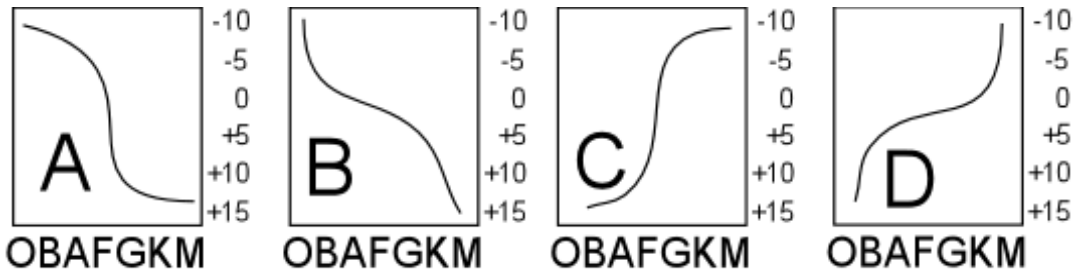


- 1 A large asteroid impact causes the extinction of whole species mainly by the effects of the
 - a. blast and shock wave: It blows them away.
 - b. light and heat: It incinerates them.
 - c. smoke and dust: It blocks the sunlight.
 - d. noise: It scares them to death.
- 2 Which of the following types of radiation has the lowest frequency on this list.
 - a. infrared light.
 - b. X-Rays.
 - c. microwaves.
 - d. ultraviolet light.
 - e. red light.
- 3 Kepler was an early advocate of the Copernican Theory. When he applied it to Tycho's observations, it
 - a. failed and was completely discarded.
 - b. failed but led to a better theory.
 - c. was as accurate as the observations.
 - d. worked perfectly.
- 4 In a region of the atmosphere in which the temperature rises with increasing altitude
 - a. you expect rapid changes.
 - b. you expect no changes.
- 5 Objects such as the Great Nebula in Andromeda were once called "extragalactic nebulae". It is now realized that they are actually
 - a. small objects just outside our own galaxy.
 - b. other galaxies much like our own.
 - c. inside our own galaxy.
- 6 The origin of the energy that is released in a supernova explosion is
 - a. rotational energy in the core.
 - b. matter-antimatter annihilation.
 - c. gravitational energy from the core collapse.
 - d. nuclear energy stored in the star.
- 7 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?
 - a. 50 parsecs.
 - b. 10 parsecs.
 - c. 100 parsecs.
 - d. 1000 parsecs.
 - e. 5 parsecs.
- 8 Newton's explanation of Kepler's Laws relied upon a force that
 - a. acts only on heavenly bodies.
 - b. acts only on inorganic matter.
 - c. acts on planets but not on comets.
 - d. acts only on planets.
 - e. acts on all objects.

- 9 Comets are made of
- concrete and marble.
 - rock and iron.
 - ice and frozen gas.
 - styrofoam and poster paint.
 - gold and silver.
- 10 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?
- 10 Newtons upward
 - 10 Newtons downward
 - 20 Newtons downward
 - 20 Newtons upward
 - 200 Newtons downward

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



- 12 Orbiting Infrared Observatories usually have limited life primarily because
- they run out of coolant.
 - they run out of maneuvering fuel.
 - their orbits decay.
 - funds to operate them run out.
 - they run out of electric power.
- 13 The word 'Parallax' in the term 'Spectroscopic Parallax' is used because that term refers to
- a method for finding the masses of stars.
 - the use of stellar parallax.
 - the use of parallel lines on the HR diagram.
 - a method for finding distances to stars.
- 14 Within our own Milky Way Galaxy, our sun is a typical member of
- Population II.
 - Population I.
 - either Population I or II.
- 15 The X-rays that reveal the possible presence of a black hole are the result of
- vibrations of the hole's event horizon.
 - starlight accelerated in the hole's gravity.
 - matter heating up as it falls toward the hole.
 - gravitons converted to photons by the hole.

- 16 The Greenhouse Effect is important because it suggests an effect on
- shielding UV light from the Sun.
 - near-Earth asteroids.
 - the availability of greenhouses.
 - the Earth's rotation.
 - the Earth's climate.
- 17 The motion of the Moon around the Earth causes
- Meteor Showers.
 - Dandruff.
 - Daily motions in the Heavens.
 - The seasons.
 - The phases of the Moon.
- 18 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?
- Peach.
 - Red.
 - Blue.
 - Yellow.
 - Green.
- 19 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.
- 20 The dust tail of a comet
- consists of straight streamers.
 - is curved and fuzzy-looking.
 - shoots out in random directions..
 - is a ball around the nucleus.
- 21 Light with an emission spectrum is usually generated by
- hot, dense material.
 - light from hot dense material passing through a rarefied gas.
 - a cold, rarefied gas.
 - a hot, rarefied gas.
- 22 Which of the following colors indicates the hottest star?
- peach.
 - yellow.
 - red.
 - orange.
 - blue.

- 23 The Lunar Regolith is
- the soft part of the lunar core.
 - a layer of dirt on the lunar surface.
 - the layer just above the core.
 - another name for the lunar crust.
 - a rock layer just beneath the lunar surface.
- 24 When a large interstellar cloud collapses, it usually
- forms a large ring that fragments to form a ring of stars.
 - remains together and collapses to a single large star.
 - fragments into several smaller clouds which then form stars.
 - remains together and spits out several stars.
- 25 The Lunar Maria are actually
- ancient dust storms.
 - oceans of water.
 - ancient lava flows.
 - the original lunar surface.
 - oceans of carbon disulfide.
- 26 We can use the pointer stars in Orion to locate a point in the sky near the
- North Celestial Pole.
 - Celestial Equator.
 - Star Sirius.
 - East Celestial Pole.
 - South Celestial Pole.
- 27 The winter solstice occurs when the Sun is
- farthest from the Earth.
 - on the Celestial Equator.
 - farthest South of the Celestial Equator.
 - farthest North of the Celestial Equator.
 - closest to the Earth.
- 28 Galaxies are organized into clusters and other large non-uniform structures that
- stop with voids and filaments (made of superclusters), 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 superclusters (of clusters), which are themselves uniformly distributed.
- 29 The layer of the atmosphere that absorbs most of the ultraviolet radiation from the Sun is the
- ozone layer.
 - stratosphere.
 - mesosphere.
 - ionosphere.
 - troposphere.

- 30 Assume that the Hubble constant is 65 km/s/Mpc. If a galaxy is 100Mpc away, how fast is it moving away from us?
- 650km/s
 - 0.65km/s
 - 6500km/s
 - 100km/s
 - 65km/s
- 31 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.
 - starts out horizontal and then goes almost vertical.
 - is mostly vertical.
- 32 The twisting of magnetic field lines by the Sun's differential rotation causes
- solar gravity.
 - solar granules.
 - sunspots.
 - sun dogs.
 - solar eclipses.
- 33 On a HR diagram, a visible white dwarf star is in the
- lower left corner.
 - lower right corner.
 - upper left corner.
 - main sequence.
 - upper right corner.
- 34 The Law of Inertia states that a moving object will
- keep moving if a force pushes it.
 - never stop.
 - stop if no force acts on it.
 - keep moving if no force acts on it.
 - always stop.
- 35 The Moon's orbit
- 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.
 - is somewhat tilted relative to the plane of the Earth's equator.
- 36 The formation of a new white dwarf is usually accompanied by a
- nova.
 - supernova explosion.
 - helium flash.
 - planetary nebula.
 - dust cloud.

- 37 The average energy of motion of an atom or molecule in a gas is called its
- frequency.
 - density.
 - speed.
 - entropy.
 - temperature.
- 38 Jupiter failed to become a star because
- It was too far from the Sun.
 - The Sun's ignition blew all the gas away.
 - It was made from the wrong material.
 - When Jupiter ignited, the Sun blew it out.
 - The Sun's gravity prevented it from growing.
- 39 The Doppler shift of familiar spectral lines from gas clouds and stars in our galaxy measures their
- orbital velocities within the galaxy.
 - masses.
 - relative ages.
 - directions of motion in the galaxy.
 - distances from the Sun.
- 40 A globular cluster usually consists of
- Glowing gas and newborn stars.
 - A single dead star surrounded by glowing gas.
 - Billions of stars together.
 - Millions of stars together.
- 41 A steady X-ray signal with sudden bursts lasting a few seconds each is probably caused by
- a white dwarf in a binary system.
 - a main sequence star.
 - an isolated neutron star.
 - a neutron star in a binary system.
 - a supermassive star.
- 42 Icy objects condensed from the outskirts of the Solar Nebula to form
- the Kuiper belt.
 - The moons of the Jovian Planets.
 - the asteroid belt.
 - the interstellar dust.
 - The Oort Cloud.
- 43 A galaxy that is a featureless flattened ball of stars would be called a type
- E0.
 - Sb.
 - E7.
 - S0.
 - Sa.

- 44 Which of the following spectral classes corresponds to the highest surface temperature (on this list)?
- B
 - A
 - G
 - F
 - K
- 45 Stellar Parallax is caused by
- turbulence in the Earth's atmosphere.
 - the motion of our Sun relative to its neighbors.
 - the actual motion of stars relative to their neighbors.
 - the motion of the Earth around the Sun.
 - the finite speed of light.
- 46 The Large Magellanic Cloud is an example of a galaxy of type
- Irr II
 - Irr I
 - Sc
 - Peculiar
 - SBc
- 47 The epicenters of earthquakes are located
- mostly along the edges of moving plates.
 - mostly near the Earth's equator.
 - mostly in the centers of oceans.
 - at random places on the Earth's surface.
 - mostly along continental boundaries.
- 48 In a Hertzsprung-Russell diagram, white dwarf stars such as Sirius B are
- at the lower right.
 - at the upper right.
 - at the upper left.
 - at the lower left.
- 49 The idea that a supernova is preceded by a huge burst of neutrinos is
- no longer believed to be correct.
 - a prediction that has now been observed.
 - a prediction that has not yet been observed.
 - a purely theoretical idea that cannot be tested.
- 50 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.
 - measuring how much hydrogen there is from its emissions.
 - measuring the temperature of the interstellar gas.
 - counting visible stars and adding up their masses.
 - measuring the bending of starlight by unseen objects.

- 51 As seen from far above the Earth's North Pole, the Earth orbits the Sun counter clockwise and
- the Jovian planets orbit the Sun clockwise.
 - Pluto orbits the Sun clockwise.
 - Mercury orbits the Sun clockwise.
 - No planet orbits the Sun clockwise.
- 52 A nova occurs when
- the core of a star suddenly collapses.
 - a white dwarf steals fuel from a neighbor.
 - a star blows off its outer envelope.
 - a red giant begins to burn helium.
 - a star runs out of fuel.
- 53 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 celestial poles.
 - only near the ecliptic.
 - in all parts of the celestial sphere.
- 54 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?
- 10Mpc .
 - 260Mpc .
 - 0.25Mpc .
 - 4Mpc .
 - 0.1Mpc .
- 55 The iron core of an evolved massive star collapses because
- its temperature rises faster when iron nuclei come apart.
 - the weight of the rest of the star goes away.
 - the weight of the rest of the star increases.
 - its temperature suddenly goes to zero.
 - its temperature rise stops when iron nuclei come apart.
- 56 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.
 - 18 parsecs.
 - 4.5 parsecs.
 - $1/9$ parsecs.
 - 4 parsecs.
- 57 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.
 - only certain isolated positive energies.
 - any negative energy at all.
 - any positive energy at all.

- 58 An eclipse of the Sun is caused by
- the Sun's shadow falling on the Earth.
 - the Moon's shadow falling on the Sun.
 - the Earth's shadow falling on the Moon.
 - the Moon's shadow falling on the Earth.
 - the Earth's shadow falling on the Sun.
- 59 Copernicus said that the Earth and planets orbiting the Sun caused
- The rising and setting of the Moon.
 - The daily motions in the heavens.
 - The phases of the Moon.
 - The retrograde motion of the planets.
 - The rising and setting of the Sun.
- 60 Which of the following statements is scientific (as defined by Popper)?
- Passenger pigeons taste good.
 - Passenger pigeons are extinct.
 - Passenger pigeons were pests.
 - Passenger pigeons taste terrible.
 - Passenger pigeons are not extinct.
- 61 Which of the following levels of the Sun's atmosphere has the highest temperature?
- photosphere.
 - transition zone.
 - chromosphere.
 - corona.
- 62 Which of Kepler's Laws governs how a particular planet speeds up and slows down?
- The Law of Inertia.
 - The Period-Radius Relation.
 - The Equal Area Law.
 - Orbits are Ellipses.
 - The Law of Averages.
- 63 A star whose apparent brightness is 10^{-6} times that of a first magnitude star would have magnitude
- 6.
 - 21.
 - 16.
 - 1.
 - 11.
- 64 Planetesimals of rock and iron, prevented from forming a planet by Jupiter's gravity, became
- the Moons of the Jovian planets.
 - the interstellar dust.
 - the Oort Cloud.
 - the asteroid belt.
 - the Kuiper belt.

- 65 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.
- 1250m/s
 - 2500m/s
 - 2m/s
 - 5000m/s
 - 1000m/s
- 66 You see a reflecting telescope with a short, stubby tube and the eyepiece at the back. This telescope uses the
- Coudé Focus
 - Cassegrain Focus.
 - Prime Focus.
 - Newtonian Focus.
- 67 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 class M object.
 - a brown dwarf.
 - a yellow dwarf.
 - a planet.
 - a white dwarf.
- 68 The first telescope was built by
- A Dutchman
 - Galileo
 - Newton
 - Tycho Brahe
- 69 The number of near-Earth asteroids is large because they
- are left over from the formation of our Moon.
 - are in stable orbits and have nowhere else to go.
 - are kicked out of the asteroid belt by Jupiter's gravity.
 - are the remains of a destroyed planet near the Earth.
- 70 Because mirrors only use one surface, they have a big advantage over lenses: They can be
- thinner and larger in diameter.
 - filled with more holes.
 - made out of metal.
 - thicker and stronger.
 - made more accurately.
- 71 During a meteor shower, shooting stars seem to be coming from
- the equant.
 - the radiant.
 - the celestial equator.
 - all parts of the sky.
 - the celestial north pole.

- 72 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
- 660nm.
 - 650nm.
 - 656nm.
- 73 The frequency of a wave is defined to be
- The distance from one crest to the next.
 - The number of seconds that it takes for a crest to pass.
 - The distance from a maximum to a minimum.
 - The time for a set of crests to pass divided by the number of crests.
 - The number of crests that pass in one second.
- 74 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
- 38.53"/yr.
 - 0.26"/yr.
 - 1.9265"/yr.
 - 3.853"/yr.
 - 3853"/yr.
- 75 The steam catapult on an aircraft carrier must accelerate an airplane from zero to 100m/s in just ten seconds. If the airplane has a mass of 10,000kg, how much force must the catapult exert on the plane?
- 100,000N
 - 10,000N
 - 5,000,000N
 - 100N.
 - 1,000,000N
- 76 In the reaction chain that powers our Sun, the first nucleus to form is
- ?-2 (two neutrons stuck together).
 - D (one proton, one neutron).
 - He-4 (two protons and two neutrons).
 - He-3 (two protons and one neutron).
 - C-12 (six protons and six neutrons).
- 77 One conclusion that was drawn from the gradual slowing of the radio signals from the Crab Nebula was that they were probably
- an obvious hoax.
 - of natural origin.
 - from a source moving toward us.
 - from a source moving away from us.
 - of artificial origin.

- 78 The total luminosity, at all wavelengths, of the source Sgr A* is approximately
- a thousand million times the luminosity of our sun.
 - the same as the luminosity of our sun.
 - one tenth the luminosity of our sun.
 - a thousand times the luminosity of our sun.
 - a million times the luminosity of our sun.
- 79 Which layer of the Earth has a thickness of only about ten miles?
- The crust.
 - The mantle.
 - The liquid part of the iron core.
- 80 Convection currents in the Earth's Mantle
- happen but do not affect the crust.
 - are responsible for moving the tectonic plates.
 - are responsible for land tides.
 - do not happen because solid rock does not move.
 - cause mass extinctions.
- 81 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.
 - 5 minutes.
 - 4 minutes.
 - 30 minutes.
 - 6 2/3 minutes.
- 82 Once a star has evolved onto the Main Sequence in the HR Diagram, it
- stays at the same point until it runs out of fuel.
 - drifts slowly toward lower mass and brightness.
 - evolves up the sequence toward higher brightness.
 - moves both up and down the sequence.
- 83 The HR diagram of a young, open cluster typically shows
- only the lower part of the main sequence still present.
 - only the upper part of the main sequence still present.
 - only the middle part of the main sequence still present.
 - the entire main sequence still present.
- 84 Kepler found that planetary orbits are
- circles with the Sun off-center.
 - circles with the Sun at the center.
 - ellipses with the Sun at the center.
 - ellipses with the Sun at one focus.

- 85 The red supergiant phase of a star is caused by
- the collapse of its core.
 - the ignition of helium at its core.
 - the exhaustion of hydrogen at its core.
 - the exhaustion of helium at its core.
 - the ignition of hydrogen at its core.
- 86 Pressure waves are transmitted through
- both solids and liquids.
 - liquids but not solids.
 - solids but not liquids.
- 87 Which of the following spectral types corresponds to the star with the lowest surface temperature?
- K5
 - G0
 - K0
 - G5
- 88 A star with a distance modulus of zero is at a distance of
- 1000 parsecs.
 - 10,000 parsecs.
 - 10 parsecs.
 - 1 parsec.
 - 100 parsecs.
- 89 The high tides drawn up by the Moon's gravity run ahead of the Moon's motion because of
- dragging by the Earth's magnetic field.
 - the finite speed of gravity.
 - the delayed response of the ocean.
 - the effect of the Sun's gravity.
 - friction with the rotating Earth.
- 90 High tide should occur
- only when the Moon is overhead.
 - when the Moon is overhead and when the Moon is over the opposite side of the Earth.
 - only when the Moon is over the opposite side of the Earth.
 - when the Moon is setting.
 - when the Moon is rising.
- 91 Detecting too few neutrinos from the Sun was a problem because it meant that
- the detectors were not working.
 - government grant money would be lost.
 - some part of the theory was wrong.
- 92 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.

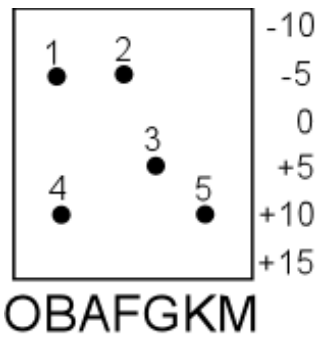
- 93 A nearby cluster of several thousand galaxies is called
- The Milky Way.
 - The Local Group.
 - The Andromeda cluster.
 - The Virgo Cluster.
- 94 The Kuiper Belt is mostly located
- between the orbits of Mars and Jupiter.
 - between the orbits of Uranus and Neptune.
 - beyond the orbit of Neptune.
 - between the orbits of Jupiter and Uranus.
- 95 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.
 - the lighter object would hit the ground long before the heavier one.
 - both objects would hit the ground at the same time.
- 96 Which of the following three systems is regarded as the most normal for a terrestrial planet?
- Venus, with no moons at all.
 - Mars, with two moons each the size of an asteroid.
 - Earth, with a moon larger than the dwarf planet Pluto.
- 97 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
- more because gravity pulls on it more strongly.
 - the same because gravity pulls on it more strongly and it has more inertia.
 - more because gravity pulls on it more strongly and it has less inertia.
 - less because it has more inertia.
 - less because gravity pulls on it less strongly and it has more inertia.
- 98 Neutron stars are often observed as
- pulsars.
 - quasars.
 - asteroids.
 - novas.
 - Tau Tauri stars.
- 99 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.
- 100 Relative to the Milky Way family of stars, our sun is
- at the extreme edge.
 - at the center.
 - neither at the center nor at the edge.

- 101 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 away.
 - B and C both move closer.
 - B moves away and C moves closer.
 - C moves away and B moves closer.
- 102 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
- still be 13 billion years.
 - be less than 13 billion years.
 - be greater than 13 billion years.
- 103 Our Sun's location in the Milky Way is closest to the
- Sagittarius Arm.
 - Norma Arm.
 - Orion Arm.
 - Scutum-Crux Arm.
 - Cygnus Arm.
- 104 The problem of stars "twinkling" due to atmospheric turbulence
- can be corrected by going to larger telescope mirrors.
 - can be corrected by using a more powerful eyepiece.
 - can only be corrected by putting telescopes in space.
 - can be corrected by using a guide star.
 - cannot be corrected.
- 105 Cepheid variable stars with the same luminosity usually
- have similar periods.
 - are at the same distance from us.
 - have the same apparent magnitude.
 - belong to the same star cluster.
- 106 The mass of Sgr A* has been determined by observing
- interstellar space probes in orbit around it.
 - the intensity of X-ray emissions from it.
 - the motions of stars near it.
 - fluctuations in radio emissions from it.
- 107 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?
- 0.004amu
 - 0.012amu
 - 0.009amu
 - 0.006amu
 - 0.002amu

- 108 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.
- 109 A star that forms an iron core most likely has a mass of
- between 1 and 4 solar masses.
 - less than one solar mass.
 - between 15 and 20 solar masses.
 - more than 20 solar masses.
- 110 The distances to the farthest galaxies can be measured using
- the Tulley-Fisher relation.
 - radar ranging.
 - Hertzsprung-Russel diagrams.
 - heliocentric parallax.
 - cepheid variable stars.
- 111 Rising pressure at the center of a collapsing cloud usually
- causes the cloud to fragment.
 - makes the collapse go faster.
 - stops the collapse.
 - prevents the cloud from fragmenting.
 - blows the cloud apart.
- 112 In our Sun, the convection zone is located
- near the surface.
 - above the central region but well below the surface.
 - at the very center.
- 113 The dark matter in our own galaxy is currently thought to be mostly
- something else.
 - brown dwarfs.
 - cold gas and dust.
- 114 The most convincing argument in favor of a large black hole at the center of the Milky Way Galaxy is
- its large mass.
 - the fact that it is at the center.
 - its power or luminosity.
 - its large mass in a small region.
- 115 By making extensive observations of planetary motion, Tycho Brahe
- discovered new planets.
 - provided only a lot of accurate data.
 - disproved Ptolemy's theory of planetary motion.
 - proved that Copernicus was right.
 - explained how planets move.

- 116 If the frequency of electromagnetic radiation goes from $2 \times 10^{14} \text{ Hz}$ to $6 \times 10^{14} \text{ Hz}$, the energy of each individual photon in the radiation
- is multiplied by 2.
 - is multiplied by 3.
 - does not change.
 - is divided by 3.
 - is divided by 2.
- 117 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.

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



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

Answer Key: Fall 2007 AFXD

- 1 Choice c. (smoke and dust: It blocks the sunlight.)
- 2 Choice c. (microwaves.)
- 3 Choice b. (failed but led to a better theory.)
- 4 Choice b. (you expect no changes.)
- 5 Choice b. (other galaxies much like our own.)
- 6 Choice c. (gravitational energy from the core collapse.)
- 7 Choice c. (100 parsecs.)
- 8 Choice e. (acts on all objects.)
- 9 Choice c. (ice and frozen gas.)
- 10 Choice a. (10 Newtons upward)
- 11 Choice b. (B)
- 12 Choice a. (they run out of coolant.)
- 13 Choice d. (a method for finding distances to stars.)
- 14 Choice b. (Population I.)
- 15 Choice c. (matter heating up as it falls toward the hole.)
- 16 Choice e. (the Earth's climate.)
- 17 Choice e. (The phases of the Moon.)
- 18 Choice c. (Blue.)
- 19 Choice b. (increased because solar activity is greater.)
- 20 Choice b. (is curved and fuzzy-looking.)
- 21 Choice d. (a hot, rarefied gas.)
- 22 Choice e. (blue.)
- 23 Choice b. (a layer of dirt on the lunar surface.)
- 24 Choice c. (fragments into several smaller clouds which then form stars.)
- 25 Choice c. (ancient lava flows.)
- 26 Choice c. (Star Sirius.)
- 27 Choice c. (farthest South of the Celestial Equator.)
- 28 Choice a. (stop with voids and filaments (made of superclusters), which are themselves uniformly distributed.)
- 29 Choice a. (ozone layer.)
- 30 Choice c. (6500km/s)
- 31 Choice a. (is mostly horizontal.)
- 32 Choice c. (sunspots.)
- 33 Choice a. (lower left corner.)
- 34 Choice d. (keep moving if no force acts on it.)
- 35 Choice d. (is somewhat tilted relative to the plane of the Earth's equator.)
- 36 Choice d. (planetary nebula.)

- 37 Choice e. (temperature.)
- 38 Choice b. (The Sun's ignition blew all the gas away.)
- 39 Choice a. (orbital velocities within the galaxy.)
- 40 Choice d. (Millions of stars together.)
- 41 Choice d. (a neutron star in a binary system.)
- 42 Choice a. (the Kuiper belt.)
- 43 Choice c. (E7.)
- 44 Choice a. (B)
- 45 Choice d. (the motion of the Earth around the Sun.)
- 46 Choice b. (Irr I)
- 47 Choice a. (mostly along the edges of moving plates.)
- 48 Choice d. (at the lower left.)
- 49 Choice b. (a prediction that has now been observed.)
- 50 Choice a. (measuring how stars orbit the center of the galaxy.)
- 51 Choice d. (No planet orbits the Sun clockwise.)
- 52 Choice b. (a white dwarf steals fuel from a neighbor.)
- 53 Choice a. (in a band of stars stretching across the sky.)
- 54 Choice d. (4Mpc.)
- 55 Choice e. (its temperature rise stops when iron nuclei come apart.)
- 56 Choice a. (9 parsecs.)
- 57 Choice a. (only certain isolated negative energies.)
- 58 Choice d. (the Moon's shadow falling on the Earth.)
- 59 Choice d. (The retrograde motion of the planets.)
- 60 Choice b. (Passenger pigeons are extinct.)
- 61 Choice d. (corona.)
- 62 Choice c. (The Equal Area Law.)
- 63 Choice c. (16.)
- 64 Choice d. (the asteroid belt.)
- 65 Choice b. (2500m/s)
- 66 Choice b. (Cassegrain Focus.)
- 67 Choice b. (a brown dwarf.)
- 68 Choice a. (A Dutchman)
- 69 Choice c. (are kicked out of the asteroid belt by Jupiter's gravity.)
- 70 Choice a. (thinner and larger in diameter.)
- 71 Choice b. (the radiant.)
- 72 Choice a. (660nm.)
- 73 Choice e. (The number of crests that pass in one second.)

- 74 Choice d. ($3.853''/\text{yr.}$)
- 75 Choice a. (100,000N)
- 76 Choice b. (D (one proton, one neutron).)
- 77 Choice b. (of natural origin.)
- 78 Choice e. (a million times the luminosity of our sun.)
- 79 Choice a. (The crust.)
- 80 Choice b. (are responsible for moving the tectonic plates.)
- 81 Choice c. (4 minutes.)
- 82 Choice a. (stays at the same point until it runs out of fuel.)
- 83 Choice d. (the entire main sequence still present.)
- 84 Choice d. (ellipses with the Sun at one focus.)
- 85 Choice d. (the exhaustion of helium at its core.)
- 86 Choice a. (both solids and liquids.)
- 87 Choice a. (K5)
- 88 Choice c. (10 parsecs.)
- 89 Choice e. (friction with the rotating Earth.)
- 90 Choice b. (when the Moon is overhead and when the Moon is over the opposite side of the Earth.)
- 91 Choice c. (some part of the theory was wrong.)
- 92 Choice a. (stars crowd closer together than usual and then move on.)
- 93 Choice d. (The Virgo Cluster.)
- 94 Choice c. (beyond the orbit of Neptune.)
- 95 Choice a. (the heavier object would hit the ground long before the lighter one.)
- 96 Choice a. (Venus, with no moons at all.)
- 97 Choice b. (the same because gravity pulls on it more strongly and it has more inertia.)
- 98 Choice a. (pulsars.)
- 99 Choice a. (a white-dwarf collapses.)
- 100 Choice c. (neither at the center nor at the edge.)
- 101 Choice a. (B and C both move away.)
- 102 Choice b. (be less than 13 billion years.)
- 103 Choice c. (Orion Arm.)
- 104 Choice d. (can be corrected by using a guide star.)
- 105 Choice a. (have similar periods.)
- 106 Choice c. (the motions of stars near it.)
- 107 Choice c. (0.009amu)
- 108 Choice a. (a neutron star.)
- 109 Choice c. (between 15 and 20 solar masses.)
- 110 Choice a. (the Tulley-Fisher relation.)

- 111 Choice d. (prevents the cloud from fragmenting.)
- 112 Choice a. (near the surface.)
- 113 Choice a. (something else.)
- 114 Choice d. (its large mass in a small region.)
- 115 Choice b. (provided only a lot of accurate data.)
- 116 Choice b. (is multiplied by 3.)
- 117 Choice c. (much closer together than neighbors of our sun.)
- 118 Choice c. (F9 star of absolute magnitude 5.)

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- 28 Module 056: The Family of Galaxies Question 056.51
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- 35 Module 022: The Earth's Moon Question 022.43
- 36 Module 048: The Quiet Deaths of Ordinary Stars Question 048.44

- 37 Module 042: Nuclear Fire Question 042.32
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- 53 Module 052: The Milky Way Question 052.12
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