

1) How many electrons does a neutral helium atom have?

ANSWER:

2) What are the two nucleons that make up a helium nucleus?

ANSWER:

3) What is the carrier particle for the electromagnetic force?

ANSWER:

4) Name all of the following 3 sub-atomic particles that have mass and charge: electrons; protons; neutrons

ANSWER:

5) Name all of the following 3 choices of particles that can travel at the speed of light: photons; neutrinos; neutrons

ANSWER:

6) Identify which 2 of the following particles, carry away most of the energy produced by fusion in the core of a star: protons; electrons; neutrinos; photons

ANSWER:

7) Which of the following atomic particles will travel the greatest distance though lead:

- W) photon
- X) alpha particle
- Y) beta particle
- Z) neutrino

ANSWER:

8) Tritium (read as: TRIT-ee-um) is an isotope of hydrogen with how many neutrons?

ANSWER:

9) An alpha particle is the same as the nucleus of what element?

ANSWER:

10) How many electrons are in the outer shell of an element in period 4 and group 5A?

ANSWER:

11) How many electrons are in the outer shell of the element argon?

ANSWER:

12) Which of the following best describes an elementary particle as it relates to atoms:

- W) any atomic particle
- X) any atomic particle that has no charge
- Y) any atomic particle that has no charge and no mass
- Z) any atomic particle that is not known to be made of smaller structures

13) If an elementary particle is one that is not known to be made up of smaller particles, which of the following is an elementary particle:

- W) proton
- X) neutron
- Y) electron
- Z) hadron

14) The nucleus of a the heavy isotope of hydrogen called deuterium has a charge that is:

- W) four times greater and opposite in sign to that of a single electron
- X) two times greater and opposite in sign to that of a single electron
- Y) the same as but opposite in sign to that of a single electron
- Z)  $\frac{1}{2}$  as great and opposite in sign to that of a single electron

15) All isotopes of which of the following elements are radioactive:

- W) silver with 47 protons
- X) indium with 49 protons
- Y) polonium with 84 protons
- Z) osmium with 76 protons

16) For a radioactive element with a half-life of 12,000 years, if a sample of the radioactive element is left to decay for 36,000 years, what fraction of the original radioactive atoms in the sample will have decayed?

ANSWER:

17) Which of the following substances was commonly used in cathode ray tubes to detect high energy photons because it emits light when sufficiently excited:

- W) zinc sulfide
- X) copper oxide
- Y) iron oxide
- Z) magnesium chloride

18) When zinc sulfide absorbs energy it re-emits it as light for a while after it has absorbed energy. This is an example most accurately described as:

- W) phosphorescence
- X) luminescence
- Y) radioactive decay
- Z) quantum discordance

19) What is the common name for the main scientific instrument that J. J. Thomson used to discover the electron?

ANSWER:

20) Name all of the following 4 particles that will be deflected in a uniform electric field: electron; neutrino; photon; proton

ANSWER:

21) To maintain nuclear stability, as elements have more and more protons, what other nucleon is needed in greater and greater numbers?

ANSWER:

22) What subatomic particle differs in its numbers among isotopes of the same element?

ANSWER:

23) Carbon-14 has how many neutrons and protons respectively?

ANSWER:

24) Order the following 3 choices from the one that will generally penetrate a 5 meter thick wall of concrete the most to the least in distance: alpha particles; gamma rays; beta particles

25) When an atom decays by a single alpha emission, by how many atomic mass numbers will it decrease?

ANSWER:

26) What basic force or interaction of the universe is most directly responsible for radioactivity?

ANSWER:

27) If an atom absorbed a single alpha particle, it would:

- W) change into a new element and increase its atomic number by 2
- X) remain as the same element and increase its atomic mass by 4
- Y) change into a new element and increase its atomic mass by 2
- Z) remain as the same element and increase its atomic mass by 2

28) What is the most common term for the force or interaction that binds protons and neutrons together?

ANSWER:

30) Which of the following is not true:

- W) at the boiling point of a substance it is possible for bubbles of vapor to appear in the liquid
- X) vapor pressure generally increases as temperature increases
- Y) for the same substance, the average molecular motion in the gaseous state is greater than that in the liquid state
- Z) a substance at 100 degrees C has twice the energy as the same substance at 50 degrees C

31) Which of the following is CLOSEST to the calories needed to raise the temperature of 10 grams of water from 25°C to 35°C:

- W) 50
- X) 100
- Y) 150
- Z) 200

32) A cube of metal that is 2 centimeters on edge has a mass of 140 grams. What is its density in grams per cc to the first decimal place?

ANSWER:

33) Which of the following 4 substances are compounds: table salt; table sugar; mercury; water

ANSWER:

34) Identify all of the following 3 elements that will combine with sodium in a one to one ratio: chlorine; sulfur; magnesium; iodine

ANSWER:

35) Which of the following elements are divalent cations: magnesium; calcium; potassium

ANSWER:

36) Identify all of the following 4 characteristics that all matter must have:

- 1) mass
- 2) inertia
- 3) weight
- 4) composed of atoms

ANSWER:

37) Which of the following is the most common term for a substance that has the same properties throughout:

- W) monomer
- X) homogenous
- Y) isotropic
- Z) standard

38) Identify all of the following 4 substances that can be decomposed into at least two different elements: graphite; air; ammonia; nitrate

39) Identify all of the following 3 choices that are examples of physical changes and not chemical changes:

- 1) oxidation of sugar
- 2) heating gold into liquid form
- 3) deforming lead under stress

40) What is the most common diatomic molecule in the universe?

ANSWER:

41) Name all of the following 3 elements that often occur as diatomic molecules naturally on Earth: fluorine; oxygen; nitrogen

ANSWER:

42) Identify all of the following 3 substances that are known to exist as crystals: proteins; iodine; carbon

43) Identify all of the following 3 choices that will generally increase when moving from left to right across a period in the periodic table: electronegativity; atomic mass; atomic radius

44) Which of the following best explains why atomic radius does not generally increase with increased atomic mass in a single period of the periodic table:

- W) all atoms in the same period have the same atomic radius
- X) neutrons have no charge and do not occupy as much space as protons
- Y) elements with more protons attract their respective electrons more closely
- Z) as an atom increases in mass its protons are increasing packed more tightly

45) Order the following 3 elements from the one that is generally the most reactive to the least: Xenon; Chlorine; Carbon

46) Identify all of the following 4 choices that are commonly employed in techniques to purify a substance: sublimation, evaporation; precipitation

47) Which of the following best describes the most important clue to why Rutherford and coworkers decided most of the mass of the atom was in the nucleus:

- W) alpha particles were helium nuclei that had been released during radioactive decay
- X) during bombardment of foil with alpha particles, some seemed to bounce straight backwards
- Y) electrons had almost no mass and neutrons had no charge
- Z) all the neutrons were in one location and could not be ejected by electrons

48) If the atomic number of oxygen is 8, what is the total charge of the nucleus and number of electrons in the atom in its neutral state respectively?

ANSWER:

49) What is the ratio of magnesium atoms to chloride atoms in a magnesium chloride crystal?

ANSWER:

50) Danny needs a metal that will not rust, corrode, or tarnish and is an excellent conductor of electricity. Which of the following would be the best choice:

- W) copper
- X) iron
- Y) silver
- Z) gold

51) In what state of matter do most atoms exist on our Sun?

ANSWER:

52) What transition metal of Period 6 is the most ductile substance?

ANSWER:

53) What is the scientific term for the process used in nuclear reactors where atoms are split to form smaller atoms and release energy?

ANSWER:

54) Which of the following materials exhibits the LEAST elasticity at room temperature:

- W) lead
- X) iron
- Y) steel
- Z) brass

55) Identify all of the following 3 choices that are not true regarding ductility and malleability:

- 1) any element that is malleable is ductile
- 2) an elemental material's malleability is directly related to the behavior of valence electrons shared among its atoms
- 3) most elements are either ductile, malleable or both

56) Which of the following is NOT true:

- W) ozone is a tri-atomic molecule
- X) carbon dioxide has 2 oxygen molecules for each atom of carbon
- Y) sodium hydroxide is a compound
- Z) a lithium atom always has 3 protons

57) Which of the following best describes the bubbles that form in boiling water:

- W) water being split into hydrogen and oxygen gas
- X) gasses trapped in the liquid water being boiled off
- Y) water changing from a liquid to a gas and rising to the surface
- Z) sublimation of the gasses in the water

58) Which of the following best explains why carbon is central to biological molecules:

- W) it has many stable isotopes
- X) it is highly electronegative
- Y) it forms ionic bonds quickly with water
- Z) it can covalently bond with up to 4 other atoms at one time

59) What phase change involves the direct change of a gas into a liquid?

ANSWER:

60) Identify all of the following 3 choices that typically increase with decreasing temperature: viscosity; electrical resistance; volume

ANSWER:

61) What state of matter predominates at very high temperatures and is characterized by many of its atoms existing as ions with their electrons unbound to any atom or molecule?

ANSWER:

62) Frost primarily forms by what specific phase change process?

ANSWER:

63) Which of the following elements is most likely to be found in its free and uncombined state in nature:

- W) chlorine
- X) sodium
- Y) copper
- Z) fluorine

64) Which of the following elements is found in galena, pyrite, cinnabar, and gypsum, and when combined with hydrogen forms a compound that smells of rotten eggs:

- W) phosphorus
- X) sulfur
- Y) nitrogen
- Z) potassium

65) Which of the following can transfer energy through a vacuum:

- W) sound
- X) electromagnetic radiation
- Y) conduction
- Z) convection

66) The transition metals elements of period six such as iron and cobalt have characteristic colors. Identify all of the following 3 choices that are typically noted as responsible for the variation in colors of transition metals:

- 1) atomic number
- 2) oxidation state of each element
- 3) number of neutrons in each element

67) In period 4 on the periodic chart, as you move from left to right for the first 3 elements, potassium, calcium and scandium they progressively become:

- W) softer with lower melting points
- X) harder with lower melting points
- Y) softer with higher melting points
- Z) harder with higher melting points

68) Which of the following best explains the steady increase in hardness and melting point for the first 6 elements of period 4:

- W) increasing numbers of neutrons prevents nuclear destabilization
- X) increased numbers of valence electrons leads to stronger molecular bonding
- Y) increasing atomic number increases atomic ionic radius
- Z) increasing size of the nuclei allows for greater packing of the atoms in the crystal lattice

69) Identify all of the following 4 elements that are known to occur on Earth in pure elementary states: magnesium; mercury; gold; silver

70) What group on the periodic chart has the most electropositive elements?

ANSWER:

71) Lithium and osmium differ most extremely in what physical property?

ANSWER:

72) What is the most common term for the elements such as boron, silicon and germanium that have properties intermediate to those of metals and non-metals

ANSWER:

73) Which of the following best describes the appearance of pure iron:

- W) dull redish-brown
- X) shiny redish-brown
- Y) dull green
- Z) shiny silvery-grey

74) If something increases in mass, it must also increase its:

- W) kinetic energy
- X) velocity
- Y) inertia
- Z) weight

75) To the first decimal place, if air resistance is ignored, a free-falling body near the surface of the Earth will increase its velocity at how many meters per second for each second of descent?

ANSWER:

76) Which one of the basic forces of the universe is typically considered to act over the longest distances?

ANSWER:

77) Linda carries a ten kilogram box 20 meters in 20 seconds and Ken does the same job in 10 seconds. The difference in the two jobs has most directly to do with:

- W) total amount of work
- X) power
- Y) potential energy
- Z) efficiency

78) If Bugs Bunny lifts a bag of carrots vertically with force of 10 newtons for a distance of 4 meters in 5 seconds, how many joules of work is done, when friction is ignored?

ANSWER:

79) At which of the following locations on Earth is the force of gravity the GREATEST:

- W) at the center of the Earth
- X) half-way from the center of the Earth to its surface
- Y) at the surface of the Earth
- Z) at the top of Mt. Everest

80) What is the ideal mechanical advantage of a wheel and axle if the diameter of the wheel is 0.5 meters and the diameter of the axle is 50 millimeters?

ANSWER:

81) Consider a 1,000-newton metal block that sinks in water. What is the apparent weight block, in proper SI units, if it displaces 600 newtons of water when fully immersed?

ANSWER:

82) Which of the following terms is most often used by a physicist when describing the motion of an object that includes both its speed and direction:

- W) momentum
- X) rate
- Y) distance per time
- Z) velocity

83) Which of the following is most often used when computing the combined displacements in the movements of an object:

- W) rate adjustment
- X) vector addition
- Y) total distance traveled
- Z) instantaneous velocity

84) Identify all of the following 4 choices that are vector quantities: charge; weight; acceleration; speed

ANSWER:

85) Ignoring friction, how many newtons of force were applied to a block of ice with a mass of 10 kilograms in order to accelerate the block across a frozen lake at 2 meters per second squared?

ANSWER:

86) On a planet with no atmosphere and a gravitational acceleration of 6 meters per second squared, how far will an object travel in free fall after 1 second if dropped from rest?

ANSWER:

87) Which of the following must remain unchanged to have a constant velocity for an object in motion:

- W) speed only
- X) friction and speed only
- Y) speed and mass only
- Z) speed and direction of travel

88) If the speed of an object remains the same and its mass doubles, how many times as much kinetic energy does it possess?

ANSWER:

89) What is the ideal mechanical advantage of a lever with an effort arm of 1 meter and a resistance arm of 20 centimeters?

ANSWER:

90) Consider a train traveling on a level straight track and the engineer applies the brakes. Which of the following would a physicist agree best describes the train's motion:

- W) gaining momentum
- X) accelerating
- Y) equilibrating
- Z) losing kinetic and gaining energy

91) Which of the following is the correct term for the type of friction keeping a book from slipping down an inclined plane:

- W) oppositional friction
- X) holding friction
- Y) static friction
- Z) anti-kinetic friction

92) A common rectangular clay brick is placed on a 30 degree inclined plane. Which of the following is not true regarding the brick and its possible motion down the plane :

- W) at rest, the amount of static friction depends on the texture of the surfaces of the brick and plane
- X) the static friction is a measure of the initial resistance of the brick to moving down the plane
- Y) if the brick begins to slide down the plane, frictional resistance typically decreases
- Z) the resistance of the brick to sliding depends on which side of the brick is in contact with the plane

93) Steven tries to move a 1000 newton crate and expends 200 calories of energy over 60 seconds. If he did not move the crate, how much work was accomplished?

ANSWER:

94) Molly lifts a 5-kilogram box off a floor to a counter 200 centimeters above the floor. What is the block's increase in gravitational potential energy, giving you answer in standard SI units?

ANSWER:

95) Ignoring air resistance, order the following 3 choices from the one with the SHORTEST horizontal displacement to the LONGEST horizontal displacement for identical bullets fired with the same initial speeds but at differing angles above the horizon: 31°, 44°, 84°

ANSWER:

96) Albert is on a level field and walks 30 meters exactly east and then 40 meters exactly north. What is his total magnitude of displacement, in meters?

ANSWER:

97) Which of the following methods is most appropriate for graphically computing the combined velocity of 2 objects:

- W) vector addition
- X) area under the curve
- Y) scatter plotting
- Z) interpolation

98) What is the most common term used in science to describe the time to complete one entire cycle, such as an orbit, or one back and forth motion of a pendulum?

ANSWER:

99) Consider a planet that has no atmosphere and where gravitational acceleration is 18 meters per second. If an object falls from a resting position, how many meters will it travel in 1 second?

ANSWER:

100) If the distance between two opposite charges is doubled, by what factor will the attractive force between them decrease?

ANSWER:

101) Which of the following laws most directly describes the behavior of elastic solids:

- W) Newton's third Law
- X) Hooke's Law
- Y) Young's law of modulus elasticity
- Z) Gauss's Law

102) On the Moon, a spring-loaded catapult that launches a rock straight up reaches a maximum height 200 meters. It then launches the same rock in the same way but its spring is compressed only half as much as originally. Assuming ideal conditions, how many meters high will the ball reach on the second launch?

ANSWER:

103) Ignoring friction, order the following 3 objects from the one to reach the bottom of a 5 meter long inclined plane first to last. Assume the blocks slides friction free and the other two roll without slipping: a 1.5 centimeter round gold wedding band; a standard ten pin bowling ball; a 100 kilogram cubic block of steel

ANSWER:

104) Identify all of the following 3 choices that are true regarding thermodynamics:

- 1) when converting from one form energy to another some useful energy is always lost
- 2) cold objects typically lose energy to warmer objects
- 3) the total amount of disorder or entropy of an isolated system increases with time

105) Which of the following is the most common term for the part of the universe in a thermodynamic situation where various quantities such as energy, work, and heat within a hypothetical boundary that separates it from a surrounding environment:

- W) unit
- X) substructure
- Y) entropy
- Z) system

106) Which of the following best describes a thermodynamic isolated system:

- W) a system that exchange only energy with its surroundings
- X) a system that exchange no energy with its surroundings
- Y) a system that exchanges no mass with its surroundings
- Z) a system that exchanges nothing whether its is energy, matter or work with its surroundings

107) The internal energy of an isolated system is always:

- W) rising because of increasing disorder in the system
- X) falling because of decreasing disorder in the system
- Y) falling because of energy transformations in the system
- Z) the same even if one form of energy changes to another

108) Two objects that are in thermal equilibrium have:

- W) the same amount of matter
- X) constant exchange of heat through conduction and convection
- Y) the same temperature
- Z) the same thermal mass

109) What three processes are typically noted as transferring heat from one object to another?

ANSWER:

110) Of the three ways in which heat is transferred from one object to another which ones can occur through a perfect vacuum?

ANSWER:

111) What is the wavelength, in meters and rounded to the first decimal place, of a transverse wave that has a frequency of 600 hertz and a speed in a certain medium of 300 meters per second?

ANSWER:

112) If the intensity of a explosion is one million times as much as another, by how many decibels has it increased?

ANSWER:

113) Jan is standing at the entrance of a harbor watching waves pass her by. If she counts 1 wave pass by per second, what is the frequency of the waves in hertz?

ANSWER:

114) For a standing wave on a violin string 30 centimeters long, how many antinodes does the fundamental frequency have and how long is its wavelength in meters?

ANSWER:

115) What would be the frequency, in hertz, of the first overtone of a note on a piano that vibrates at 330 hertz?

ANSWER:

116) In seconds and giving your answer in scientific notation, what is the period of a wave with a frequency of 20,000 hertz?

ANSWER:

117) Assuming all materials are at room temperature, order the following 3 materials from the material in which sound travels the FASTEST to the SLOWEST: sea water; air; steel

ANSWER:

118) By words or number, name all of the following 3 choices that will affect speed of sound in air: 1) loudness; 2) pitch; 3) temperature of air

ANSWER:

119) If at zero degrees C, the speed of sound in dry air at sea level is 331.3 meters per second, what would the speed of sound be in meters per second at 10 degrees C:

- W) 318.9
- X) 325.2
- Y) 334.3
- Z) 337.3

120) What property of a sound wave is perceived as pitch?

ANSWER:

121) What property of a sound wave determines what is perceived as loudness?

ANSWER:

122) What is the name for a single light quantum?

ANSWER:

123) Identify all of the following 4 choices that can travel at 299,792,458 meters per second in a vacuum: x-rays; cosmic-rays; ultraviolet light; microwaves

ANSWER:

124) Which of the following is not true of electromagnetic radiation:

- W) they all can travel through a vacuum
- X) higher frequencies are always brighter than lower frequencies
- Y) it can be polarized
- Z) the angle of incidence equals the angle of reflection

125) If equal amounts of light are mixed, what color of light will mix with red to produce yellow?

ANSWER:

126) Which of the following colors of light will bend or change direction the LEAST when entering glass at an angle:

- W) blue
- X) red
- Y) violet
- Z) orange

127) If a sound wave has a frequency of 500 hertz, what is its period, in seconds rounded to the fourth decimal place?

ANSWER:

128) Which of the following will produce the clearest interference pattern:

- W) passing white light through a prism and projecting the emitted light on a screen
- X) passing monochromatic light passing through two slits is projected on a screen
- Y) projecting complimentary colors on a screen
- Z) shining light on two subtractive color pigments

129) Circle all of the following 3 choices that are true regarding light:

- 1) the theory of Special Relativity implies light always has the same velocity in any medium
- 2) light sometimes behaves as if it was made of waves and at other times as if it was made of particles
- 3) light can be considered to travel as a wave

130) In Thomas Young's famous double slit experiment, the interference pattern was most easily explained by considering light to:

- W) travel as waves
- X) travel as particles
- Y) always travel at the same speed
- Z) be made of individual units called photons

131) If the speed of light in a vacuum is taken to be  $3 \times 10^8$  meters per second, what is the wavelength, in meters, of an electromagnetic wave in a vacuum if its frequency is 300 megahertz?

ANSWER:

132) If Michelle looks at a light bulb which is 100 meters away and she then looks at a second light of the same intrinsic brightness that has appears  $1/4^{\text{th}}$  as bright, how far away is the second light, in meters?

ANSWER:

133) In a standing wave on a guitar string, what are the points called where the string vibrates with maximum amplitude?

ANSWER:

134) If the distance between two protons is tripled, the repulsive force between them will be:

- W) three times stronger
- X) three times weaker
- Y) nine times weaker
- Z) 12 times weaker

135) Sound waves are best described as :

- W) a gravitational waves
- X) electromagnetic transverse waves
- Y) longitudinal compression waves
- Z) horizontal pitch waves

136) What is the term physicists most often use for the length between the midpoint of a lens to the focal point of the lens?

ANSWER:

137) Order the following 4 colors of light from the one that has the SMALLEST angle of refraction in glass to the one with the LARGEST: red, violet, green, yellow

ANSWER:

138) What material has a refractive index of 1?

ANSWER:

139) In the photoelectric effect, incident light of a certain color will emit no electrons from a zinc plate. Identify all of the following 3 choices that will cause the emission of electrons:

- 1) increase the brightness of the light
- 2) change the angle of the incident light rays
- 3) increase the frequency of light

140) Which of the following is the optical term for the type of image that is produced by a plane mirror:

- W) reformed
- X) imaginary
- Y) virtual
- Z) refracted

141) Which of the following is true regarding a ray of light when it passes from a vacuum into glass:

- W) the frequency changes but the speed remains the same
- X) the speed changes as well as the frequency
- Y) the wavelength and frequency change but the speed remains the same
- Z) the wavelength changes but the frequency remains the same

142) Radiant energy is best described as:

- W) the energy found in electromagnetic waves
- X) the energy in any wave
- Y) the power of any sound or light wave that can heat another object
- Z) a non-scientific term with no specific technical meaning

143) A charged wand is brought near an electroscope causing the leaves of the electroscope to separate. This is a common demonstration of what electrical principle:

- W) induction
- X) conduction
- Y) convection
- Z) insulation

143) Which of the following best describes what happens when rabbit fur is rubbed against amber:

- W) the amber becomes negatively charged by losing protons to the fur
- X) the amber becomes positively charged by losing electrons to the fur
- Y) the amber becomes negatively charged by gaining electrons from the fur
- Z) the amber becomes positively charged by gaining protons from the fur

144) Identify all of the following 4 choices that are typically characteristic of materials that are good electrical conductors:

- 1) they are good thermal insulators
- 2) transparent to infrared light
- 3) made of atoms that easily lose electrons
- 4) low in density

145) What term is most commonly used for the type of electrical current that flows in only one direction?

ANSWER:

146) Giving your answer in proper SI units, what is its resistance in the circuit of an electric oven operating on a 240-volt AC power source and drawing 40 amperes of current?

ANSWER:

147) Which of the following carries the electrical current in a metal wire:

- W) nucleons
- X) protons
- Y) electrons
- Z) metal ions

148) If an electrical transformer is designed to step down from 24,000 volts AC to 120 volts AC, how many turns are in the secondary coil if the primary coil has 10,000 turns?

ANSWER:

149) Assuming each wire is operating under identical circumstances, which gauge would carry 15 amperes of current at room temperature with the least resistance:

- W) 14-gauge braided copper wire
- X) 14-gauge solid copper wire
- Y) 12-gauge solid copper wire
- Z) 12-gauge solid aluminum wire

150) Consider 2 hydraulic cylinders connected by a single metal pipe. If 1,500 newtons of force is applied to the piston of the first cylinder that has a surface area of 10 square centimeters, how many newtons of force will be produced at the other cylinder if its piston has a surface area of 20 square centimeters?

ANSWER:

151) How many amperes of current are running through a 6,000-watt electric heater operating on a 240-volt power source?

ANSWER:

152) How much does it cost to run a 2,000 watt hair dryer for  $\frac{1}{2}$  hour if the electric company charges 14 cents per kilowatt hour?

ANSWER: 14 cents

153) Silicon dioxide exists in nature most commonly as what mineral?

ANSWER:

154) If a gas has a volume of 1513 milliliters at 298 kelvin, what is the volume of the gas in cubic centimeters rounded to the nearest whole number at 273 kelvin?

ANSWER:

155) Which of the following is the major advantage of borosilicate glass made with higher amounts of boron over soda-lime or soft glass:

- W) borosilicate glass has a smaller coefficient of expansion
- X) borosilicate glass have no toxic elements such as lead
- Y) borosilicate contains no silicon and is cheaper to make
- Z) borosilicate is softer and more flexible and therefore less prone to breakage

156) What is the ratio of potassium to oxygen in potassium carbonate?

ANSWER:

157) Which of the following is not true for the letter symbols used for elements on the periodic chart:

- W) the first letter is always upper case
- X) the second letter is always lower case
- Y) some symbols in period three are single letter
- Z) no symbols are three letters long

158) What is the common name for the principal ore of beryllium?

ANSWER:

159) Which of the following elements typically has the closest crystalline structure to that of diamond:

- W) calcium
- X) silicon
- Y) iron
- Z) sodium

160) What three elements make up boric acid?

ANSWER:

161) From what element does the proton that dissociates in acids typically originate?

ANSWER:

162) How many electrons does chlorine need to gain to form an octet?

ANSWER:

163) What is the molecular mass of carbon dioxide?

ANSWER:

164) Which of the following elements is a halogen:

- W) argon
- X) iodine
- Y) iridium
- Z) radon

165) What is the molarity, in moles per liter, of a solution made by dissolving 5 moles of a solute in enough water to make 1,000 milliliters of solution?

ANSWER:

166) Which of the following will occur if you pass a full rainbow of visible light colors through a second prism:



- W) white light is reconstituted
- X) each color is broken down into further colors
- Y) no light is emitted
- Z) an interference pattern results with light and dark lines

167) Identify all of the following 3 choices under which an object is accelerating: 1) increase in speed; 2) decrease in speed; 3) change in direction

168) If the molecular weight of a compound is 25.9, and 51.8 grams of that substance are dissolved in 1,000 milliliters of pure water, what is the molarity of the solution?

ANSWER:

169) Using proper chemical formulas, finish balancing the following equation:  $\text{AgNO}_3 + \text{HCl} \rightarrow$  what?

ANSWER:

170) If the atomic mass of nitrogen is 14.0 and the atomic mass of oxygen is 16.0, then how many grams of nitrogen dioxide will have one mole of atoms?

ANSWER:

171) Which of the following is the best way to show that a sample of diesel fuel is a mixture and not a compound:

- W) burn it in a combustion chamber
- X) separate into its components
- Y) determine its melting and boiling points
- Z) determine its specific gravity

172) Which of the following is a chemical change:

- W) iron melting
- X) alcohol burning
- Y) ice sublimating
- Z) distillation of gasoline

173) Identify all of the following 5 choices that are NOT correct symbols of elements: Si; Ja; Cl; Hg; Pb

ANSWER:

174) Give the total number of atoms for the following compound:  $\text{Ca}_3(\text{PO}_4)_2$

ANSWER

175) Which of the following is NOT generally true regarding catalysts in chemical reactions:

- W) they are always visible when the reaction stops
- X) they can either increase or decrease the rate of reactions
- Y) they are not altered as a result of the reaction
- Z) they decrease the activation energy of reactions