Pre-AP Atomic Theory Study Guide and Practice Quiz

Study Guide: Test = 90 Points

- Multiple Choice = 21 points
- Matching = 51 points
  - Multiple Choice and Matching questions cover all topics discussed during this unit.
- Metric conversions = 1 problem, 1 pt.
- Percent Error = 1 Problem, 1 pt
- Essay Questions = 9 total points.
  - The essay questions on the test ARE below in the practice quiz!
  - The practice essay questions will also be good review for the multiple choice questions!
- Atomic Conversions= 4 problems 6 points.
  - 2 problems are 1 step = 1 point each
  - 2 problems are 2 step = 2 points.
- Average Atomic Mass Calculation = 1 point
- Extra Credit opportunity.

The remainder of this study guide has practice problems, sample essay questions, and 195 multiple choice questions that cover the content listed above. Answers are available on the website.

Practice Quiz: Answers are on web!

Isotope Name	Symbol	Atomic Number	Atomic Mass	# Protons	# Neutrons	# Electrons
Carbon-14						
		1	3			
	^{37}Cl					
				35	45	

Conversions:

1. Find the mass in
   a) 1.22 mol sodium
   b) 14.5 mol copper

2. Find the number of moles in:
   a) 16 g S
   b) 1.2 044 x 10^{24} atoms Na

3. Find the mass (g) in:
   a) 6.022 x 10^{24} atoms of tantalum
   b) 3.01 x 10^{21} atoms of cobalt

4. Find the number of atoms in:
   a) 54 g Al
   b) .697 g Ga

Possible Essay Questions: GOOD REVIEW FOR THE MULTIPLE CHOICE QUESTIONS TOO!!!

1. Explain the Difference between Dalton's and Democritus's ideas. Which was a Theory and why?

2. Define each of the 3 Laws of Matter (Law of Conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions). Give examples of each.

3. What is the difference between a Law and a Theory in science? Which is "better" scientifically speaking?

4. Explain the how properties on the Periodic Table are affected by the organization of Groups and Periods on the periodic table.

5. What are the 5 parts of Dalton's Atomic Theory? Indicate which parts have been changed and which are still the same. Explain the changes made.

6. Explain the difference between Intensive and Extensive Properties and Chemical and Physical Properties. Give an example of each.

7. Draw a flow chart showing the relationships between the following terms:
    a. Matter, Pure Substance, Mixture, Heterogeneous mixture, Homogeneous mixture, Pure Substance, Elements

8. Describe the basic properties of Metals, Nonmetals, and Metalloids.

9. Explain what each of the following scientists discovered and what equipment they used to make their discoveries.
    a. Thomson, Milikan, Rutherford

10. Explain the experiment Rutherford conducted (what was used, what did he expect to happen, what actually happened).

11. Explain how the charge of electrons was determined. How was it determined that electrons had mass?

12. Explain the evidence that allowed Rutherford to determine the internal structure of the atom. Discuss both the nucleus and electron cloud.

13. Explain how the average atomic mass of an element relates to the mass number of the elements isotopes.

14. Explain the difference between atoms, elements, and compounds.

15. Explain what an isotope of an element is. What is the same among all atoms of that element, what changes to make isotopes different. Include the terms, atomic number, mass number, proton, neutron, and electron in your answer.

16. Describe how scientific advancements and technological advancements often occur at or near the same time.
    a. Give at least 2 examples from this unit of scientific advancements and technological advancements that are related.
    b. What is a current technological advancement that could lead to a greater understanding of the atom?

17. Explain how you determined the mass of Carbon Dioxide produced in the Baking Soda lab. What information from class made that possible?

Name: _____ Class: _____ Date: _____ ID: A

Pre-AP Atomic Theory Practice Quiz

The following list are the answer choices for the matching questions.

1.

Law of Conservation of Mass	Homogenous Mixture
Law of Definite Proportions	Heterogeneous Mixture
Law of Multiple Proportions	Chemical Change
Solid	Physical Change
Liquid	Group or Family
Gas	Period
Plasma	Dalton
Metal	Thomson
Nonmetal	Rutherford
Metalloid	Intensive Property
Compound	Extensive Property
Element	Chemical Property
Atom	Physical Property
Matter	

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 2. A physical property may be investigated by
a. melting ice.
b. letting milk turn sour.
c. allowing silver to tarnish.
d. burning wood.

____ 3. Chemical properties
a. include changes of state of a substance.
b. include mass and color.
c. include changes that alter the identity of a substance.
d. can be observed without altering the identity of a substance.

____ 4. Two features that distinguish matter are
a. mass and velocity.
b. weight and velocity.
c. mass and volume.
d. weight and volume.

____ 5. One chemical property of matter is
a. boiling point.
b. texture.
c. reactivity.
d. density.

____ 6. An example of an extensive physical property is
a. mass.
b. density.
c. color.
d. boiling point.

____ 7. Which of the following is an intensive physical property?
a. volume
b. length
c. color
d. mass

____ 8. A chemical change occurs when
a. dissolved minerals solidify to form a crystal.
b. ethanol is purified through distillation.
c. salt deposits form from evaporated sea water.
d. a leaf changes color.

____ 9. The melting of candle wax is classified as a physical change because it
a. produces no new substances.
b. transfers energy.
c. absorbs heat.
d. changes the chemical properties of wax.

____ 10. An example of a chemical change is
a. sanding wood.
b. melting ice.
c. milk going sour.
d. vaporizing gasoline.

____ 11. A physical change occurs when a
a. peach spoils.
b. copper bowl tarnishes.
c. bracelet turns your wrist green.
d. glue gun melts a glue stick.

____ 12. The particles in a solid are
a. packed closely together.
b. very far apart.
c. constantly in motion.
d. able to slide past each other.

____ 13. The state of matter in which a material is most likely to resist compression is the
a. solid state.
b. liquid state.
c. gaseous state.
d. vaporous state.

____ 14. The state of matter in which a material has definite shape and definite volume is the
a. liquid state.
b. solid state.
c. gaseous state.
d. vaporous state.

____ 15. The state of matter in which a material has neither a definite shape nor a definite volume is the
a. gaseous state.
b. liquid state.
c. elemental state.
d. solid state.

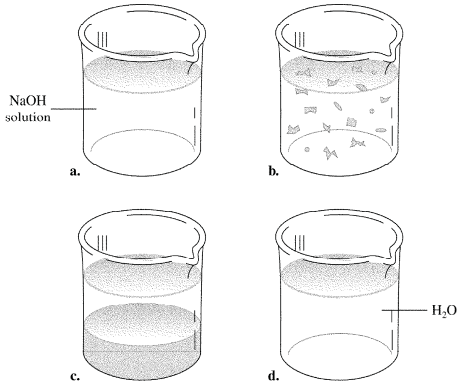
____ 16. The state of matter in which particles are rigidly held in fixed positions is the
a. gaseous state.
b. liquid state.
c. vaporous state.
d. solid state.

____ 17. A substance classified as a fluid contains particles that
a. quickly expand into any available space.
b. are held in fixed positions.
c. may slide past each other.
d. are very far from each other.

____ 18. The state of matter in which a material has a definite volume but no definite shape is the
a. gaseous state.
b. solid state.
c. frozen state.
d. liquid state.

____ 19. Under ordinary conditions of temperature and pressure, the particles in a gas are
a. closely packed.
b. very far from each other.
c. held in fixed positions.
d. able to slide past each other.

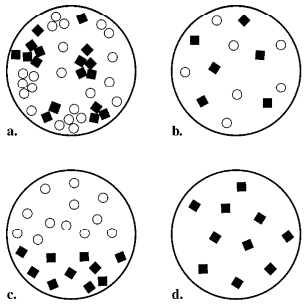
____ 20. A list of pure substances could include
a. bread dough.
b. vinegar (5% acetic acid).
c. vitamin C (ascorbic acid).
d. sea water.



____ 21. The homogeneous mixture in the illustration above is in container
a. a.
b. b.
c. c.
d. d.

____ 22. The substances that are chemically bound together are
a. the gases in the air.
b. the elements that compose water.
c. dust particles in air.
d. substances in blood.

____ 23. Physical means can be used to separate
a. elements.
b. pure substances.
c. mixtures.
d. compounds.



____ 24. Which part of the illustration above shows the particles in a heterogeneous mixture?
a. a
b. b
c. c
d. d

	Group 1	Group 2	Group 13	Group 14	Group 15	Group 16	Group 17	Group 18
1	1 H Hydrogen 1.01							2 He Helium 4.00
2	3 Li Lithium 6.94	4 Be Beryllium 9.01	5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
3	11 Na Sodium 22.99	12 Mg Magnesium 24.30	13 Al Aluminum 26.98	14 Si Silicon 28.08	15 P Phosphorus 30.97	16 S Sulfur 32.07	17 Cl Chlorine 35.45	18 Ar Argon 39.95
4	19 K Potassium 39.10	20 Ca Calcium 40.08	31 Ga Gallium 69.72	32 Ge Germanium 72.61	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.90	36 Kr Krypton 83.80
5	37 Rb Rubidium 85.47	38 Sr Strontium 87.62	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
6	55 Cs Cesium 132.90	56 Ba Barium 137.33	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (208.98)	85 At Astatine (209.99)	86 Rn Radon (222.02)
7	87 Fr Francium (223.02)	88 Ra Radium (226.02)						

____ 25. Group ____ in the figure above contains only metals.
a. 2
b. 13
c. 17
d. 18

____ 26. Based on their location in the figure above, oxygen and selenium have
a. the same number of neutrons.
b. the same conductivity.
c. similar properties.
d. the same number of electron orbitals.

____ 27. Use the figure above. Which element has properties most similar to those of sodium?
a. boron
b. calcium
c. sulfur
d. nitrogen

____ 28. Based on its location in the figure above, you could infer that ____ is very unreactive.
a. Ca
b. P
c. Si
d. Ar

____ 29. Based on their location in the figure above, boron and antimony might be good elements to use as
a. semiconductors.
b. fuels.
c. construction materials.
d. catalysts.

____ 30. What is the atomic number for aluminum from the figure above?
a. 13
b. 14
c. 26.98
d. 26.9815

____ 31. In the figure above, a neutral atom of silicon contains
a. 14 electrons.
b. 28.09 electrons.
c. 16 electrons.
d. 38 electrons.

____ 32. The most useful source of chemical information about the elements is a
a. calculator.
b. table of metric equivalents.
c. periodic table.
d. table of isotopes.

____ 33. A horizontal row of blocks in the periodic table is called a(n)
a. group.
b. period.
c. family.
d. octet.

____ 34. Elements in a group in the periodic table can be expected to have similar
a. atomic masses.
b. atomic numbers.
c. numbers of neutrons.
d. properties.

____ 35. A vertical column of blocks in the periodic table is called a(n)
a. group.
b. period.
c. property.
d. octet.

____ 36. The elements that border the zigzag line in the periodic table are
a. inactive.
b. metals.
c. metalloids.
d. nonmetals.

____ 37. Which is NOT a property of metals?
a. malleability
b. ability to conduct heat and electricity
c. unreactivity
d. tensile strength

____ 38. Which statement is NOT true of nonmetals?
a. They have characteristics of both metals and nonmetals.
b. Many are gases at room temperature.
c. They have low conductivity.
d. There are fewer nonmetals than metals.

____ 39. Which statement is NOT true of most metalloids?
a. They are used in computers and calculators.
b. They are semiconductors of electricity.
c. They are generally unreactive.
d. They have characteristics of both metals and nonmetals.

____ 40. The law of conservation of mass follows from the concept that
a. atoms are indivisible.
b. atoms of different elements have different properties.
c. matter is composed of atoms.
d. atoms can be destroyed in chemical reactions.

____ 41. If each atom of element D has 3 mass units and each atom of element E has 5 mass units, a chemical molecule composed of one atom each of D and E has
a. 15 mass units.
b. 2 mass units.
c. 35 mass units.
d. 8 mass units.

____ 42. A certain compound is composed of elements G and H. It always has the same mass ratio of G to H because
a. all atoms have the same mass.
b. any excess of G or H will be destroyed.
c. G and H have characteristic masses.
d. G and H have identical masses.

____ 43. If 4 g of element A combine with 10 g of element B, then 12 g of element A combine with ____ g of element B.
a. 10
b. 12
c. 24
d. 30

____ 44. If 6 g of element K combine with 17 g of element L, how many grams of element K combine with 85 g of element L?
a. 17 g
b. 23 g
c. 30 g
d. 91 g

____ 45. In oxides of nitrogen, such as N_2O, NO, NO_2, and N_2O_3, atoms combine in small whole-number ratios. This evidence supports the law of
a. conservation of mass.
b. multiple proportions.
c. definite composition.
d. mass action.

____ 46. The two oxides of lead, PbO and PbO_2, are explained by the
a. periodic law.
b. law of multiple proportions.
c. atomic law.
d. law of conservation of mass.

____ 47. If two or more compounds are composed of the same two elements, the ratio of the masses of one element that combine with a fixed mass of the other element is a simple whole number. This is a statement of the law of
a. conservation of mass.
b. mass action.
c. multiple proportions.
d. definite composition.

____ 48. Which two compounds are examples of the law of multiple proportions?
a. $FeCl_3$ and $Fe_2(SO_4)_3$
b. O_2 and O_3
c. CO and CO_2
d. $FeCl_2$ and $Fe(NO_3)_2$

____ 49. The law of multiple proportions can be partly explained by the idea that
a. elements can combine in only one way to form compounds.
b. whole atoms of the same elements combine to form compounds.
c. elements in a compound always occur in a 1:1 ratio.
d. only atoms of the same element can combine.

____ 50. In water, H_2O, the ratio of the masses of oxygen to hydrogen is 8:1. What is the ratio of the masses of oxygen to hydrogen in hydrogen peroxide, H_2O_2?
a. 1:1
b. 8:1
c. 16:1
d. 32:1

____ 51. If 3 g of element C combine with 8 g of element D to form compound CD, how many grams of D are needed to form compound CD2?
a. 8 g
b. 16 g
c. 11 g
d. 19 g

____ 52. Oxygen can combine with carbon to form two compounds, carbon monoxide and carbon dioxide. The ratio of the masses of oxygen that combine with a given mass of carbon is 1:2. This is an example of
a. the law of conservation of mass.
b. Dalton's atomic theory.
c. the law of conservation of energy.
d. the law of multiple proportions.

____ 53. If 63.5 g of copper (Cu) combine with 16 g of oxygen (O) to form the compound CuO, how many grams of oxygen will be needed to combine with the same amount of copper to form the compound CuO_2?
a. 16 g
b. 32 g
c. 64 g
d. 127 g

____ 54. According to the law of definite proportions, any two samples of KCl have
a. the same mass.
b. slightly different molecular structures.
c. the same melting point.
d. the same ratio of elements.

____ 55. According to the law of conservation of mass, when sodium, hydrogen, and oxygen react to form a compound, the mass of the compound is ____ the sum of the masses of the individual elements.
a. equal to
b. greater than
c. less than
d. either greater than or less than

____ 56. The atomic mass of an atom of carbon is 12, and the atomic mass of an atom of oxygen is 16. To produce CO, 16 g of oxygen can be combined with 12 g of carbon. What is the ratio of oxygen to carbon when 32 g of oxygen combine with 12 g of carbon?
a. 1:1
b. 2:1
c. 1:2
d. 8:3

____ 57. Who was the schoolmaster who studied chemistry and proposed an atomic theory?
a. John Dalton
b. Jons Berzelius
c. Robert Brown
d. Dmitri Mendeleev

____ 58. Who first recognized that the ratio of the number of atoms that combine is the same as the ratio of the masses that combine?
a. Jons Berzelius
b. Edward Morley
c. John Dalton
d. Jon Newlands

____ 59. The principles of atomic theory recognized today were conceived by
a. Avogadro.
b. Bohr.
c. Dalton.
d. Rutherford.

____ 60. According to Dalton's atomic theory, atoms
a. are destroyed in chemical reactions.
b. can be divided.
c. of each element are identical in size, mass, and other properties.
d. of different elements cannot combine.

____ 61. Which of the following is NOT part of Dalton's atomic theory?
a. Atoms cannot be divided, created, or destroyed.
b. The number of protons in an atom is its atomic number.
c. In chemical reactions, atoms are combined, separated, or rearranged.
d. All matter is composed of extremely small particles called atoms.

____ 62. According to Dalton's atomic theory, atoms
a. of different elements combine in simple whole-number ratios to form compounds.
b. can be divided into protons, neutrons, and electrons.
c. of all elements are identical in size and mass.
d. can be destroyed in chemical reactions.

____ 63. Dalton's atomic theory did NOT explain the law of
a. whole-number ratios.
b. definite proportions.
c. conservation of mass.
d. conservation of energy.

____ 64. The law of definite proportions
a. contradicted Dalton's atomic theory.
b. was explained by Dalton's atomic theory.
c. replaced the law of conservation of mass.
d. assumes that atoms of all elements are identical.

____ 65. Dalton's atomic theory helped to explain the law of conservation of mass because it stated that atoms
a. could not combine.
b. could not be created or destroyed.
c. all had the same mass.
d. were invisible.

____ 66. Who proposed the law of multiple proportions?
a. Avogadro
b. Rutherford
c. Dalton
d. Thomson

____ 67. Dalton's theory essentially agreed with the present atomic theory EXCEPT for the statement that
a. all matter is made up of small particles called atoms.
b. atoms are not divided in chemical reactions.
c. atoms of the same element are chemically alike.
d. all atoms of the same element have the same mass.

____ 68. Which of the following statements is true?
a. Atoms of the same element may have different masses.
b. Atoms may be divided in ordinary chemical reactions.
c. Atoms can never combine with any other atoms.
d. Matter is composed of large particles called atoms.

____ 69. Which concept in Dalton's atomic theory has been modified?
a. All matter is composed of atoms.
b. Atoms of different elements have different properties and masses.
c. Atoms can combine in chemical reactions.
d. Atoms cannot be divided.

____ 70. The atomic theory proposed by Dalton
a. has been totally discarded.
b. has been expanded and modified.
c. has been accepted unchanged to the present day.
d. has been found to be false.

____ 71. In early experiments on electricity and matter, an electrical current was passed through a glass tube containing
a. water.
b. gas under high pressure.
c. liquid oxygen.
d. gas under low pressure.

____ 72. In a glass tube, electrical current passes from the negative electrode, called the ____, to the other electrode.
a. cathode
b. anode
c. electron
d. millikan

____ 73. When an electrical current passed through a glass tube, a paddle wheel placed between the electrodes moved. Scientists concluded that
a. a magnetic field was produced.
b. particles were passing from the cathode to the anode.
c. there was gas in the tube.
d. atoms were indivisible.

____ 74. The rays produced in a cathode tube in early experiments were
a. unaffected by a magnetic field.
b. deflected away from a negative plate.
c. found to carry a positive charge.
d. striking the cathode.

____ 75. The behavior of cathode rays produced in a glass tube containing gas at low pressure led scientists to conclude that the rays
a. were not composed of matter.
b. were composed of positively charged particles.
c. were composed of negatively charged particles.
d. were composed of uncharged particles.

____ 76. Experiments with cathode rays led to the discovery of the
a. proton.
b. nucleus.
c. neutron.
d. electron.

____ 77. After measuring the ratio of the charge of a cathode-ray particle to its mass, Thomson concluded that the particles
a. had no mass.
b. had a very small mass.
c. had a very large mass.
d. carried a positive charge.

____ 78. Millikan's experiments
a. demonstrated that the electron carried no charge.
b. demonstrated that the electron carried the smallest possible positive charge.
c. measured the charge on the electron.
d. demonstrated that the electron was massless.

____ 79. Because any element used in the cathode produced electrons, scientists concluded that
a. all atoms contained electrons.
b. only metals contained electrons.
c. atoms were indivisible.
d. atoms carried a negative charge.

____ 80. The discovery of the electron resulted from experiments using
a. gold foil.
b. cathode rays.
c. neutrons.
d. alpha particles.

____ 81. The deflection of cathode rays in Thomson's experiments was evidence of the ____ nature of electrons.
a. wave
b. charged
c. particle
d. spinning

____ 82. Who discovered the nucleus by bombarding gold foil with positively charged particles and noting that some particles were widely deflected?
a. Rutherford
b. Dalton
c. Chadwick
d. Bohr

____ 83. In Rutherford's experiments, very few positively charged particles
a. were slightly deflected as they passed through the metal.
b. were greatly deflected back from the metal.
c. passed straight through the metal.
d. combined with the metal.

____ 84. In Rutherford's experiments, positively charged particles
a. passed through a tube containing gas.
b. were used to bombard a cathode plate.
c. collided with electrons.
d. were used to bombard thin metal foil.

____ 85. In Rutherford's experiments, most of the particles
a. bounced back.
b. passed through the foil.
c. were absorbed by the foil.
d. combined with the foil.

____ 86. Because most particles fired at metal foil passed straight through, Rutherford concluded that
a. atoms were mostly empty space.
b. atoms contained no charged particles.
c. electrons formed the nucleus.
d. atoms were indivisible.

____ 87. Because a few positively charged particles bounced back from the foil, Rutherford concluded that such particles were
a. striking electrons.
b. indivisible.
c. repelled by densely packed regions of positive charge.
d. magnetic.

____ 88. Rutherford's experiments led to the discovery of the
a. electron.
b. cathode ray.
c. nucleus.
d. neutron.

____ 89. Rutherford's experimental results led him to conclude that atoms contain massive central regions that have
a. a positive charge.
b. a negative charge.
c. no charge.
d. both protons and electrons.

____ 90. Rutherford fired positively charged particles at metal foil and concluded that most of the mass of an atom was
a. in the electrons.
b. concentrated in the nucleus.
c. evenly spread throughout the atom.
d. in rings around the atom.

____ 91. What did Rutherford conclude about the structure of the atom?
a. An atom is indivisible.
b. Electrons make up the center of an atom.
c. An atom carries a positive charge.
d. An atom contains a small, dense, positively charged central region.

____ 92. In Rutherford's experiments, the backward deflection of alpha particles gave evidence of an atom's
a. size.
b. electron orbitals.
c. charge.
d. nucleus.

____ 93. A positively charged particle with mass 1.673×10^{-24} g is a(n)
a. proton.
b. neutron.
c. electron.
d. positron.

____ 94. A nuclear particle that has about the same mass as a proton, but with no electrical charge, is called a(n)
a. nuclide.
b. neutron.
c. electron.
d. isotope.

____ 95. The nucleus of an atom has all of the following characteristics EXCEPT that it
a. is positively charged.
b. is very dense.
c. contains nearly all of the atom's mass.
d. contains nearly all of the atom's volume.

____ 96. Which part of an atom has a mass approximately equal to 1/2000 of the mass of a common hydrogen atom?
a. nucleus
b. electron
c. proton
d. electron cloud

____ 97. The mass of a neutron is
a. about the same as that of a proton.
b. about the same as that of an electron.
c. double that of a proton.
d. double that of an electron.

____ 98. The nucleus of most atoms is composed of
a. tightly packed protons.
b. tightly packed neutrons.
c. tightly packed protons and neutrons.
d. loosely connected protons and electrons.

____ 99. Protons and neutrons strongly attract when they
a. are moving fast.
b. are very close together.
c. are at high energies.
d. have opposite charges.

____ 100. Protons within a nucleus are attracted to each other by
a. nuclear forces.
b. opposite charges.
c. their energy levels.
d. electron repulsion.

____ 101. Protons have
a. negative charges.
b. an attraction for neutrons.
c. no charges.
d. no mass.

____ 102. An atom is electrically neutral because
a. neutrons balance the protons and electrons.
b. nuclear forces stabilize the charges.
c. the numbers of protons and electrons are equal.
d. the numbers of protons and neutrons are equal.

____ 103. Most of the volume of an atom is occupied by the
a. nucleus.
b. nuclides.
c. electron cloud.
d. protons.

____ 104. The charge on the electron cloud
a. prevents compounds from forming.
b. balances the charge on the nucleus.
c. attracts electron clouds in other atoms to form compounds.
d. does not exist.

____ 105. The smallest unit of an element that can exist either alone or in combination with other such particles of the same or different elements is the
a. electron.
b. proton.
c. neutron.
d. atom.

____ 106. The forces that hold the particles in the nucleus together are called
a. nuclear forces.
b. gravitational forces.
c. magnetic forces.
d. electron clouds.

____ 107. The radius of an atom extends to the outer edge of the
a. nucleus.
b. region occupied by the electrons.
c. region occupied by the neutrons.
d. positive charges.

____ 108. Isotopes are atoms of the same element that have different
a. principal chemical properties.
b. masses.
c. numbers of protons.
d. numbers of electrons.

____ 109. Atoms of the same element that have different masses are called
a. moles.
b. isotopes.
c. nuclides.
d. neutrons.

____ 110. Isotopes of an element contain different numbers of
a. electrons.
b. protons.
c. neutrons.
d. nuclides.

____ 111. The most common form of hydrogen has
a. no neutrons.
b. one neutron.
c. two neutrons.
d. three neutrons.

____ 112. The only radioactive form of hydrogen is
a. protium.
b. deuterium.
c. tritium.
d. quadrium.

____ 113. The tritium atom consists of
a. one proton, two neutrons, and two electrons.
b. one proton, one neutron, and one electron.
c. one proton, two neutrons, and one electron.
d. two protons, one neutron, and one electron.

____ 114. What is the mass number of deuterium?
a. 1
b. 2
c. 3
d. 4

____ 115. How many isotopes of hydrogen are known?
a. 2
b. 3
c. 4
d. 5

____ 116. The hydrogen isotope with the least mass is named
a. tritium.
b. helium.
c. deuterium.
d. protium.

____ 117. Deuterium contains one proton and
a. two neutrons.
b. one neutron.
c. no neutrons.
d. two electrons.

____ 118. Deuterium differs from tritium in having one
a. less neutron.
b. more proton.
c. more electron.
d. more neutron.

____ 119. All isotopes of hydrogen contain
a. one neutron.
b. two electrons.
c. one proton.
d. two nuclei.

____ 120. Protium contains one proton and
a. one neutron.
b. two neutrons.
c. no neutrons.
d. three electrons.

____ 121. Helium-4 and helium-3 are
a. isotopes.
b. different elements.
c. compounds.
d. nuclei.

____ 122. Isotopes of each element differ in
a. the number of neutrons in the nucleus.
b. atomic number.
c. the number of electrons in the highest energy level.
d. the total number of electrons.

____ 123. The atomic number of oxygen, 8, indicates that there are eight
a. protons in the nucleus of an oxygen atom.
b. oxygen nuclides.
c. neutrons outside the oxygen atom's nucleus.
d. energy levels in the oxygen atom's nucleus.

____ 124. The total number of protons and neutrons in the nucleus of an atom is its
a. atomic number.
b. Avogadro constant.
c. mass number.
d. number of neutrons.

____ 125. As the mass number of the isotopes of an element increases, the number of protons
a. decreases.
b. increases.
c. remains the same.
d. doubles each time the mass number increases.

____ 126. As the atomic number increases, the number of electrons in an atom
a. decreases.
b. increases.
c. remains the same.
d. is undetermined.

____ 127. All atoms of the same element have the same
a. atomic mass.
b. number of neutrons.
c. mass number.
d. atomic number.

____ 128. Atoms of the same element can differ in
a. chemical properties.
b. mass number.
c. atomic number.
d. number of protons and electrons.

____ 129. In determining atomic mass units, the standard is the
a. C-12 atom.
b. C-14 atom.
c. H-1 atom.
d. O-16 atom.

____ 130. The abbreviation for atomic mass unit is
a. amu.
b. mu.
c. a.
d. μ.

____ 131. The relative atomic mass of an atom can be found by comparing the mass of the atom to the mass of
a. one atom of carbon-12.
b. one atom of hydrogen-1.
c. a proton.
d. uranium-235.

____ 132. The average atomic mass of an element is the average of the atomic masses of its
a. naturally occurring isotopes.
b. two most abundant isotopes.
c. nonradioactive isotopes.
d. artificial isotopes.

____ 133. The atomic mass of an isotope is its
a. average atomic mass.
b. isotopic mass number.
c. atomic number.
d. relative atomic mass.

____ 134. The carbon-12 atom is assigned a relative mass of exactly
a. 1 amu.
b. 6 amu.
c. 12 amu.
d. 100 amu.

____ 135. The average atomic mass of an element depends on both the masses of its isotopes and each isotope's
a. atomic number.
b. radioactivity.
c. relative abundance.
d. mass number.

____ 136. The average atomic mass of an element
a. is the mass of the most abundant isotope.
b. may not equal the mass of any of its isotopes.
c. cannot be calculated.
d. always adds up to 100.

____ 137. A single atom of an isotope does not have a(n)
a. relative atomic mass.
b. atomic number.
c. mass number.
d. average atomic mass.

____ 138. The atomic mass listed in the periodic table is the
a. average atomic mass.
b. relative atomic mass of the most abundant isotope.
c. relative atomic mass of the most stable radioactive isotope.
d. mass number of the most abundant isotope.

____ 139. An aluminum isotope consists of 13 protons, 13 electrons, and 14 neutrons. Its mass number is
a. 13.
b. 14.
c. 27.
d. 40.

____ 140. An atom of potassium has 19 protons and 20 neutrons. What is its mass number?
a. 19
b. 20
c. 39
d. 10

____ 141. A neutral carbon atom (atomic number 6) has
a. 3 electrons and 3 neutrons.
b. 6 protons.
c. 3 protons and 3 electrons.
d. 3 protons and 3 neutrons.

____ 142. Zn-66 (atomic number 30) has
a. 30 neutrons.
b. 33 neutrons.
c. 36 neutrons.
d. 96 neutrons.

____ 143. Ag-109 has 62 neutrons. The neutral atom has
a. 40 electrons.
b. 47 electrons.
c. 53 electrons.
d. 62 electrons.

____ 144. Chlorine has atomic number 17 and mass number 35. It has
a. 17 protons, 17 electrons, and 18 neutrons.
b. 35 protons, 35 electrons, and 17 neutrons.
c. 17 protons, 17 electrons, and 52 neutrons.
d. 18 protons, 18 electrons, and 17 neutrons.

____ 145. Nickel-60 (atomic number 28) has
a. 28 neutrons.
b. 32 neutrons.
c. 60 neutrons.
d. 88 neutrons.

____ 146. Carbon-14 (atomic number 6), the radioactive nuclide used in dating fossils, has
a. 6 neutrons.
b. 8 neutrons.
c. 10 neutrons.
d. 14 neutrons.

____ 147. Sulphur-34 (atomic number 16) contains
a. 34 protons.
b. 18 protons.
c. 18 neutrons.
d. 16 neutrons.

____ 148. Phosphorus-33 (atomic number 15) contains
a. 33 protons.
b. 18 neutrons.
c. 33 neutrons.
d. 18 protons.

____ 149. Silicon-30 contains 14 protons. It also contains
a. 16 electrons.
b. 16 neutrons.
c. 30 neutrons.
d. 44 neutrons.

____ 150. Neon-22 contains 12 neutrons. It also contains
a. 12 protons.
b. 22 protons.
c. 22 electrons.
d. 10 protons.

____ 151. Calcium-48 (atomic number 20) contains
a. 20 electrons.
b. 48 protons.
c. 20 neutrons.
d. 28 protons.

____ 152. Argon (atomic number 18 and mass number 40) has ____ protons in its nucleus.
a. 22
b. 9
c. 40
d. 18

____ 153. An electrically neutral atom of mercury (atomic number 80) has
a. 80 neutrons and 80 electrons.
b. 40 protons and 40 electrons.
c. 80 protons and 80 neutrons.
d. 80 protons and 80 electrons.

____ 154. The number of atoms in 1 mol of carbon is
a. 6.022×10^{22}.
b. 6.022×10^{23}.
c. 5.022×10^{22}.
d. 5.022×10^{23}.

____ 155. The number of atoms in a mole of any pure substance is called
a. its atomic number.
b. Avogadro's constant.
c. its mass number.
d. its gram-atomic number.

____ 156. As the atomic masses of the elements in the periodic table increase, the number of atoms in 1 mol of each element
a. decreases.
b. increases.
c. remains the same.
d. becomes a negative number.

____ 157. The atomic number of neon is 10. The atomic number of calcium is 20. Compared with a mole of neon, a mole of calcium contains
a. twice as many atoms.
b. half as many atoms.
c. an equal number of atoms.
d. 20 times as many atoms.

____ 158. To determine the molar mass of an element, one must know the element's
a. Avogadro constant.
b. atomic number.
c. number of isotopes.
d. average atomic mass.

____ 159. If samples of two different elements each represent one mole, then
a. they are equal in mass.
b. they contain the same number of atoms.
c. their molar masses are equal.
d. they have the same atomic mass.

____ 160. An Avogadro's constant amount of any element is equivalent to
a. the atomic number of that element.
b. the mass number of that element.
c. 6.022×10^{23} particles.
d. 100 g of that element.

____ 161. Avogadro's constant is
a. the maximum number of electrons that all the energy levels can accommodate.
b. the number of protons and neutrons that can fit in the shells of the nucleus.
c. the number of particles in 1 mole of a pure substance.
d. the number of particles in exactly 1 gram of a pure substance.

____ 162. Molar mass
a. is the mass in grams of one mole of a substance.
b. is numerically equal to the average atomic mass of the element.
c. both a and b
d. neither a nor b

____ 163. The mass of 1 mol of chromium (atomic mass 51.996 amu) is
a. 12 g.
b. 198 g.
c. 51.996 g.
d. 6.02×10^{23} g.

____ 164. A mass of 6.005 g of carbon (atomic mass 12.010 amu) contains
a. 1 mol C.
b. 2 atoms C.
c. 0.5000 mol C.
d. 1 atom O.

____ 165. A quantity of sodium (atomic mass 22.99 amu) contains 6.02×10^{23} atoms. The mass of the sodium is
a. 6.02×10^{23} g.
b. 3.88 g.
c. 22.99 g.
d. not determinable.

____ 166. The mass of two moles of oxygen atoms (atomic mass 16 amu) is
a. 16 g.
b. 32 g.
c. 48 g.
d. 64 g.

____ 167. The mass of a sample containing 3.5 mol of silicon atoms (atomic mass 28.0855 amu) is
a. 28 g.
b. 35 g.
c. 72 g.
d. 98 g.

____ 168. What is the number of moles of chemical units represented by 9.03×10^{24} units?
a. 1.50 mol
b. 9.03 mol
c. 10.0 mol
d. 15.0 mol

____ 169. The mass of 2.50 mol of calcium atoms (atomic mass 40.08 amu) is approximately
a. 10.0 g.
b. 42.5 g.
c. 100 g.
d. 250 g.

____ 170. How many moles of atoms are in 50.15 g of mercury (atomic mass 200.59 amu)?
a. 0.1001 mol
b. 0.1504 mol
c. 0.2500 mol
d. 0.4000 mol

____ 171. A prospector finds 39.39 g of gold (atomic mass 196.9665 amu). She has
a. 1.20×10^{23} atoms.
b. 2.30×10^{23} atoms.
c. 4.30×10^{23} atoms.
d. 6.02×10^{23} atoms.

____ 172. A sample of tin (atomic mass 118.69 amu) contains 3.01×10^{23} atoms. The mass of the sample is
a. 3.01 g.
b. 59.3 g.
c. 72.6 g.
d. 11 g.

____ 173. The mass of a sample of nickel (atomic mass 58.69 amu) is 176.07 g. It contains
a. 1.7607×10^{24} atoms.
b. 1.806×10^{24} atoms.
c. 5.869×10^{23} atoms.
d. 5.869×10^{24} atoms.

____ 174. The mass of a sample of nickel (atomic mass 58.69 amu) is 11.74 g. It contains
a. 1.174×10^{23} atoms.
b. 1.205×10^{23} atoms.
c. 1.869×10^{23} atoms.
d. 3.256×10^{23} atoms.

____ 175. The mass of exactly 5 mol of cesium (atomic mass 132.9 amu) is
a. 664.5 g.
b. 132.9 g.
c. 6.02×10^{23} g.
d. 5 g.

____ 176. Which of the following statements is true?
a. Atoms of the same element may have different masses.
b. Atoms may be divided in ordinary chemical reactions.
c. Atoms can never combine with any other atoms.
d. Matter is composed of large particles called atoms.

____ 177. Experiments with cathode rays led to the discovery of the
a. proton.
b. nucleus.
c. neutron.
d. electron.

____ 178. After measuring the ratio of the charge of a cathode-ray particle to its mass, Thomson concluded that the particles
a. had no mass.
b. had a very small mass.
c. had a very large mass.
d. carried a positive charge.

____ 179. Millikan's experiments
a. demonstrated that the electron carried no charge.
b. demonstrated that the electron carried the smallest possible positive charge.
c. measured the charge on the electron.
d. demonstrated that the electron was massless.

____ 180. Because any element used in the cathode produced electrons, scientists concluded that
a. all atoms contained electrons.
b. only metals contained electrons.
c. atoms were indivisible.
d. atoms carried a negative charge.

____ 181. Because most particles fired at metal foil passed straight through, Rutherford concluded that
a. atoms were mostly empty space.
b. atoms contained no charged particles.
c. electrons formed the nucleus.
d. atoms were indivisible.

____ 182. Because a few positively charged particles bounced back from the foil, Rutherford concluded that such particles were
a. striking electrons.
b. indivisible.
c. repelled by densely packed regions of positive charge.
d. magnetic.

____ 183. What did Rutherford conclude about the structure of the atom?
a. An atom is indivisible.
b. Electrons make up the center of an atom.
c. An atom carries a positive charge.
d. An atom contains a small, dense, positively charged central region.

____ 184. A positively charged particle in an atom is a(n)
a. proton.
b. neutron.
c. electron.
d. positron.

____ 185. A nuclear particle that has about the same mass as a proton, but with no electrical charge, is called a(n)
a. nuclide.
b. neutron.
c. electron.
d. isotope.

____ 186. The nucleus of most atoms is composed of
a. tightly packed protons.
b. tightly packed neutrons.
c. tightly packed protons and neutrons.
d. loosely connected protons and electrons.

____ 187. An atom is electrically neutral because
a. neutrons balance the protons and electrons.
b. nuclear forces stabilize the charges.
c. the numbers of protons and electrons are equal.
d. the numbers of protons and neutrons are equal.

____ 188. Most of the volume of an atom is occupied by the
a. nucleus.
b. nuclides.
c. electron cloud.
d. protons.

____ 189. The smallest unit of an element that can exist either alone or in combination with other such particles of the same or different elements is the
a. electron.
b. proton.
c. neutron.
d. atom.

____ 190. Isotopes of each element differ in
a. the number of neutrons in the nucleus.
b. atomic number.
c. the number of electrons in the highest energy level.
d. the total number of electrons.

____ 191. The total number of protons and neutrons in the nucleus of an atom is its
a. atomic number.
b. Avogadro constant.
c. mass number.
d. number of neutrons.

____ 192. The average atomic mass of an element depends on both the masses of its isotopes and each isotope's
a. atomic number.
b. radioactivity.
c. relative abundance.
d. mass number.

____ 193. An aluminum isotope consists of 13 protons, 13 electrons, and 14 neutrons. Its mass number is
a. 13.
b. 14.
c. 27.
d. 40.

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a. 3 electrons and 3 neutrons.
b. 6 protons.
c. 3 protons and 3 electrons.
d. 3 protons and 3 neutrons.

____ 195. Chlorine has atomic number 17 and mass number 35. It has
a. 17 protons, 17 electrons, and 18 neutrons.
b. 35 protons, 35 electrons, and 17 neutrons.
c. 17 protons, 17 electrons, and 52 neutrons.
d. 18 protons, 18 electrons, and 17 neutrons.

____ 196. Which of the parts of the 1st Atomic Theory that have been modified? CHOOSE ALL CORRECT ANSWERS!
a. All Matter is composed of Atoms.
b. Atoms combine in simple whole number ratios to form compounds.
c. Atoms of an element are identical.
d. In chemical reactios Atoms are combined, seperated, or rearranged.
e. Atoms are composed of protons, neutrons, and electrons.
f. Atoms can not be subdivided, created, or destroyed.
g. Atoms have a nucleus and electron cloud.