AST 1002 Midterm Exam.

Test Version 111111111111

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following is *not* consistent with the major hallmarks of science? 1) _____
   A) Science progresses through the creation and testing of models that explain observation as simply as possible.
   B) Science consists of proven theories that are understood to be true explanations of reality.
   C) Scientific explanations should be based solely on natural causes.
   D) A scientific model must make testable predictions.

2) Which of the following most likely explains why Venus does *not* have a global magnetic field like Earth? 2) _____
   A) It has too thick of an atmosphere.
   B) Its rotation is too slow.
   C) Unlike Earth, Venus does not have a liquid outer core.
   D) It does not have a metallic core.

3) What do we mean when we say that the terrestrial worlds underwent *differentiation*? 3) _____
   A) They lost interior heat to outer space.
   B) The five terrestrial worlds all started similarly but ended up looking quite different.
   C) Their surfaces show a variety of different geological features resulting from different geological processes.
   D) When their interiors were molten, denser materials sank toward their centers and lighter materials rose toward their surfaces.

4) Which of the following best describes the composition of the particles forming Saturn's rings? 4) _____
   A) hydrogen and helium
   B) volcanic rock
   C) metallic grains
   D) water ice
   E) methane ice

5) Suppose you look at a spectrum of visible light by looking through a prism or diffraction grating. How can you decide whether it is an emission line spectrum or an absorption line spectrum? 5) _____
   A) The only way to decide is to make a graph of the intensity of the light at every wavelength, and then analyze the graph carefully.
   B) An emission line spectrum consists of a long bright line, while an absorption line spectrum consists of a long dark line.
   C) The emission line spectrum is produced by electrons jumping up in energy level, while the absorption line spectrum is produced by electrons jumping down in energy level.
   D) An emission line spectrum consists of bright lines on a dark background, while an absorption line spectrum consists of dark lines on a rainbow background.

6) Lunar eclipses can occur only during a _____. 6) _____

A) third quarter moon B) full moon
C) new moon D) first quarter moon

7) Where is Jupiter's strong magnetic field generated? 7) _____

A) liquid hydrogen layer
B) rocky core
C) cloud tops
D) metallic hydrogen layer
E) gaseous hydrogen layer

8) According to the laws of thermal radiation, hotter objects emit photons with _____. 8) _____

A) a shorter average wavelength B) a higher average speed
C) a lower average energy D) a lower average frequency

9) When we see a meteor shower, it means that _____. 9) _____

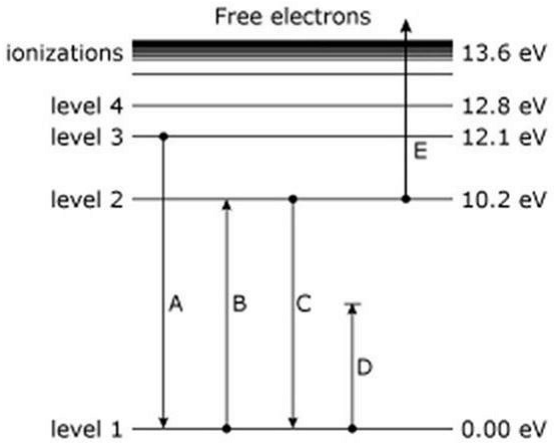
A) the solar wind is unusually strong
B) an Earth–approaching asteroid has recently come very close to our planet
C) you should duck and run for cover to avoid being blasted on the head by a rock from space
D) Earth is crossing the orbit of a comet

10) What do we mean by the *frost line* when we discuss the formation of planets in the solar nebula? 10) _____

A) It marks the special distance from the Sun at which hydrogen compounds become abundant; closer to the Sun, there are no hydrogen compounds.
B) It is another way of stating the temperature at which water freezes into ice.
C) It is a circle at a particular distance from the Sun, beyond which the temperature was low enough for ices to condense.
D) It is the altitude in a planet's atmosphere at which snow can form.

11) Which of the following statements about X–rays and radio waves is *not* true? 11) _____

A) X–rays and radio waves are both forms of light, or electromagnetic radiation.
B) X–rays have higher frequency than radio waves.
C) X–rays travel through space faster than radio waves.
D) X–rays have shorter wavelengths than radio waves.



12) The diagram represents energy levels in a hydrogen atom. The labeled transitions (A through E) represent an electron moving between energy levels. Which labeled transition represents an electron that *absorbs* a photon with 10.2 eV of energy? 12) _____

A) A B) B C) C D) D E) E

13) How does Earth's varying distance from the Sun affect our seasons? 13) _____

A) It doesn't—Earth's orbital distance plays no significant role in the seasons.
B) It is responsible for the fact that the seasons are opposite in the Northern and Southern hemispheres.
C) It causes the seasons to be more extreme than they would be if the Earth's distance from the Sun were always the same.
D) It makes summer warmer in the Northern Hemisphere than in the Southern Hemisphere.

14) All the following statements about Mars are true. Which one might have led to a significant loss of atmospheric gas to space? 14) _____

A) Mars probably once had a much higher density of greenhouse gases in its atmosphere than it does today.
B) Outgassed water molecules are split apart by ultraviolet light, and the oxygen then reacts chemically with surface rock on Mars.
C) The axis tilt of Mars is thought to change significantly with time.
D) Mars lost any global magnetic field that it may once have had.

15) When we look at an object that is 1,000 light-years away, we see it _____. 15) _____

A) looking just the same as our ancestors would have seen it 1,000 years ago
B) as it was 1,000 years ago
C) as it is right now, but it appears 1,000 times dimmer
D) as it was 1,000 light-years ago

16) A rock found on Earth that crashed down from space is called _____. 16) _____

A) a meteor B) an impact C) an asteroid D) a meteorite

17) Suppose a comet orbits the Sun on a highly eccentric orbit with an average (semimajor axis) distance of 1 AU. How long does it take to complete each orbit, and how do we know? 17) _____

A) Each orbit should take about 2 years, because the eccentricity is so large.
B) It depends on the eccentricity of the orbit, as described by Kepler's second law.
C) Each orbit takes about 1 year, which we know from Kepler's third law.
D) It depends on the eccentricity of the orbit, as described by Kepler's first law.

18) Which jovian planet does *not* have rings? 18) _____

A) All the jovian planets have rings.
B) Uranus
C) Jupiter
D) Saturn
E) Neptune

19) He developed a geocentric system for predicting planetary positions that remained in use for some 1,500 years. 19) _____

A) Ptolemy
B) Tycho Brahe
C) Galileo
D) Kepler
E) Copernicus

20) Suppose you lived on the Moon. Which of the following would be true? 20) _____

A) Your weight would be less than your weight on Earth, but your mass would be the same as it is on Earth.
B) Both your weight and your mass would be less than they are on Earth.
C) Both your weight and your mass would be the same as they are on Earth.
D) Your mass would be less than your mass on Earth, but your weight would be the same as it is on Earth.

21) Betelgeuse is the bright red star representing the left shoulder of the constellation Orion. All the following statements about Betelgeuse are true. Which one can you infer from its red color? 21) _____

A) It is moving away from us.
B) It is much brighter than the Sun.
C) Its surface is cooler than the surface of the Sun.
D) It is much more massive than the Sun.

22) Which of the following is the most basic definition of a *greenhouse gas*? 22) _____

A) a gas that absorbs infrared light
B) a gas that keeps warms air from rising, and therefore warms the surface
C) a gas that makes a planet much hotter than it would be otherwise, even in small amounts
D) a gas that reflects a lot of sunlight

23) What do astronomers mean by a *constellation*? 23) _____

A) A constellation is a group of stars that are all located in about the same place in space.
B) A constellation is a region in the sky as seen from Earth.
C) A constellation is any random grouping of stars in the sky.
D) A constellation is a group of stars related through an ancient story.

24) What mechanism is most responsible for generating the internal heat of Io that drives its volcanic activity? 24) _____

A) radioactive decay
B) differentiation
C) accretion
D) tidal heating
E) bombardment

25) Suppose you view the solar system from high above Earth's North Pole. Which of the following statements about planetary orbits will be true? 25) _____

A) The inner planets orbit the Sun clockwise while the outer planets orbit the Sun counterclockwise.
B) All the planets orbit counterclockwise around the Sun.
C) The inner planets orbit the Sun counterclockwise while the outer planets orbit the Sun clockwise.
D) All the planets except Uranus orbit the Sun counterclockwise; Uranus orbits in the opposite direction.

26) On a scale where the Sun is about the size of a grapefruit and the Earth is about 15 meters away, how far away are the nearest stars besides the Sun? 26) _____

A) about the distance across the United States
B) about the distance across the state of Delaware
C) about the distance across 50 football fields
D) 100 meters

27) According to our present theory of solar system formation, which of the following statements about the growth of terrestrial and jovian planets is *not* true? 27) _____

A) Both types of planet begun with planetesimals growing through the process of accretion, but only the jovian planets were able to capture hydrogen and helium gas from the solar nebula.
B) Swirling disks of gas, like the solar nebula in miniature, formed around the growing jovian planets but not around the growing terrestrial planets.
C) The terrestrial planets formed inside the frost line of the solar nebula and the jovian planets formed beyond it.
D) The jovian planets began from planetesimals made only of ice, while the terrestrial planets began from planetesimals made only of rock and metal.

28) Why are Saturn's rings so thin? 28) _____

A) Any particle in the ring with an orbital tilt would collide with other ring particles, flattening its orbit.
B) Saturn's gravity prevents particles from migrating upwards out of the rings.
C) The current thinness is a short–lived phenomenon that is special to this time.
D) The "gap" moons shepherd the particles and maintain its thin profile.
E) Solar radiation pressure keeps particles pressed into the rings.

29) The point directly over your head is called _____. 29) _____

A) the zenith
B) the north celestial pole
C) the North Star
D) the meridian

30) Which of the following is furthest from the Sun? 30) _____
A) a comet in the Kuiper belt
B) Neptune
C) a comet in the Oort cloud
D) Pluto
E) an asteroid in the asteroid belt

31) What does *temperature* measure? 31) _____
A) the average mass of particles in a substance
B) the total amount of heat in a substance
C) the average kinetic energy of particles in a substance
D) the total potential energy of particles in a substance

32) Why is Saturn almost as big as Jupiter, despite its smaller mass? 32) _____
A) Jupiter's greater mass compresses it more and increases its density.
B) Saturn is further from the Sun, thus cooler, and therefore less compact.
C) Saturn's rings make the planet look bigger.
D) Jupiter's strong magnetic field constrains its size.
E) Saturn has a larger proportion of hydrogen and helium than Jupiter, and is therefore less dense.

33) Which forms of light are *lower* in energy and frequency than the light that our eyes can see? 33) _____
A) infrared and ultraviolet
B) infrared and radio
C) visible light
D) ultraviolet and X–rays

34) According to our theory of solar system formation, what three major changes occurred in the solar nebula as it shrank in size? 34) _____
A) Its gas clumped up to form the terrestrial planets, nuclear fusion produced heavy elements to make the jovian planets, and central temperatures rose to more than a trillion Kelvin.
B) Its mass, temperature, and density all increased.
C) It got hotter, its rate of rotation increased, and it flattened into a disk.
D) It gained energy, it gained angular momentum, and it flattened into a disk.

35) Laboratory measurements show hydrogen produces a spectral line at a wavelength of 486.1 nanometers (nm). A particular star's spectrum shows the same hydrogen line at a wavelength of 486.0 nm. What can we conclude? 35) _____
A) The star is getting colder.
B) The star is moving away from us.
C) The star is getting hotter.
D) The star is moving toward us.

36) The energy attributed to an object by virtue of its motion is known as _____. 36) _____
A) potential energy
B) kinetic energy
C) radiative energy
D) mass–energy

37) What is *stellar parallax*? 37) _____

A) It is the daily rise and set of the stars.
B) It is the slight back–and–forth shifting of star positions that occurs as we view the stars from different positions in Earth's orbit of the Sun.
C) It is the change in the set of constellations that we see at different times of year in the evening sky.
D) It describes the fact that stars are actually moving relative to one another, even though to our eyes the stars appear fixed in the constellations.

38) According to Kepler's third law ($p^2 = a^3$), how does a planet's mass affect its orbit around the Sun? 38) _____

A) More massive planets must have more circular orbits.
B) A more massive planet must have a larger semimajor axis.
C) A planet's mass has no effect on its orbit around the Sun.
D) More massive planets orbit the Sun at higher average speed.

39) The planet in our solar system with the highest average surface temperature is _____. 39) _____

A) Mercury B) Earth C) Neptune D) Venus

40) According to our present theory of solar system formation, how did Earth end up with enough water to make oceans? 40) _____

A) Earth formed at a distance from the Sun at which liquid water happened to be plentiful in the solar nebula.
B) The water was brought to the forming Earth by planetesimals that accreted near Earth's orbit.
C) The water was formed by chemical reactions among the minerals in the Earth's core.
D) The water was brought to the forming Earth by planetesimals that accreted beyond the orbit of Mars.

41) Which of the following best describes the geological histories of the Moon and Mercury? 41) _____

A) Early in their histories, they suffered many impacts and experienced some volcanism and tectonics, but they now have little geological activity at all.
B) Impact cratering is the only major geological process that has affected their surfaces.
C) Impact cratering shaped these worlds early in their histories. Then, during the past few million years, they were reshaped by episodes of volcanism and tectonics.
D) All four geological processes were important in their early histories, but only impact cratering still reshapes their surfaces today.

42) An angle of 1 arcsecond is _____. 42) _____

A) less than the thickness of a human hair held at arm's length
B) about the width of a finger held at arm's length
C) slightly more than the width of a basketball held at arm's length
D) about the width of your fist held at arm's length

43) Which of the following is *not* one of, nor a direct consequence of, Kepler's Laws? 43) _____

A) The orbit of each planet about the Sun is an ellipse with the Sun at one focus.
B) The force of attraction between any two objects decreases with the square of the distance between their centers.
C) As a planet moves around its orbit, it sweeps out equal areas in equal times.
D) More distant planets orbit the Sun at slower speeds.

44) The difference between *speed* and *velocity* is that _____. 44) _____

A) velocity is the same as acceleration but speed is different
B) they are expressed in different units
C) velocity also includes a direction
D) velocity is calculated using a physics equation

45) Which of the following is *not* a major pattern of motion in the solar system? 45) _____

A) The Sun and most of the planets rotate in the same direction in which the planets orbit the Sun.
B) All of the planets orbit the Sun in the same direction—counterclockwise as viewed from above Earth's north pole.
C) Nearly all comets orbit the Sun in same direction and roughly the same plane.
D) Most of the solar system's large moons orbit in their planet's equatorial plane.

46) If you are located in the Northern Hemisphere, which of the following correctly describes a relationship between the sky and your location? 46) _____

A) The altitude of the north celestial pole equals your longitude.
B) The longitude of the north celestial pole is circumpolar, and therefore crosses your zenith at the meridian.
C) The altitude of the north celestial pole equals your latitude.
D) The altitude of the celestial equator equals your latitude.

47) What do we mean when we say that the universe is *expanding*? 47) _____

A) Average distances between galaxies are increasing with time.
B) Within galaxies, average distances between star systems are increasing with time.
C) The statement is not meant to be literal; rather, it means that our knowledge of the universe is growing.
D) Everything in the universe is gradually growing in size.

48) During the period each year when we see Mars undergoing apparent retrograde motion in our sky, what is really going on in space? 48) _____

A) Earth and Mars are getting closer together.
B) Earth is catching up with and passing by Mars in their respective orbits.
C) Mars is moving around the Sun in the opposite direction from which Earth is moving around the Sun.
D) Earth and Mars are on opposite sides of the Sun.

49) Why does Jupiter have several distinct cloud layers? 49) _____

A) Different layers represent the various regions where the temperature is cool enough for liquid water to condense.
B) Different layers represent clouds made of gases that condense at different temperatures.
C) Different gases are present at different altitudes in Jupiter's atmosphere.
D) Clouds form randomly, so on average there are always several layers.
E) Winds prevent clouds from forming at some altitudes, so we see clouds only at the other altitudes.

50) A television advertisement claiming that a product is light–years ahead of its time does not make sense because _____. 50) _____

A) light–years can only be used to talk about light
B) it doesn't specify the number of light–years
C) a light–year is an astronomically large unit, so a product could not possibly be so advanced
D) it uses "light–years" to talk about time, but a light–year is a unit of distance

51) Which of the following *best* explains why many jovian moons have been more geologically active than the Moon or Mercury? 51) _____

A) Jovian moons are made mostly of ice that can melt or deform at lower temperatures than can the rock and metal that make up the Moon and Mercury.
B) The jovian moons probably have far more internal heat generated by radioactive decay than do the Moon or Mercury.
C) Because of their greater distances from the Sun, the jovian moons receive much less heat from the Sun.
D) The jovian moons are considerably larger than the Moon and Mercury and therefore have retained much more internal heat.

52) An astronomical unit (AU) is _____. 52) _____

A) the *current* distance between Earth and the Sun
B) the average distance between any planet and the Sun
C) any very large unit, such as a light–year
D) the *average* distance between Earth and the Sun

53) Which of the following statements about an ellipse is *not* true? 53) _____

A) An ellipse with a large eccentricity looks much more elongated (stretched out) than an ellipse with a small eccentricity.
B) The semimajor axis of an ellipse is half the length of the longest line that you can draw across an ellipse.
C) A circle is considered to be a special type of ellipse.
D) The focus of an ellipse is always located precisely at the center of the ellipse.

54) The reason that small planets tend to lose interior heat faster than larger planets is essentially the same as the reason that _____. 54) _____

A) Earth contains more metal than the Moon
B) gas bubbles form and rise upward in boiling water
C) a large baked potato takes longer to cool than a small baked potato
D) thunderstorms tend to form on hot summer days

55) Gaps in the asteroid belt (often called *Kirkwood gaps*) are caused by _____. 55) _____

A) tidal forces from the Sun
B) orbital resonances with Jupiter
C) tidal forces from Jupiter
D) the competing gravitational tugs of Mars and Jupiter