a thousand times the luminosity of our sun.
 - one tenth the luminosity of our sun.
 - a thousand million times the luminosity of our sun.
 - the same as the luminosity of our sun.
 - a million times the luminosity of our sun.

- 106 The stars of the Milky Way are found
- in a band of stars stretching across the sky.
 - only near the celestial equator.
 - only near the ecliptic.
 - only near the celestial poles.
 - in all parts of the celestial sphere.
- 107 A star with a distance modulus of zero is at a distance of
- 1 parsec.
 - 1000 parsecs.
 - 10,000 parsecs.
 - 100 parsecs.
 - 10 parsecs.
- 108 Assume that the Hubble constant is 65 km/s/Mpc. If a galaxy is 100Mpc away, how fast is it moving away from us?
- 6500km/s
 - 650km/s
 - 65km/s
 - 100km/s
 - 0.65km/s
- 109 The word 'Parallax' in the term 'Spectroscopic Parallax' is used because that term refers to
- the use of parallel lines on the HR diagram.
 - the use of stellar parallax.
 - a method for finding the masses of stars.
 - a method for finding distances to stars.
- 110 The Moon's orbit
- is somewhat tilted relative to the plane of the Earth's equator.
 - is perpendicular to the plane of the Earth's equator.
 - is in the plane of the Earth's equator.
 - is in the plane of the ecliptic.
- 111 The average energy of motion of an atom or molecule in a gas is called its
- entropy.
 - frequency.
 - temperature.
 - density.
 - speed.
- 112 Which of the following objects is closest in size to a black hole formed from the collapse of a star?
- a neutron star.
 - a white dwarf star.
 - a yellow dwarf star.
 - a red giant star.

- 113 Planetesimals of rock and iron, prevented from forming a planet by Jupiter's gravity, became
- the Kuiper belt.
 - the interstellar dust.
 - the Moons of the Jovian planets.
 - the Oort Cloud.
 - the asteroid belt.
- 114 Objects such as the Great Nebula in Andromeda were once called "extragalactic nebulae". It is now realized that they are actually
- other galaxies much like our own.
 - inside our own galaxy.
 - small objects just outside our own galaxy.
- 115 A globular cluster usually consists of
- Millions of stars together.
 - Glowing gas and newborn stars.
 - Billions of stars together.
 - A single dead star surrounded by glowing gas.
- 116 Stars with more than 15 times the mass of our Sun usually evolve off the main sequence along a path in the HR diagram that
- is mostly horizontal.
 - starts out vertical and then goes almost horizontal.
 - is mostly vertical.
 - starts out horizontal and then goes almost vertical.
- 117 Suppose that an object with a mass of one kilogram and an object with a mass of two kilograms are both in free fall near the Earth's surface. As compared to the one kilogram object, the two kilogram object accelerates
- the same because gravity pulls on it more strongly and it has more inertia.
 - less because gravity pulls on it less strongly and it has more inertia.
 - less because it has more inertia.
 - more because gravity pulls on it more strongly and it has less inertia.
 - more because gravity pulls on it more strongly.
- 118 Which of the following statements is scientific (as defined by Popper)?
- Passenger pigeons taste good.
 - Passenger pigeons taste terrible.
 - Passenger pigeons are extinct.
 - Passenger pigeons are not extinct.
 - Passenger pigeons were pests.

Answer Key: Fall 2007 AFXA

- 1 Choice a. (blue.)
- 2 Choice a. (of natural origin.)
- 3 Choice a. (fragments into several smaller clouds which then form stars.)
- 4 Choice a. (the entire main sequence still present.)
- 5 Choice c. (No planet orbits the Sun clockwise.)
- 6 Choice d. (10 Newtons upward)
- 7 Choice c. (matter heating up as it falls toward the hole.)
- 8 Choice a. (they run out of coolant.)
- 9 Choice c. (are kicked out of the asteroid belt by Jupiter's gravity.)
- 10 Choice b. (4 minutes.)
- 11 Choice b. (neither at the center nor at the edge.)
- 12 Choice a. (9 parsecs.)
- 13 Choice d. (D)
- 14 Choice d. (failed but led to a better theory.)
- 15 Choice a. (Venus, with no moons at all.)
- 16 Choice a. (smoke and dust: It blocks the sunlight.)
- 17 Choice b. (near the surface.)
- 18 Choice a. (keep moving if no force acts on it.)
- 19 Choice e. ($3.853''/\text{yr.}$)
- 20 Choice b. (provided only a lot of accurate data.)
- 21 Choice c. (Population I.)
- 22 Choice c. (are responsible for moving the tectonic plates.)
- 23 Choice e. (the radiant.)
- 24 Choice c. (much closer together than neighbors of our sun.)
- 25 Choice b. (0.02m/s^2)
- 26 Choice a. (The crust.)
- 27 Choice a. (the exhaustion of helium at its core.)
- 28 Choice b. (0.009amu)
- 29 Choice c. (K5)
- 30 Choice d. (stop with voids and filaments (made of superclusters), which are themselves uniformly distributed.)
- 31 Choice c. (The Equal Area Law.)
- 32 Choice b. (ice and frozen gas.)
- 33 Choice d. (gravitational energy from the core collapse.)
- 34 Choice d. (Star Sirius.)
- 35 Choice d. (a layer of dirt on the lunar surface.)
- 36 Choice a. (sunspots.)

- 37 Choice d. (mostly along the edges of moving plates.)
- 38 Choice b. (16.)
- 39 Choice d. (E7.)
- 40 Choice d. (100 parsecs.)
- 41 Choice c. (B and C both move away.)
- 42 Choice a. (the Earth's climate.)
- 43 Choice a. (B)
- 44 Choice b. (The Virgo Cluster.)
- 45 Choice a. (when the Moon is overhead and when the Moon is over the opposite side of the Earth.)
- 46 Choice a. (The number of crests that pass in one second.)
- 47 Choice a. (the heavier object would hit the ground long before the lighter one.)
- 48 Choice d. (at the lower left.)
- 49 Choice e. (ozone layer.)
- 50 Choice b. (is curved and fuzzy-looking.)
- 51 Choice e. (prevents the cloud from fragmenting.)
- 52 Choice a. (stars crowd closer together than usual and then move on.)
- 53 Choice e. (Irr I)
- 54 Choice d. (stays at the same point until it runs out of fuel.)
- 55 Choice a. (is multiplied by 3.)
- 56 Choice c. (the motion of the Earth around the Sun.)
- 57 Choice a. (pulsars.)
- 58 Choice a. (a prediction that has now been observed.)
- 59 Choice c. (both solids and liquids.)
- 60 Choice b. (ellipses with the Sun at one focus.)
- 61 Choice e. (planetary nebula.)
- 62 Choice a. (measuring how stars orbit the center of the galaxy.)
- 63 Choice c. (its large mass in a small region.)
- 64 Choice a. (farthest South of the Celestial Equator.)
- 65 Choice c. (orbital velocities within the galaxy.)
- 66 Choice a. (you expect no changes.)
- 67 Choice e. (The phases of the Moon.)
- 68 Choice c. (thinner and larger in diameter.)
- 69 Choice c. (D (one proton, one neutron).)
- 70 Choice c. (corona.)
- 71 Choice e. (its temperature rise stops when iron nuclei come apart.)
- 72 Choice c. (lower left corner.)
- 73 Choice d. (have similar periods.)

- 74 Choice d. (F9 star of absolute magnitude 5.)
- 75 Choice c. (a white dwarf steals fuel from a neighbor.)
- 76 Choice d. (ancient lava flows.)
- 77 Choice a. (beyond the orbit of Neptune.)
- 78 Choice c. (something else.)
- 79 Choice e. (Orion Arm.)
- 80 Choice b. (increased because solar activity is greater.)
- 81 Choice a. (a white-dwarf collapses.)
- 82 Choice a. (A Dutchman)
- 83 Choice c. (the Moon's shadow falling on the Earth.)
- 84 Choice a. (Cassegrain Focus.)
- 85 Choice d. (a brown dwarf.)
- 86 Choice e. (can be corrected by using a guide star.)
- 87 Choice b. (some part of the theory was wrong.)
- 88 Choice c. (4Mpc.)
- 89 Choice a. (The retrograde motion of the planets.)
- 90 Choice a. (the Kuiper belt.)
- 91 Choice a. (a neutron star in a binary system.)
- 92 Choice a. (a hot, rarefied gas.)
- 93 Choice c. (acts on all objects.)
- 94 Choice d. (microwaves.)
- 95 Choice d. (friction with the rotating Earth.)
- 96 Choice b. (The Sun's ignition blew all the gas away.)
- 97 Choice d. (Blue.)
- 98 Choice d. (between 15 and 20 solar masses.)
- 99 Choice a. (be less than 13 billion years.)
- 100 Choice b. (2500m/s)
- 101 Choice a. (only certain isolated negative energies.)
- 102 Choice d. (the Tulley-Fisher relation.)
- 103 Choice b. (660nm.)
- 104 Choice b. (the motions of stars near it.)
- 105 Choice e. (a million times the luminosity of our sun.)
- 106 Choice a. (in a band of stars stretching across the sky.)
- 107 Choice e. (10 parsecs.)
- 108 Choice a. (6500km/s)
- 109 Choice d. (a method for finding distances to stars.)
- 110 Choice a. (is somewhat tilted relative to the plane of the Earth's equator.)

- 111 Choice c. (temperature.)
- 112 Choice a. (a neutron star.)
- 113 Choice e. (the asteroid belt.)
- 114 Choice a. (other galaxies much like our own.)
- 115 Choice a. (Millions of stars together.)
- 116 Choice a. (is mostly horizontal.)
- 117 Choice a. (the same because gravity pulls on it more strongly and it has more inertia.)
- 118 Choice c. (Passenger pigeons are extinct.)

Solutions

1. Module 045: Star Colors and Classes 045.11
2. Module 050: Neutron Stars Question 050.12
3. Module 047: Star Formation Question 047.13
4. Module 047: Star Formation Question 047.53
5. Module 017: Formation of the Solar System: Question 017.11
6. Module 007 Definitions of Force and Mass: Question 007.34
7. Module 051: Black Holes Question 051.22
8. Module 013 Infrared: Question 013.22
9. Module 016: Earth Impacts: Question 016.11
10. Module 001 Star Motions: Question 001.34
11. Module 052: The Milky Way Question 052.41
12. Module 043: Stellar Parallax Question 043.32
13. Module 046: The Hertzsprung-Russell Diagram Question 046.36
14. Module 006 Death of a Theory: Question 006.11
15. Module 014: Solar System Survey: Question 014.24
16. Module 016: Earth Impacts: Question 016.33
17. Module 040: Survey of the Sun Question 040.11
18. Module 007 The Law of Inertia: Question 007.12
19. Module 043: Stellar Parallax Question 043.42
20. Module 004 Tycho Brahe's Role: Question 004.42
21. Module 053: Shape of the Milky Way Question 053.31
22. Module 021: Continental Drift Question 021.32
23. Module 015: Comets in Detail: Question 015.45
24. Module 055: The Monster in the Milky Way Question 055.11
25. Module 007 The Law of Force and Mass: Question 007.44
26. Module 020: Earth and Moon Interiors Question 020.22
27. Module 048: The Quiet Deaths of Ordinary Stars Question 048.31
28. Module 042: Nuclear Fire Question 042.21
29. Module 045: Star Colors and Classes Question 045.32
30. Module 056: The Family of Galaxies Question 056.51
31. Module 006 Equal Area Rule: Question 006.32
32. Module 014: Solar System Survey: Question 014.42
33. Module 049: Supernova Explosions Question 049.53
34. Module 001 The Celestial Sphere: Question 001.13
35. Module 022: The Earth's Moon Question 022.32
36. Module 041: Solar Magnetism and Activity Question 041.22

37. Module 021: Continental Drift Question 021.12
38. Module 044: Stellar Magnitudes 044.23
39. Module 056: The Family of Galaxies Question 056.16
40. Module 044: Stellar Magnitudes Question 044.42
41. Module 057: The Expanding Universe Question 057.21
42. Module019: The Earth's Atmosphere Question 019.33
43. Module 045: Star Colors and Classes 045.21
44. Module 056: The Family of Galaxies Question 056.44
45. Module 018: The Moon and the Tides: Question 018.11
46. Module 009 Frequency: Question 009.21
47. Module 005 The First Physicist: Question 005.14
48. Module 046: The Hertzsprung-Russell Diagram Question 046.22
49. Module019: The Earth's Atmosphere Question 019.25
50. Module 015: Comets in Detail: Question 015.14
51. Module 047: Star Formation Question 047.22
52. Module 053: Shape of the Milky Way Question 053.43
53. Module 056: The Family of Galaxies Question 056.21
54. Module 047: Star Formation Question 047.33
55. Module 011 Photons: Question 011.23
56. Module 043: Stellar Parallax Question 043.11
57. Module 050: Neutron Stars Question 050.22
58. Module 049: Supernova Explosions Question 049.43
59. Module020:Earth and Moon Interiors Question 020.13
60. Module 006 Orbits are Ellipses: Question 006.21
61. Module 048: The Quiet Deaths of Ordinary Stars Question 048.44
62. Module 054: Dark Matter in the Milky Way Question 054.22
63. Module 055: The Monster in the Milky Way Question 055.41
64. Module 001 The Path of the Sun: Question 001.56
65. Module 054: Dark Matter in the Milky Way Question 054.12
66. Module019: The Earth's Atmosphere Question 019.13
67. Module 002 Phases of the Moon: Question 002.12
68. Module 012 Focal Point of a Mirror: Question 012.24
69. Module 042: Nuclear Fire Question 042.42
70. Module 040: Survey of the Sun Question 040.23
71. Module 049: Supernova Explosions Question 049.31
72. Module 048: The Quiet Deaths of Ordinary Stars Question 048.54
73. Module 052: The Milky Way Question 052.32

74. Module 046: The Hertzsprung-Russell Diagram Question 046.14
75. Module 048: The Quiet Deaths of Ordinary Stars Question 048.61
76. Module 022: The Earth's Moon Question 022.11
77. Module 015: Comets in Detail: Question 015.21
78. Module 054: Dark Matter in the Milky Way Question 054.33
79. Module 053: Shape of the Milky Way Question 053.23
80. Module 040: Survey of the Sun Question 040.35
81. Module 049: Supernova Explosions Question 049.62
82. Module 005 The First Astrophysicist: Question 005.22
83. Module 002 Solar Eclipses: Question 002.23
84. Module 012 Telescope Designs: Question 012.32
85. Module 047: Star Formation Question 047.44
86. Module 012 Telescope Limitations: Question 012.43
87. Module 042: Nuclear Fire Question 042.52
88. Module 057: The Expanding Universe Question 057.32
89. Module 004 The Copernican System: Question 004.22
90. Module 017: Formation of the Solar System: Question 017.43
91. Module 050: Neutron Stars Question 050.32
92. Module 010 Spectra: Question 010.32
93. Module 008 Explaining Kepler's Laws: Question 008.12
94. Module 010 The Electromagnetic Spectrum: Question 010.14
95. Module 018: The Moon and the Tides: Question 018.42
96. Module 017: Formation of the Solar System: Question 017.31
97. Module 010 Temperature and Color: Question 010.21
98. Module 049: Supernova Explosions Question 049.12
99. Module 057: The Expanding Universe Question 057.41
100. Module 009 Speed of a Wave: Question 009.35
101. Module 011 Atomic Energy Levels: Question 011.31
102. Module 056: The Family of Galaxies Question 056.35
103. Module 010 The Doppler Effect: Question 010.43
104. Module 055: The Monster in the Milky Way Question 055.31
105. Module 055: The Monster in the Milky Way Question 055.23
106. Module 052: The Milky Way Question 052.12
107. Module 044: Stellar Magnitudes 044.31
108. Module 057: The Expanding Universe Question 057.11
109. Module 046: The Hertzsprung-Russell Diagram Question 046.52
110. Module 022: The Earth's Moon Question 022.43

111. Module 042: Nuclear Fire Question 042.32
112. Module 051: Black Holes Question 051.14
113. Module 017: Formation of the Solar System: Question 017.51
114. Module 053: Shape of the Milky Way Question 053.11
115. Module 052: The Milky Way Question 052.22
116. Module 049: Supernova Explosions Question 049.22
117. Module 008 Unifying Physical Law: Question 008.24
118. Module 003 How to test a statement : Question 003.23