1. **A _____ predicts that the strong, weak, and electromagnetic forces should become indistinguishable at high temperatures**
- grand unified theory
- electroweak force
- inflation
- Olber's paradox
- cosmic microwave background
- annihilation
grand unified theory

2. **The _____ is a single force that unifies the electromagnetic and weak forces**
- grand unified theory
- electroweak force
- inflation
- Olber's paradox
- cosmic microwave background
- annihilation
electroweak force

3. **A _____ stands out in a photo of a galaxy because it shines bright with light from massive young stars and glowing clouds of gas and dust**
- halo
- bulge
- disk
- spiral arm
- spiral galaxy
- globular cluster
spiral arm

4. **_____ was a dramatic expansion of the universe thought to have occurred when the universe was only a tiny fraction of a second old**
- grand unified theory
- electroweak force
- inflation
- Olber's paradox
- cosmic microwave background
- annihilation
inflation

5. **_____ forces us to think about why the sky is dark at night**
- grand unified theory
- electroweak force
- inflation
- Olber's paradox
- cosmic microwave background
- annihilation
Olber's paradox

6. **The "aspect ratio" of thickness to width of the galactic disk is about**
1:100

7. **A 20 solar mass star will stay on the main sequence for 10 million years, yet its iron core can exist for only a...**
A.) century.
B.) year.
C.) week.
D.) month.
E.) day
day

8. **A(n) _____ consists of hot, swirling gas captured by a white dwarf (or neutron star or black hole) from a binary companion star**
A.) electron degeneracy pressure
B.) nova
C.) massive star supernova
D.) white dwarf limit (1.4 solar masses)
E.) accretion disk
F.) white dwarf supernova
accretion disk

9. **A(n) _____ occurs when hydrogen fusion ignites the surface of a white dwarf in a binary system**
A.) electron degeneracy pressure
B.) nova
C.) massive star supernova
D.) white dwarf limit (1.4 solar masses)
E.) accretion disk
F.) white dwarf supernova
nova

10. **A(n) _____ occurs when fusion creates iron in the core of a star**
A.) electron degeneracy pressure
B.) nova
C.) massive star supernova
D.) white dwarf limit (1.4 solar masses)
E.) accretion disk
F.) white dwarf supernova
massive star supernova

11. **A(n) _____ can occur only in a binary system, and all such events are thought to have the same luminosity**
A.) electron degeneracy pressure
B.) nova
C.) massive star supernova
D.) white dwarf limit (1.4 solar masses)
E.) accretion disk
F.) white dwarf supernova
white dwarf supernova

12. **A(n) white dwarf in a close binary system will explode as a supernova if it gains enough mass to exceed the _____**
A.) electron degeneracy pressure
B.) nova
C.) massive star supernova
D.) white dwarf limit (1.4 solar masses)
E.) accretion disk
F.) white dwarf supernova
white dwarf limit (1.4 solar masses)

13.	**about how hot was the Big Bang when matter and energy "decoupled"?**	3,000 K
14.	**According to available physical and biological evidence, when did multicellular organisms first appear on Earth?** **About 200 million years ago** **A few thousand years ago** **About 1 billion years ago** **About 3 billion years ago** **About 1 million years ago**	About 1 billion years ago
15.	**According to our definition, we have been a technological civilization for about...**	100 years
16.	**According to the turn off points of the oldest globular clusters, they formed about...**	12 billion years ago
17.	**Addition to Mars, which jovian moon shows promise of life, with a surface not that different from the Arctic ocean?**	Europa
18.	**The age of the universe is related to the slope of the graph of Hubble's law, and current data put the age of the universe at about 14 billion years. Suppose that future observations showed that the slope of Hubble's law on the graph is actually steeper than that shown. In that case, the age of the universe would be _____ than 14 billion years because the universe is expanding _____ than current data suggest. (Each choice gives words to fill in the two blanks, separated by a slash.)** **younger / more rapidly** **younger / more slowly** **older / more rapidly** **older / more slowly**	younger / more rapidly
19.	**All RR lyrae stars have about the same**	luminosity (of about 100 suns)
20.	**Almost half of all known millisecond pulsars are found in what type of object?** **open clusters** **emission nebulae** **giant molecular clouds** **globular clusters** **supernova remnants**	globular clusters
21.	**As a star's evolution approaches the Type II supernova, we find...** **A.) helium to carbon fusion takes at least 100 million K to start.** **B.) the heavier the element, the higher the temperature to fuse it.** **C.) photo disintegration of iron nuclei begins at 10 billion K to ignite the supernova.** **D.) the heavier the element, the less time it takes to make it.** **E.) All of the above**	All of the above
22.	**As the mass of the central star increases, the distance to the habitable zone _____ and the size (width) of the habitable zone _____.** **Select from the choices in the format first blank / second blank.** **decreases / increases** **increases / increases** **increases / decreases** **decreases / decreases**	increases / increases
23.	**Assuming conditions are ripe for life and intelligence around the galaxy, what factor limits the number of galactic civilizations?**	average survival time of the civilizations
24.	**Assuming that the bright core of M 87 is powered by a supermassive black hole, which of the following best describes the source of energy that makes the core appear so bright?** **The black hole emits intense light as its huge mass is squeezed to infinite density at the black hole's singularity.** **Gravitational potential energy is converted to thermal energy as matter from the surrounding gas disk spirals into the central black hole.** **The immense gravitational force exerted by the central black hole in M 87 triggers nearby stars to explode as supernovae.** **Gas and dust clouds form stars at a rapid rate due to forces from the central black hole in M 87.**	Gravitational potential energy is converted to thermal energy as matter from the surrounding gas disk spirals into the central black hole.

25.	**Astronomers observe galaxies and categorize them according to four different kinds of shapes: elliptical, spiral, barred-spiral, and irregular. In addition to shape, each of the four different galaxy types can be described by other common characteristics. Match the following characteristics with their corresponding galaxy type. (Barred Spiral Galaxy - SB) - elongated central structure flattened disk, spiral arms, gas and dust, young stars - central bulge, flattened disk, spiral arms, gas, dust, young stars - round, no disk, very little gas and dust, only old stars - asymmetric, often with gas and dust, and young stars**	elongated central structure flattened disk, spiral arms, gas and dust, young stars
26.	**Astronomers observe galaxies and categorize them according to four different kinds of shapes: elliptical, spiral, barred-spiral, and irregular. In addition to shape, each of the four different galaxy types can be described by other common characteristics. Match the following characteristics with their corresponding galaxy type. (Elliptical Galaxy - E) - elongated central structure flattened disk, spiral arms, gas and dust, young stars - central bulge, flattened disk, spiral arms, gas, dust, young stars - round, no disk, very little gas and dust, only old stars - asymmetric, often with gas and dust, and young stars**	round, no disk, very little gas and dust, only old stars
27.	**Astronomers observe galaxies and categorize them according to four different kinds of shapes: elliptical, spiral, barred-spiral, and irregular. In addition to shape, each of the four different galaxy types can be described by other common characteristics. Match the following characteristics with their corresponding galaxy type. (Irregular galaxy - Irr) - elongated central structure flattened disk, spiral arms, gas and dust, young stars - central bulge, flattened disk, spiral arms, gas, dust, young stars - round, no disk, very little gas and dust, only old stars - asymmetric, often with gas and dust, and young stars**	asymmetric, often with gas and dust, and young stars
28.	**Astronomers observe galaxies and categorize them according to four different kinds of shapes: elliptical, spiral, barred-spiral, and irregular. In addition to shape, each of the four different galaxy types can be described by other common characteristics. Match the following characteristics with their corresponding galaxy type. (Spiral Galaxy - S) - elongated central structure flattened disk, spiral arms, gas and dust, young stars - central bulge, flattened disk, spiral arms, gas, dust, young stars - round, no disk, very little gas and dust, only old stars - asymmetric, often with gas and dust, and young stars**	central bulge, flattened disk, spiral arms, gas, dust, young stars
29.	**Astronomers think most galaxy interaction took place at redshifts greater than 1 because...**	clusters were more compact
30.	**at the end of the first 15 minutes, the mass ratio of H/He was about...**	75/25
31.	**the average density of a neutron star approaches...**	about 10^14 kg/m^-3
32.	**Based on star counts, 100 years ago most astronomers thought galaxies were**	circular disk, 10 kpc wide, 2 kpc thick
33.	**the best answer to both the flatness and horizon problem is...**	the inflationary epoch
34.	**A billion solar mass black hole would still have a radius of only...**	20 AU
35.	**Black holes result from stars having initial masses - less than the mass of the Sun. - between 1 and 2 times the mass of the Sun. - up to 8 times the mass of the Sun. - more than 25 times the mass of the Sun.**	more than 25 times the mass of the Sun.
36.	**Blank**	Blank

37.	**By looking at the graph, what can we say about the galaxies that have the lowest speeds?** **They are moving away from Earth and are farther from Earth than galaxies with high speeds.** **They are moving toward Earth and are farther from Earth than galaxies with high speeds.** **They are moving away from Earth and are closer to Earth than galaxies with high speeds.** **They are moving toward Earth and are closer to Earth than galaxies with high speeds.**	They are moving away from Earth and are closer to Earth than galaxies with high speeds
38.	**The circular but relatively flat portion of the galaxy is the _____** **- halo** **- bulge** **- disk** **- spiral arm** **- spiral galaxy** **- globular cluster**	disk
39.	**Classify the given types of matter as either baryonic (meaning ordinary matter that contains protons and neutrons) or as nonbaryonic (meaning "extraordinary" matter that consists of more exotic subatomic particles). (for Baryonic matter)(USE NUMBERS)** **- 1.) matter in stars, 2.) matter in brown dwarfs, 3.) dark matter consisting of weakly interacting subatomic particles, 4.) matter that probably makes up the majority of dark matter, 5.) matter in our bodies, 6.) dark matter consisting of Jupiter-size objects in galactic halos**	1, 2, 5, 6
40.	**Classify the given types of matter as either baryonic (meaning ordinary matter that contains protons and neutrons) or as nonbaryonic (meaning "extraordinary" matter that consists of more exotic subatomic particles). (for nonbaryonic matter)(USE NUMBERS)** **- 1.) matter in stars, 2.) matter in brown dwarfs, 3.) dark matter consisting of weakly interacting subatomic particles, 4.) matter that probably makes up the majority of dark matter, 5.) matter in our bodies, 6.) dark matter consisting of Jupiter-size objects in galactic halos**	3, 4
41.	**Compared to when the cosmic microwave background was first released, the radiation of the cosmic microwave background today is _____.** **brighter and has most of its photons at shorter wavelengths** **fainter and has most of its photons at shorter wavelengths** **fainter and has most of its photons at longer wavelengths** **brighter and has most of its photons at longer wavelengths**	fainter and has most of its photons at longer wavelengths
42.	**Considering luminosity and longevity, which of these would be the most likely candidate for seeking extraterrestrial intelligence?**	61 Cygni (a K type main sequence star)
43.	**Critical evidence for cosmic acceleration in 1998 came from two teams of astronomers, both observing...**	type I supernovae
44.	**Curtis was right in arguing the milky way was**	similar to spiral nebulae, blocking our view of spiral nebula in the galactic plane
45.	**detailed measurements of the disk and central bulge region of our galaxy suggest our Milky Way is a...**	barred spiral galaxy
46.	**Discovery of the cosmic microwave background was important because...**	experimental verification of a prediction from the Big Bang Theory
47.	**Do astronomers expect to find planets around binary stars that are stable enough for life to develop? Why?** **No. Planets won't form at all in binary systems.** **No. Planets may form in binary systems, but their orbits won't be stable.** **Yes. It is possible for a planet stable enough for life to develop to form a stable orbit in a binary system.** **No. Planets may form stable orbits in binary systems, but the conditions on them won't be conducive to developing life.**	No. Planets may form stable orbits in binary systems, but the conditions on them won't be conducive to developing life.

48.	**due to the galaxy density and collisions, _____ are in the centres of clusters**	spirals
49.	**During the history of the universe, what important event occurred about 0.001 seconds after the Big Bang? Spacetime rapidly expanded during a brief period of inflation. Most matter in the early universe was annihilated by antimatter. Light began to travel freely through the universe. The first massive supernovae explosions occurred.**	Most matter in the early universe was annihilated by antimatter.
50.	**During the history of the universe, what important event occurred about 380,000 years after the Big Bang? The first massive supernovae explosions occurred. Most matter in the early universe was annihilated by antimatter. Light began to travel freely through the universe. Spacetime rapidly expanded during a brief period of inflation.**	Light began to travel freely through the universe.
51.	**Each item below belongs either with the population of disk stars or the population of halo stars of the Milky Way Galaxy. Match each item to the appropriate population (for Disk Stars (Yellow)) - youngest stars, stars whose orbits can be inclined at any angle, globular clusters, stars with the smallest abundance of heavy elements, stars that all orbit in nearly the same plane, the sun, oldest stars, high mass stars**	youngest stars, the sun, stars that all orbit in nearly the same plane, high mass stars
52.	**Each item below belongs either with the population of disk stars or the population of halo stars of the Milky Way Galaxy. Match each item to the appropriate population (for Halo Stars (Green)) (USE NUMBERS) - 1.) youngest stars, 2.) stars whose orbits can be inclined at any angle, 3.) globular clusters, 4.) stars with the smallest abundance of heavy elements, 5.) stars that all orbit in nearly the same plane, 7.) the sun, 8.) oldest stars, 9.) high mass stars**	8, 3, 4, 2
53.	**The energy radiated by a typical quasar requires that its black hole accrete about**	ten solar masses a year
54.	**Energy radiated from a typical quasar requires that its black hole accrete about...**	10 solar masses a year
55.	**Essentially all the hydrogen nuclei that will ever exist in our universe was created _____. shortly after the era of galaxies ended at the time that the first stars and galaxies began to form at the end of the era of nuclei, when light began to travel freely through the universe by the time the universe was about 3 minutes old**	by the time the universe was about 3 minutes old
56.	**The figures below show several different astronomical objects. Rank the objects based on the acceleration a spaceship would have as it passed very near the surface (or event horizon) of each object, from smallest to largest. - the sun, black hole mass, red giant mass, white dwarf mass**	red giant mass, the sun, white dwarf mass, black hole mass
57.	**The figures below show several different astronomical objects. Rank the objects based on the amount that spacetime is curved (relative to flat spacetime) at a distance of 10 AU from the center of each of the objects, from least to greatest. If two (or more) cases are equal, show this equality by dragging one figure on top of the other(s). - the sun, black hole mass, red giant mass, white dwarf mass**	all the same
58.	**The figures below show several different astronomical objects. Rank the objects based on the amount that spacetime is curved (relative to flat spacetime) very near the surface (or event horizon) of each of the objects, from least to greatest. - neutron star, main sequence star, red giant, white dwarf, black hole**	red giant, main sequence star, white dwarf, neutron star, black hole
59.	**The figures below show several different astronomical objects. Rank the objects based on the amount that spacetime is curved (relative to flat spacetime) very near the surface (or event horizon) of the objects, from least to greatest. - the sun, black hole mass, red giant mass, white dwarf mass**	red giant mass, the sun, white dwarf mass, black hole mass

60.	**The figures below show several different astronomical objects. Rank the objects based on the strength of the gravitational force that would be felt by a spacecraft traveling at a distance of 10 AU from the center of each of the objects, from weakest to strongest.** **- the sun, black hole mass, red giant mass, white dwarf mass**	all the same
61.	**The figures below show the same astronomical objects as shown in Part A. Rank the objects based on the amount that each would deflect the path of a photon of light from a very distant galaxy (as viewed from Earth), assuming the photon passes very near the surface (or event horizon) of each object, from smallest to largest.** **- neutron star, main sequence star, red giant, white dwarf, black hole**	red giant, main sequence star, white dwarf, neutron star, black hole
62.	**The first portion of the galaxy to form was the _____** **- halo** **- bulge** **- disk** **- spiral arm** **- spiral galaxy** **- globular cluster**	halo
63.	**the first probe carrying mankind's message to alien civilizations was...**	Pioneer 10
64.	**The first stars that formed in the Milky Way now...** **orbit in the Galactic plane.** **orbit closest to the Galactic center.** **orbit in the same direction as the Milky Way spins.** **have random orbits in the halo.**	have random orbits in the halo
65.	**Flattest of elliptical class are class...**	E7
66.	**The following figures give the approximate distances of five galaxies from Earth. Rank the galaxies based on the speed with which each should be moving away from Earth due to the expansion of the universe, from fastest to slowest.** **- 2 billion light years, 800 million light years, 5 billion light years, 230 million light years, 70 million light years**	5 billion light years, 2 billion light years, 800 million light years, 230 million light years, 70 million light years
67.	**The following figures give the approximate speeds at which five galaxies are moving away from Earth due to the expansion of the universe. Rank the galaxies based on the amount of redshift that would be observed in each galaxy's spectrum, from largest to smallest.** **- 130,000 km/s, 18,730 km/s, 1,577 km/s, 45,000 km/s, 5264 km/s**	130,000 km/s, 45,000 km/s, 18,730 km/s, 5,264 km/s, 1,577 km/s
68.	**The following figures give the approximate speeds at which five galaxies are moving away from Earth due to the expansion of the universe. Rank the galaxies based on their distance from Earth, from farthest to closest.** **- 130,000 km/s, 18,730 km/s, 1,577 km/s, 45,000 km/s, 5264 km/s**	130,000 km/s, 45,000 km/s, 18,730 km/s, 5,264 km/s, 1,577 km/s
69.	**For finding the distance to M31, Hubble relied upon...**	cepheid variables in its spiral arms
70.	**For which of these forms of life is it hardest to apply present criteria for life, based on its behaviour when isolated?**	virus
71.	**the formed meteorite with carbonate rocks and possible microfossils came from...**	Mars
72.	**From Earth, the view of the Milky Way is a thin band of stars across the night sky. The part of the Milky Way galaxy that is described here is the...** **globular cluster.** **bulge.** **halo.** **disk.** **spiral arm.**	disk
73.	**From the Sun, the distance to the Galactic Center is about** **8 pc.** **8,000 pc.** **100,000 pc.** **225 million pc.** **100 billion pc.**	8,000 pc
74.	**The Galactic Year is the time for our solar system to orbit the Galaxy; it is about** **15 million years.** **225 million years.** **4.5 billion years.** **9.6 billion years.** **13.5 billion years.**	225 million years

75.	**galactic year is the time for our solar system to orbit the galaxy; it is about...**	225 million years
76.	**Galaxies sometimes interact at a distance, becoming distorted or changing shapes. Typically, how long does such an encounter take?** **10 million years** **Up to 10,000 years** **Several hundred million years** **3-5 billion years**	several hundred million years
77.	**Gamma-ray bursts are observed to occur...** **approximately uniformly over the entire sky.** **throughout the Milky Way Galaxy.** **near pulsars.** **mainly near the Sun.**	approximately uniformly over the entire sky
78.	**The graph shows that galaxies with high speeds as measured from Earth are _____.** **moving away from Earth and are farther from Earth than galaxies with lower speeds** **moving toward Earth and are farther from Earth than galaxies with lower speeds** **moving away from Earth and are closer to Earth than galaxies with lower speeds** **moving toward Earth and are closer to Earth than galaxies with lower speeds**	moving away from Earth and are farther from Earth than galaxies with lower speeds
79.	**Gravitational lensing of distant, faint irregular galaxies may be the key to...**	mapping dark matter
80.	**Harlow Shapely was correct in arguing the Milky Way was**	much larger than previously expected
81.	**A head-tail radio galaxy is one that has _____ significantly while ejecting its radio lobes.** **varied in brightness** **dimmed** **moved** **rotated** **brightened**	moved
82.	**The history of the universe can be divided into seven major phases. Taken together, these phases make up the cosmic evolutionary scheme—the continuous transformation of matter and energy that has led to the appearance of life and civilization on Earth.** **Rank the phases in the history of cosmic evolution from earliest to most recent.** **- stellar, galactic, biological, cultural, chemical, planetary, particulate**	particulate, galactic, stellar, planetary, chemical, biological, cultural
83.	**Homogeneity and isotropy taken as assumptions regarding the structure and evolution of the universe, are known as...**	cosmological principle
84.	**How did large galaxies form?** **From the collisions and mergers of smaller galaxies** **From the fragmentation of very large clouds of gas** **From very large clouds of gas, much like the smaller galaxies** **By very slowly accreting gas from the surrounding space**	from the collisions and mergers of smaller galaxies
85.	**How long between the evolution of single versus multicellular organisms?**	2.5 billion years
86.	**How many years ago did most quasars became inactive?** **5 billion** **10 million** **13 billion** **10 billion** **Quasars are still active.**	10 billion
87.	**Hubble time is expressed as**	1/H (13 Billion years?)
88.	**Hubble's classification, which type of galaxy has a small bulge and loose, widely spread, poorly defined spiral pattern**	Sc
89.	**Identify which emission properties relate to thermal and synchrotron (nonthermal) radiation (Synchrotron)** **- radiation peaks at a characteristic frequency, radiation is consistently stronger at lower frequency (longer wavelengths), radiation depends on the temperature of the source, radiation depends on the presence of magnetic fields**	radiation is consistently stronger at lower frequency (longer wavelength), radiation depends on the presence of magnetic fields

90.	**Identify which emission properties relate to thermal and synchrotron (nonthermal) radiation (Thermal) - radiation peaks at a characteristic frequency, radiation is consistently stronger at lower frequency (longer wavelengths), radiation depends on the temperature of the source, radiation depends on the presence of magnetic fields**	radiation peaks at a characteristic frequency, radiation depends on the temperature of the source
91.	**If the density of the universe is greater than the critical density, this means that...**	the universe is expanding at a rate less than the escape speed of the universe
92.	**Imagine a photon of light traveling the different paths in the Milky Way described in the following list. Rank the paths based on how much time the photon takes to complete each journey, from longest to shortest. (USE NUMBERS) - 1.) across the diameter of the galactic disk, 2.) from the sun to the center of the galaxy, 3.) through the disk from top to bottom, 4.) across the diameter of the central bulge, 5.) across the diameter of the galactic halo**	5, 1, 2, 4, 3
93.	**Imagine that the Sun could be turned into a black hole without changing its mass. How would Earth's orbit change? Earth's orbit would change from elliptical to unbound. Earth's orbit would move farther from the Sun. Earth would be sucked into the black hole. Earth's orbit would not change.**	Earth's orbit would not change.
94.	**Imagine that the Sun gained mass without changing its radius. How would the structure of spacetime change at the distance of Earth's orbit? The structure of spacetime would stay the same. Spacetime would become more curved at Earth's orbit. Spacetime would become flatter (less curved) at Earth's orbit. A black hole would engulf the Earth.**	Spacetime would become more curved at Earth's orbit.
95.	**Imagine that when we looked out into the universe we found that the light from all galaxies was blueshifted (rather than redshifted) and that the light from the most distant galaxies was blueshifted by the greatest amount. Which statement best describes what we would conclude about the motions of galaxies in this case? All are moving toward Earth, with nearby galaxies moving faster than distant galaxies. All are moving toward Earth, with distant galaxies moving faster than nearby galaxies. All are moving away from Earth, with nearby galaxies moving faster than distant galaxies. All are moving away from Earth, with distant galaxies moving faster than nearby galaxies.**	All are moving toward Earth, with distant galaxies moving faster than nearby galaxies.
96.	**In a closed universe, a beam of light will...**	come back to where it originated
97.	**In a neutron star, the core is.... A.) electrons and protons packed so tightly they are in contact. B.) made of compressed neutrons in contact with each other. C.) primarily iron and silicon. D.) constantly expanding and contracting. E.) no longer rotating.**	made of compressed neutrons in contact with each other
98.	**In active galaxies, their central engines may be temporarily fed by...**	nearby galaxies
99.	**In Hubble's classification, which type of galaxy has no stellar disk, no gas, and no dust?**	Elliptical (Eo)
100.	**in our best current theory, the first quasars formed about...**	13 billion years ago
101.	**In our vicinity, the galactic disk is about 100 times wider than it is thick. True False**	True
102.	**in Robert Frost's classic poem, when he ends with "ice will suffice", the universe is...**	open
103.	**In the closed universe model, the geometry of space time in two dimensions resembles the surface of a...**	sphere
104.	**in the critical density universe now proposed, the ratio of dark energy to matter is about...**	3 to 1

105.	**In what sense are viruses on the border between material that we consider living and that we consider nonliving?** **Viruses do not take in nourishment from their surroundings.** **Viruses have no capacity for genetic change.** **Viruses cannot reproduce on their own but must make use of the genetic machinery of the cells they invade to multiply.** **Viruses contain no DNA or RNA, only simple molecules that govern their functions.** **Viruses cannot react to their environment and can only make simple copies of themselves on their own.**	Viruses cannot reproduce on their own but must make use of the genetic machinery of the cells they invade to multiply
106.	**An intermediary wound barred spiral galaxy would, in Hubble's system, be...**	SBb
107.	**Intracluster gas has been observed in what region of the spectrum?** **X-ray** **Radio** **Infrared** **Visible** **Ultraviolet**	x-ray
108.	**The irregular classification is in some ways a method of dealing with galaxies that are clearly not elliptical or spiral in shape. Select the properties associated with irregular galaxies.** **They have tightly wound spiral arms.** **They all have centrally concentrated starlight.** **They are typically smaller than spiral galaxies.** **They exhibit vigorous star-forming activity.** **Some show evidence for prior collision or close encounter with another galaxy.** **They are rare.**	They are typically smaller than spiral galaxies, they exhibit vigorous star-forming activity, some show evidence for prior collision or close encounter with another galaxy.
109.	**leading explanation for the existence of spiral arms are**	passages of spiral density waves
110.	**Leave blank**	blank
111.	**Life that creates energy through chemical reactions (chemosynthesis instead of photosynthesis) and live in environments thought to be too hot, alkaline, etc. are called...**	extremophiles
112.	**Lighthouse model explains**	rotating neutron star generates observable beam of light
113.	**Listed following are distinguishing characteristics of different end states of stars. Match these to the appropriate consequence of stellar death for a Black Hole** **-in a binary system, it can explode as a supernova** **-usually has a very strong magnetic field** **-viewed from afar, time stops at its event horizon** **-size defined by its Schwarzschild radius** **-sometimes appears as a pulsar** **-has a mass no greater than 1.4MSun** **- typically about the size (diameter) of Earth** **- supported by electron degeneracy pressure**	viewed from afar, time stops at its event horizon, size defined by its Schwarzschild radius
114.	**Listed following are distinguishing characteristics of different end states of stars. Match these to the appropriate consequence of stellar death for a Neutron Star** **-in a binary system, it can explode as a supernova** **-usually has a very strong magnetic field** **-viewed from afar, time stops at its event horizon** **-size defined by its Schwarzschild radius** **-sometimes appears as a pulsar** **-has a mass no greater than 1.4MSun** **- typically about the size (diameter) of Earth** **- supported by electron degeneracy pressure**	sometimes appears as a pulsar, usually has a very strong magnetic field

115.	**Listed following are distinguishing characteristics of different end states of stars. Match these to the appropriate consequence of stellar death for a White Dwarf** **-in a binary system, it can explode as a supernova** **-usually has a very strong magnetic field** **-viewed from afar, time stops at its event horizon** **-size defined by its Schwarzschild radius** **-sometimes appears as a pulsar** **-has a mass no greater than 1.4MSun** **- typically about the size (diameter) of Earth** **- supported by electron degeneracy pressure**	in a binary system, it can explode as a supernova, has a mass no greater than 1.4MSun, typically about the size (diameter) of Earth, supported by electron degeneracy pressure
116.	**Listed following are events that occurred either before or after the first five minutes in the history of the universe. Match these events to the appropriate time period. (Sometime after the first 5 minutes) (USE NUMBERS)** **- 1.) galaxies formed, 2.) carbon nuclei formed by fusion, 3.) temperature fell to 10^15 K, 4.) inflation occurred, 5.) antielectrons (positrons) as common as electrons, 6.) strong force and electroweak force first became distinct, 7.) photons of cosmic microwave background released**	1, 2, 3, 7
117.	**Listed following are events that occurred either before or after the first five minutes in the history of the universe. Match these events to the appropriate time period. (Within first 5 minutes) (USE NUMBERS)** **- 1.) galaxies formed, 2.) carbon nuclei formed by fusion, 3.) temperature fell to 10^15 K, 4.) inflation occurred, 5.) antielectrons (positrons) as common as electrons, 6.) strong force and electroweak force first became distinct, 7.) photons of cosmic microwave background released**	3, 4, 5, 6
118.	**Listed following are several astronomical objects. Rank these objects based on their density, from highest to lowest.** **- singularity of a black hole, main sequence star, typical neutron star, one solar mass white dwarf**	singularity of a black hole, typical neutron star, one solar mass white dwarf, main sequence star
119.	**Listed following are several locations in the Milky Way Galaxy. Rank these locations based on their distance from the center of the Milky Way Galaxy, from farthest to closest.** **- the edge of the central bulge, a cloud of gas and dust in the outskirts of the disk, our solar system, a globular cluster int he outskirts of the halo**	a globular cluster in the outskirts of the halo, a cloud of gas and dust in the outskirts of the disk, our solar system, the edge of the central bulge
120.	**Location of the galactic center was first found by Harlow Shapley using**	RR lyrae variables in globular clusters
121.	**Many millisecond pulsars lie within**	Globular clusters
122.	**MASTERING ASTRO - Most of the energy of the supernova is carried outward via a flood of...** **A.) gamma rays** **B.) protons** **C.) neutrinos** **D.) positrons** **E.) helium nuclei**	Neutrinos
123.	**Matter belonging to the Galaxy can be traced out to _____ from the center.** **50 kpc** **5 kpc** **8 kpc** **15 kpc** **200 kpc**	50 kpc
124.	**Matter made out of protons, neutrons, and electrons in the universe accounts for that percent of the total mass of the universe?**	less than 4%

125.	**The Milky Way and Andromeda galaxies are among a few dozen galaxies that make up our _____** **- milky way galaxy** **- local group** **- rotates** **- orbits** **- universe** **- solar system**	local group
126.	**Mixing water, methanol, ammonia, and carbon monoxide. The purpose of this experiment was to determine whether...**	amino acids could form in the harsh vacuum of outer space
127.	**Most galaxies in the local group are...**	small ellipticals like the companions to M31 in Andromeda
128.	**Most important property in how a star will evolve and die?**	Mass
129.	**The most likely region of the radio spectrum for communication with other civilizations is in the "water hole." What part of the spectrum is this?** **Between the radio emissions of hydrogen and oxygen** **Around the radio emission of water molecules** **Around the radio emission of oxygen molecules** **Between the radio emissions of hydrogen and OH**	between the radio emissions of hydrogen and OH
130.	**most of the mass of the Milky Way seems to exist in the form of...**	dark matter (out in the halo)
131.	**most of the new star formation in the Galaxy is found in the...**	spiral arms
132.	**Most of the new star formation in the Galaxy is found in the...** **spiral arms.** **halo.** **globular clusters.** **galactic center.** **bulge.**	spiral arms
133.	**Most of the stars in the Local Group are in**	big spirals like our galaxy (M31)
134.	**the most rapidly "blinking" pulsars are those that...** **-spin fastest.** **-are oldest.** **-are most massive.** **-are hottest.**	spin fastest
135.	**The most successful model for explaining nuclear activity in galaxies involves a supermassive black hole that is gravitationally accreting matter from its surroundings. According to this model, different regions of the active galactic nucleus produce different types of radiation. Referring to the figure, match the region with the type of radiation being emitted. (Accretion Disk)** **- infrared, none, x-ray, radio**	X-ray
136.	**The most successful model for explaining nuclear activity in galaxies involves a supermassive black hole that is gravitationally accreting matter from its surroundings. According to this model, different regions of the active galactic nucleus produce different types of radiation. Referring to the figure, match the region with the type of radiation being emitted. (Dusty Donut)** **- infrared, none, x-ray, radio**	infrared
137.	**The most successful model for explaining nuclear activity in galaxies involves a supermassive black hole that is gravitationally accreting matter from its surroundings. According to this model, different regions of the active galactic nucleus produce different types of radiation. Referring to the figure, match the region with the type of radiation being emitted. (Magnetized Jet)** **- infrared, none, x-ray, radio**	radio
138.	**The most successful model for explaining nuclear activity in galaxies involves a supermassive black hole that is gravitationally accreting matter from its surroundings. According to this model, different regions of the active galactic nucleus produce different types of radiation. Referring to the figure, match the region with the type of radiation being emitted. (Supermassive black hole)** **- infrared, none, x-ray, radio**	none

139.	**A nova includes...**	Mass transfer into a white dwarf in a binary system
140.	**An object more massive than the sun, but roughly the size of a city, is a...** **A.) white dwarf.** **B.) brown dwarf.** **C.) red dwarf.** **D.) neutron star.** **E.) supernova remnant.**	neutron star
141.	**Observations of the _____ provide a way to our theory of the Big Bang** **- grand unified theory** **- electroweak force** **- inflation** **- Olber's paradox** **- cosmic microwave background** **- annihilation**	cosmic microwave background
142.	**of the normal elements around us, the Big Bang produced...**	hydrogen and helium
143.	**On average, galaxies are getting farther apart with time, which is why we say our _____ is expanding** **- milky way galaxy** **- local group** **- rotates** **- orbits** **- universe** **- solar system**	universe
144.	**the orbits of Population II stars (older stars) have been compared to**	comets around the sun
145.	**The orbits of Population II stars have been compared to...** **binary stars.** **planets around the Sun.** **comets around the Sun.** **satellites around planets.** **the accretion disc around a black hole.**	comets around the sun
146.	**Our _____ is moving toward the star Vega at about 70,000 km/hr** **- milky way galaxy** **- local group** **- rotates** **- orbits** **- universe** **- solar system**	solar system
147.	**Our entire solar system orbits around the center of the _____ about once every 230 million years** **- milky way galaxy** **- local group** **- rotates** **- orbits** **- universe** **- solar system**	milky way galaxy
148.	**Our Milky Way galaxy is a _____** **- halo** **- bulge** **- disk** **- spiral arm** **- spiral galaxy** **- globular cluster**	spiral galaxy
149.	**Photons from the microwave background have not interacted with matter since the universe was how old?**	400,000 years old
150.	**Population I stars came billions of years before Population II stars.** **True** **False**	False
151.	**Pre-galactic blobs had masses similar to...**	Large Magellanic clouds
152.	**A proposed explanation for gamma-ray bursters is coalescence of a neutron star binary.** **hypernova-making black holes and bi-polar jets.** **collisions between two white dwarfs.** **Both A and B are possible.** **All three are possible.**	Both A and B are possible
153.	**Proposed WIMPS would be massive like _____, but more elusive than _____, however this is not yet proven**	neutrons, neutrinos
154.	**Pulsars show all of the following except...**	high temp. fusion reactions
155.	**Quasars usually have their distances measured by what technique?**	Hubble's Law
156.	**Quasars were at cosmological distance that appeared like ordinary faint stars meant that**	they must be producing such large quantities of energy that even fusion could not explain

157.	**the radius of a white dwarf is determined by a balance between the inward force of gravity and the outward push of _____** **A.) electron degeneracy pressure** **B.) nova** **C.) massive star supernova** **D.) white dwarf limit (1.4 solar masses)** **E.) accretion disk** **F.) white dwarf supernova**	electron degeneracy pressure
158.	**Rank the following items according to their size (diameter) from left to right, from largest to smallest.** **- our solar system, milky way galaxy, the sun, jupiter, local group, the universe, the local supercluster, earth**	the universe, local supercluster, local group, the milky way galaxy, our solar system, the sun, jupiter, earth
159.	**Rank the following items that describe distances from longest distance (left) to shortest distance (right) (USE NUMBERS)** **- 1.) the distance from the Sun to the center of the galaxy, 2.) one light year, 3.) the distance across our solar system (to neptune), 4.) one astronomical unit (AU), 5.) distance from milky way galaxy to andromeda galaxy, 6.) distance from earth to alpha centauri, 7.) the average distance from earth to the sun**	5, 1, 6, 2, 3, (4 and 7)
160.	**Rank the following steps that lead to a Type I supernova event in order of when they occur from first to last.** **-white dwarf at Chandrasekhar limit, accretion disk with growing white dwarf, carbon fusion begins throughout, detonation**	accretion disk with growing white dwarf, white dwarf at Chandrasekhar limit, carbon fusion begins throughout, detonation
161.	**Rank these objects based on their diameter, from largest to smallest. (Note that the neutron star and black hole in this example have the same mass to make your comparison easier, but we generally expect black holes to have greater masses than neutron stars.)** **Jupiter, one-solar-mass white dwarf, main-sequence star of spectral type A, a two-solar-mass neutron star, the event horizon of a two-solar-mass black hole, the moon**	main-sequence star of spectral type A, Jupiter, one-solar-mass white dwarf, the moon, a two-solar-mass neutron star, the event horizon of a two-solar-mass black hole
162.	**Rank these objects based on their mass, from largest to smallest.** **main-sequence star of spectral type M, a one solar mass white dwarf, typical black hole (formed in a supernova), typical neutron star, Jupiter, the Moon**	typical black hole (formed in a supernova), typical neutron star, a one solar mass white dwarf, main-sequence star of spectral type M, Jupiter, the Moon
163.	**The ratio of bulge mass to black hole mass is roughly...**	200 to 1
164.	**Redshift of galaxies is correctly interpreted as...**	space itself is expanding with time, so the photons are stretched while they travel outside of space
165.	**Region on the HR diagram where pulsating variables occur is called the**	instability strip
166.	**Robot probes sent to the other planets of the solar system have demonstrated that life as we know it exists on which of the following?** **On the planet Mars** **On the moon Europa** **Only on Earth** **On the moon Titan** **Possibly on Jupiter**	only on earth
167.	**The scarcity of what isotope is a critical test of the density of the present cosmos?**	deuterium
168.	**Scientists think it is very unlikely that complex and large forms of life could evolve on planets that orbit stars that are much more massive than the Sun. Why?** **The expected lifetime of a massive star is too short to allow for the evolution of complex life** **The habitable zone of a massive star covers too wide a range of distances from the star to allow for the evolution of complex life** **The habitable zone of a massive star is too far from the star to allow for the evolution of complex life**	The expected lifetime of a massive star is too short to allow for the evolution of complex life

169.	**Shown following are several times in the history of the universe. Imagine that you were able to watch a single photon that has been part of the cosmic microwave background since it first became present in the universe. Rank these times from left to right based on the wavelength this photon would have at each time, from shortest to longest.** **- 1.) 100 million years after the Big Bang, 2.) today, 3.) 1.5 billion years after the Big Bang, 4.) 500,000 years after the Big Bang, 5.) 1 million years after the Big Bang**	4, 5, 1, 3, 2
170.	**Shown following are several times in the history of the universe. Rank these times from left to right based on the average temperature of the universe at each time, from coolest to hottest.** **- 100 million years after the Big Bang, today, 1.5 billion years after the Big Bang, 500,000 years after the Big Bang, 1 million years after the Big Bang**	today, 1.5 billion years after the big bang, 100 million years after the big bang, 1 million years after the big bang, 500,000 years after the big bang
171.	**Shown following are several times in the history of the universe. Rank these times from left to right based on the peak wavelength in the spectrum of the cosmic microwave background, from shortest to longest.** **- 100 million years after the Big Bang, today, 1.5 billion years after the Big Bang, 500,000 years after the Big Bang, 1 million years after the Big Bang**	500,000 years after the Big Bang, 1 million years after the Big Bang, 100 million years after the Big Bang, 1.5 billion years after the Big Bang, today
172.	**Simplest life forms appeared on Earth when it was how old?**	one billion years
173.	**Since the time of Hubble, astronomers have learned that the blue color observed in some galaxies is the result of recent star formation. This interpretation has been confirmed by multiwavelength observations that have revealed the presence of star-forming gas clouds in galaxies hosting newly formed O-and B-type stars. Sort the galaxy types according to their level of star-forming activity. (for Galaxies with greater Star forming activity)** **-elliptical galaxies, spiral galaxies, barred spiral galaxies, irregular galaxies**	spiral galaxies, barred spiral galaxies, irregular galaxies
174.	**Since the time of Hubble, astronomers have learned that the blue color observed in some galaxies is the result of recent star formation. This interpretation has been confirmed by multiwavelength observations that have revealed the presence of star-forming gas clouds in galaxies hosting newly formed O-and B-type stars. Sort the galaxy types according to their level of star-forming activity. (for Galaxies with little Star forming activity)** **-elliptical galaxies, spiral galaxies, barred spiral galaxies, irregular galaxies**	elliptical galaxies
175.	**The sky is dark at night because...**	all the light from the objects in space hasn't reached us yet
176.	**some examples of which type of dying star exhibit rapid pulses that were originally suspected to be communications from extraterrestrials?**	Neutron Star
177.	**Some of the objects listed following are generally considered to be single (individual) astronomical objects; others are thought of as collections of many individual astronomical objects. Match these to the appropriate category. (Many astronomical objects)** **- solar system** **- milky way galaxy** **- comet** **- planet** **- galaxy** **- supercluster** **- star**	solar system, galaxy, milky way galaxy, supercluster

178.	**Some of the objects listed following are generally considered to be single (individual) astronomical objects; others are thought of as collections of many individual astronomical objects. Match these to the appropriate category. (Single astronomical objects)** **- solar system** **- milky way galaxy** **- comet** **- planet** **- galaxy** **- supercluster** **- star**	star, comet, planet
179.	**some quasars show absorption spectra with a smaller redshift than their emission spectra, this indicates that...**	there is cooler gas between us and the quasar
180.	**Sort the following source properties by whether they might be considered as originating from intelligence or simply be natural phenomena. (possibly extraterrestrial)** **- sequence of pulses varying over time, constant unchanging signal, identical repetitive pulses, random radio fluctuations, single strong visible light burst that fades away over months**	sequence of pulses varying over time
181.	**Sort the following source properties by whether they might be considered as originating from intelligence or simply be natural phenomena. (probably cosmic)** **- sequence of pulses varying over time, constant unchanging signal, identical repetitive pulses, random radio fluctuations, single strong visible light burst that fades away over months**	constant unchanging signal, identical repetitive pulses, random radio fluctuations, single strong visible light burst that fades away over months
182.	**A spherical galaxy, like M 87, which looks like a monster globular cluster, is type...**	E0
183.	**A star in the instability strip of the HR diagram would**	vary in temperature and radius
184.	**Stars orbiting in the _____ near the galaxy's center can have orbits highly inclined to the galactic plane**	bulge
185.	**The sun appears to rise and set in our sky because Earth _____ once each day** **- milky way galaxy** **- local group** **- rotates** **- orbits** **- universe** **- solar system**	rotates
186.	**Suppose that galaxy B is twice as far from Earth as galaxy A. Hubble's law predicts that galaxy B will be moving away from Earth with approximately _____.** **the same velocity as galaxy A** **four times the velocity of galaxy A** **half the velocity of galaxy A** **twice the velocity of galaxy A**	twice the velocity of galaxy A
187.	**Suppose that our Sun was cool enough to include Mercury in its habitable zone. Which of the following would be true in that case?** **Only Mercury would be in the Sun's habitable zone.** **Mercury and Venus would be in the Sun's habitable zone, but Earth and Mars would not.** **Mercury, Venus, and Earth would be in the Sun's habitable zone, but Mars would not.** **All the terrestrial planets would be in the Sun's habitable zone.**	Only Mercury would be in the Sun's habitable zone.
188.	**Synchotron radiation produces a _____ spectrum**	continuous non-thermal
189.	**A telescope searching for newly formed stars would make the most discoveries if it were pointed...** **between spiral arms.** **within a spiral arm.** **directly away from the Galactic center.** **perpendicular to the Galactic disk.**	within a spiral arm

190.	**The third image in the interactive photo (with the most detailed view of the galactic center) is labeled "gas disk." Which of the following best describes what we are seeing in this photo? The bright central region is the bulge of the galaxy, and around it we see spiral arms. The bright central region is a place where many young stars are being born, and the surrounding material is the gas from which these stars are made. The black background in this photo is the supermassive black hole, and we see bright spots on top of it where nearby gas is emitting light. The black hole is located deep within the bright central region, and around this region we see gas that is orbiting the central black hole.**	The black hole is located deep within the bright central region, and around this region we see gas that is orbiting the central black hole.
191.	**Three terrestrial-sized planets in orbits of a fraction of an AU have been found near Supernova 1987A. a magnetar. Cygnus X-1. a millisecond pulsar. a white dwarf.**	a millisecond pulsar
192.	**A tightly packed group of a few hundred thousand very old stars is a _____ - halo - bulge - disk - spiral arm - spiral galaxy - globular cluster**	globular cluster
193.	**To which of these phenomena are X-ray busters most similar? hypernovae novae type II supernovae type I supernovae planetary nebulae**	novae
194.	**The Tully-Fisher relation is between the galaxy's luminosity and its....**	rotation
195.	**A type II supernova occurs when...**	iron builds up in the core
196.	**the universal accelerating force could not be considered...**	dark matter
197.	**Use these four characteristics as a working definition of life to see which generally accepted living and non-living things from the table would be considered alive based on these characteristics.They can react to their environment and can often heal themselves when damaged. They can grow by taking in nourishment from their surroundings and processing it into energy. They can reproduce, passing along some of their own characteristics to their offspring. They have the capacity for genetic change and can therefore evolve from generation to generation and adapt to a changing environment. (for things that don't exhibit 4 characteristics) - dogs, trees, viruses, rocks, stars**	viruses, rocks, stars
198.	**Use these four characteristics as a working definition of life to see which generally accepted living and non-living things from the table would be considered alive based on these characteristics.They can react to their environment and can often heal themselves when damaged. They can grow by taking in nourishment from their surroundings and processing it into energy. They can reproduce, passing along some of their own characteristics to their offspring. They have the capacity for genetic change and can therefore evolve from generation to generation and adapt to a changing environment. (for things that exhibit 4 characteristics) - dogs, trees, viruses, rocks, stars**	dogs, trees
199.	**The Viking lander experiments that chemically searched for life on Mars could not have detected which of the following? Seeds Living organisms Fossils Spores**	Fossils

200.	**What are X-ray bursters?** **They are the central sources of energy for planetary nebulae.** **They are neutron stars on which accreted matter builds up, then explodes in a violent nuclear explosion.** **They are violent energy sources known to lie at the heart of the Milky Way and similar massive galaxies.** **They are rapidly rotating black holes whose precession points their poles toward us on occasion.** **They are very massive stars that explode as supernovae, emitting bursts of X- rays and gamma-rays in the process.**	They are neutron stars on which accreted matter builds up, then explodes in a violent nuclear explosion.
201.	**What conclusions can be drawn about the nature of the galaxy cluster's mass? (more than one)** **Most of the cluster's mass is accounted for by the hot intracluster gas.** **Most of the cluster's mass cannot be seen as visible matter.** **Most of the cluster's mass is accounted for by the individual galaxies.** **The mass of the dark matter accounts for more of the gravitational force within the cluster than does the mass of the visible matter.**	Most of the cluster's mass cannot be seen as visible matter, The mass of the dark matter accounts for more of the gravitational force within the cluster than does the mass of the visible matter.
202.	**What did the cosmic microwave background tell cosmologists about the early universe?**	horizon problem in that the microwave background is too isotropic
203.	**What do astronomers believe is the result of a merger between two spiral galaxies?** **A Seyfert galaxy** **A radio galaxy** **An elliptical galaxy** **A quasar** **An even larger spiral galaxy**	an elliptical galaxy
204.	**What does Hubble Law imply about the universe?**	the universe had a beginning and has expanded since, giving it a finite age
205.	**What effect is thought to be due to the presence of dark matter around spiral galaxies?** **Jets of energy appear to shoot up along the rotational axes of large galaxies.** **High star-formation rates occur in interacting galaxies.** **All galaxies with positive redshifts appear to be losing material.** **The rotation rates of spiral galaxies and orbital interactions among galaxies within clusters suggest the presence of extra mass around them.** **Elliptical galaxies have no Cepheid variable stars.**	The rotation rates of spiral galaxies and orbital interactions among galaxies within clusters suggest the presence of extra mass around them
206.	**What environmental factor works against Mars having any life on its surface?** **Complete lack of water** **Its rate of rotation** **Lack of a magnetic field** **Carbon dioxide atmosphere**	lack of magnetic field

207.	**What is chemical evolution?** **The evolution of biologically important chemicals from nonbiological chemicals** **The process by which certain chemicals move through the environment, changing as they do so** **The evolution of the minerals of the land and material in the sea and air** **The process by which exposure to chemicals mutates or evolves life-forms on Earth**	The evolution of biologically important chemicals from nonbiological chemicals
208.	**What is meant by the "habitable zone"?**	region around each star where terrestrial planets could have water on their surfaces
209.	**What is the "stellar habitable zone"?** **The range in temperatures of a star around which a terrestrial planet with Earth's mass and density is expected to form.** **The range of distances from a star in which a terrestrial planet with Earth's mass and density is expected to form.** **The range in temperatures of a star around which an Earth-like planet at a distance of 1 AU could sustain water.** **The range of distances from a star in which an Earth-like planet could sustain liquid water.**	The range of distances from a star in which an Earth-like planet could sustain liquid water.
210.	**What is the average distance between adjacent galaxies in a galactic cluster?** **A few million parsecs** **A few hundred parsecs** **A few parsecs** **A few hundred thousand parsecs** **A few billion parsecs**	a few hundred thousand parsecs
211.	**What is the average rate of star formation in our Galaxy?** **1 star every year** **Star formation has ceased to occur in our Galaxy.** **1 star every 10 years** **10 stars every year** **50 stars every year**	10 stars every year
212.	**What is the best description of the distribution of the galaxies that lie within about 200 Mpc of Earth?** **The galaxies are arranged in clusters that are randomly scattered throughout the universe.** **The galaxies show up at random positions throughout the universe.** **The galaxies seem to be arranged on the points of a grid.** **The galaxies appear to be clustered into small spherical regions.** **The galaxies appear to be arranged in a network of filaments, or strings, surrounding large, empty regions of space known as voids.**	the galaxies appear to be arranged in a network of filaments, or strings, surrounding large, empty regions of space known as voids
213.	**What is the Big Bang?**	the event that started the expansion of the universe
214.	**What is the defining characteristic of starburst galaxies?** **They have a large number of young stars.** **They are surrounded by globular clusters.** **They have an overabundance of white dwarf and red dwarf stars.** **They have a smooth, elliptical shape that is steadily expanding.** **They are all much larger than the Milky Way**	they have a large number of young stars
215.	**What is the estimated percentage of dark matter in the universe?** **1 percent** **90 percent** **99.9 percent** **10 percent**	90 percent

216.	**What is the explanation of the low-redshift absorption lines in the spectra of quasars?** **Slow-moving gases surrounding the quasar** **High-velocity gas ejected toward us** **High-velocity gases in the galaxy of which the quasar is a part** **Intervening gas much closer than the quasar**	intervening gas much closer than the quasar
217.	**What is the Great Wall?**	large sheet of galaxies measuring 70 mpc by 100 mpc
218.	**What is the meaning of the term extremophiles?** **Planets that orbit either very close to or very far from their parent star** **Life-forms that have adapted to live in extreme environments** **Scientists who postulate unorthodox methods for finding extraterrestrial life** **Scientists who believe there is an infinitesimal, yet nonzero, chance of finding extraterrestrial life**	life-forms that have adapted to live in extreme environments
219.	**What is the most important piece of evidence known about Mars that suggests it once had an environment that could be supportive of life?** **Ice caps** **Rotation rate** **Dry river and lake beds** **Volcanoes**	dry river and lake beds
220.	**What is unusual about the results of mass determinations of clusters of galaxies?** **The central galaxy in a cluster appears to contain 90 percent of the cluster's mass.** **The calculations give wrong results unless general relativity is used.** **The laws of Newtonian mechanics do not seem to work.** **There is much more mass than can be accounted for by the visible galaxies.**	there is much more mass than can be accounted for by the visible galaxies
221.	**What question does the Drake equation attempt to answer?** **What is the number of technological civilizations in the Galaxy?** **How many planets are inhabited by life?** **What number of stars have planetary systems?** **What defines the habitable zone around any star?**	What is the number of technological civilizations in the Galaxy?
222.	**What temp. has the Big Bang has cooled to by now?**	just over 2.7 K
223.	**What two observations allow us to calculate the Galaxy's mass?**	sun's orbital velocity and its distance from the Galactic Centre
224.	**What use are 21 cm radio waves to galactic astronomers?**	their doppler shifts allow us to map the motions of the hydrogen in the galaxy
225.	**What were the first biologically important molecules produced in the Miller-Urey experiments?** **Amino acids** **DNA** **Genetic bases** **Proteins**	Amino acids
226.	**What would happen if mass is added to a 1.4 solar mass white dwarf?** **-The star would erupt as a carbon detonation (type I) supernova.** **-The star's radius would increase. -The star would immediately collapse into a black hole.** **-The core would collapse as a type II supernova.** **-The star would explode as a nova.**	the star would erupt as a carbon detonation (type I) supernova
227.	**When a particle of ordinary matter meets its precise opposite particle of antimatter, the result is _____ with complete conversion of mass to energy** **- grand unified theory** **- electroweak force** **- inflation** **- Olber's paradox** **- cosmic microwave background** **- annihilation**	annihilation

228.	**When another spaceship is moving by you (at constant velocity), you will measure the spaceship to be shorter than its rest length, while passengers on that ship will measure your length to be shorter. Imagine that you and the passengers on the other ship are arguing (by radio) about who really is the one that has become shorter. To settle the argument, you agree to meet up on Mars and put the two spaceships next to each other to see which one is really shorter. What will you find when you meet up on Mars?** **Your spaceship really is shorter than the other one.** **Both spaceships are the same length.** **The other spaceship really is shorter than yours.**	Both spaceships are the same length
229.	**When spiral galaxies do collide, the impact is greatest on their...**	giant molecular clouds
230.	**Where are large dust clouds predominantly located in the galaxy M51?** **distributed evenly throughout the galaxy** **within or on the edges of the spiral arms** **in the central bulge of the galaxy** **in the wide spaces between the spiral arms**	within or on the edges of the spiral arms
231.	**Where are the ionization nebulae predominantly located in the galaxy M51?** **distributed evenly throughout the galaxy** **within or on the edges of the spiral arms of the galaxy** **in the central bulge of the galaxy** **in the wide spaces between the spiral arms**	within or on the edges of the spiral arms of the galaxy
232.	**Where does an object on an elliptical orbit experience the greatest acceleration?** **where spacetime has the most curvature** **where spacetime has the least curvature** **The acceleration is the same everywhere along the orbit.**	where spacetime has the most curvature
233.	**Which galaxies are relatively rare in regions of high galaxy density?** **Irregular** **Giant elliptical** **Spiral** **Elliptical** **Dwarf elliptical**	spiral
234.	**Which is the correct description of the sun's location within the milky way?**	above the disc, about 1/3 of the galactic radius from the center
235.	**Which law is used in the calculation of the combined galaxy masses of a binary galaxy system?** **Hubble's law** **Wien's law** **Newton's form of Kepler's third law** **Newton's first law**	Newton's form of Kepler's third law
236.	**Which method relies on the mass of a dark object revealing its presence...**	temporary brightening of a distant star by a gravity lens
237.	**Which of the following important events occurred earliest in the history of the universe?** **Light began to travel freely through the universe.** **Spacetime rapidly expanded during a brief period of inflation.** **Spacetime expansion increased the average distance between galaxies.** **The first massive supernovae explosions occurred.**	Spacetime rapidly expanded during a brief period of inflation
238.	**Which of the following is most like the rotation of stars in the disk of the Milky Way?**	Cars moving at a constant speed on a circular race track
239.	**Which of the following paraphrases Hubble's Law?**	the greater the distance to a galaxy, the greater the redshift
240.	**which of these could be considered as "hot dark matter"?**	neutrinos
241.	**Which of these does not exist?** **-a million solar mass black hole -a 6 solar mass black hole** **-a 6.8 solar mass neutron star** **-a 1.0 solar mass white dwarf** **-a 0.06 solar mass brown dwarf**	a 6.8 solar mass neutron star
242.	**Which of these would be made up of only Population II stars?**	elliptical galaxies
243.	**which sequence of formation by age is correct, oldest to youngest?** **- open clusters, emission nebulae, globular clusters**	globular clusters, emission nebulae, open clusters
244.	**Which statement is true about ages and masses of spiral and elliptical galaxies?**	Both types are about the same age, but spirals vary less in mass
245.	**Which type of galaxy has a stellar disk, but without gas and dust?**	So (Spiral Galaxy)

246.	**While examining the spectrum of a galaxy you find that all the hydrogen lines are shifted to the longest wavelengths. The galaxy is...**	moving away from us
247.	**A white dwarf can explode when...**	its mass exceeds the Chandreskhar limit
248.	**why are super massive galaxies often found at the cores of rich galaxy clusters?**	they are the result of many galactic mergers; one galaxy growing at the expense of others
249.	**Why are the ionization nebulae so bright?** **They are the remains of stars that have died in supernova explosions.** **They become very hot because of collisions with dust clouds.** **They are always located very near a galaxy's hot core.** **They are regions where gas is ionized by hot, young stars.**	They are regions where gas is ionized by hot young stars
250.	**Why do astronomers consider very long-wavelength, low-frequency radio waves not to be a good range to search for an extraterrestrial signal?** **Radio waves at such long wavelengths require too much energy to be generated.** **Long-wavelength radio waves are blocked by dust in the galactic plane.** **There are too many natural galactic sources that cause noise at these wavelengths.** **Molecules in Earth's atmosphere naturally emit radiation at these wavelengths, causing noise.**	There are too many natural galactic sources that cause noise at these wavelengths.
251.	**Why do astronomers hypothesize that a massive black hole lies at the center of M 87?** **Historical records show that a supermassive star at the center of M 87 exploded as a supernova, leaving behind a black hole.** **Time-lapse images from space telescopes show stars falling to the center of M 87 and then disappearing from view.** **Images of M 87 made with powerful telescopes show a well-defined black region devoid of any stars.** **A very small region at the center of M 87 releases an enormous amount of energy.**	A very small region at the center of M 87 releases an enormous amount of energy
252.	**Why do some quasars have red shifts greater than 1?**	they are very distant, with relativistic red shifts that take into account dilation of space-time, as Einstein predicted
253.	**Why do we feel type O and B stars are poor candidates for extraterrestrial life?**	their lifetime is too short
254.	**Why does the cepheid "standard candle" have limited usefulness beyond 20 mpc?**	cepheids are too faint to be seen beyond that distance, even with HST
255.	**why is the hypothesis that life on Earth came from outer space considered plausible?**	many meteorites contain complex organic molecules
256.	**why is thought that quasars probably spend only a fairly short time in their highly luminous place?**	because a black hole cannot power a highly luminous quasar for more than a few million years
257.	**Why was Herschel's strategy for mapping out galaxy flawed?**	he relied on visual wavelengths, which are obscured by dust
258.	**Within the boundaries of the constellations of Coma and Virgo are found...**	largest nearby superclusters of galaxies
259.	**X-ray bursters are similar to novae, except the collapsed star is a neutron star, not a white dwarf.** **True or False**	True

260.	**You are one year older each time Earth _____ about the Sun** **- milky way galaxy** **- local group** **- rotates** **- orbits** **- universe** **- solar system**	orbits
261.	**You see a spiral galaxy with a large central bulge and tightly wrapped arms. It would be a...**	Spiral galaxy (Sa)