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

# Chemistry - Fall Semester Midterm Exam 2016

**These questions are selected from the chapter tests we have taken this semester. From this packet of questions, we will select 60 to be on your semester exam. Work through these questions. Look up answers you do not know. Attend tutorials to get the help you need. This is not a grade, but rather a chance to study all the questions that we may use on the semester exam.**

**You WILL NOT get a cheat sheet for the semester exam.**

____ 1. A physical change occurs when a
   a. peach spoils.
   b. bracelet turns your wrist green.
   c. glue gun melts a glue stick.
   d. silver bowl tarnishes.

____ 2. When heating a test tube, you should:
   a. move the test tube back and forth over the flame
   b. use a test tube holder to hold it
   c. point the opening away from yourself and others
   d. all of the above

____ 3. If a mixture is uniform in composition, it is said to be
   a. heterogeneous.
   b. chemically bonded.
   c. a compound.
   d. homogeneous.

____ 4. Potassium cyanide has a 0 rating for flammability, how flammable is it?
   a. dangerous
   b. minor
   c. severe
   d. not flammable

____ 5. What is the name of the lab equipment pictured below?

   a. Florence flask
   b. volumetric flask
   c. Erlenmeyer flask
   d. beaker

____ 6. What is the name of the lab equipment pictured below?

   a. watch glass
   b. evaporating dish
   c. little heater
   d. crucible

____ 7. A chemical change occurs when
a. water freezes to ice
b. rust forms on a nail
c. water in salt water evaporates and leave salt behind
d. cheese melts

____ 8. A mixture is
a. a combination of pure substances bonded chemically.
b. any substance with a uniform composition.
c. any group of elements that are chemically bonded to one another.
d. a blend of any two or more kinds of matter, as long as each maintains its own unique properties.

____ 9. What quadrant of the National Fire Protection Association (NFPA) diamond is yellow?
a. flammability
b. special hazards
c. health
d. chemical reactivity

____ 10. It is easy to determine whether a substance is a metal if the substance is
a. very hard.
b. a good electrical and heat conductor.
c. easy to break down into its components.
d. very brittle.

____ 11. The main cause of accidents in the lab is
a. not following directions exactly
b. broken glass
c. explosions
d. not wearing goggles

____ 12. Which of these is an example of an element?
a. oxygen
b. soil
c. sugar
d. water

____ 13. Chemistry is a natural science that deals with the study of
a. the composition, motion, and relative positions of stars and planets.
b. the composition, structure, properties, and changes of matter.
c. living things and their life processes.
d. the physical features of Earth.

____ 14. Every pure chemical compound consists of two or more elements that
a. cannot be separated.
b. are combined in any proportion.
c. are combined chemically.
d. can be separated by a physical change.

____ 15. Which process is a chemical change?
a. slicing into two pieces
b. dissolving in alcohol
c. burning in air
d. heating to boiling

____ 16. One way to separate the different kinds of matter in a mixture is through
a. decomposition.
b. filtration.
c. chemical reactions.
d. electrolysis.

____ 17. The horizontal rows of the periodic table are called
a. columns.
b. families.
c. periods.
d. groups.

____ 18. The smallest unit of matter that retains the properties of that matter is
a. a mixture.
b. a molecule.
c. an atom.
d. a compound.

____ 19. What is the difference between a mixture and a compound?
a. All mixtures are heterogeneous.
b. Mixtures are made of at least two different elements.
c. Mixtures can be separated by physical processes.
d. All mixtures have a uniform composition.

____ 20. Which of the following changes is a physical change of matter?
a. a nail rusting
b. water evaporating
c. a silver spoon tarnishing
d. paper burning

____ 21. The symbols for units of length in order from largest to smallest are
a. m, cm, mm, km.
b. mm, m, cm, km.
c. km, mm, cm, m.
d. km, m, cm, mm.

____ 22. Which of these symbols represents a unit of volume?
a. mL
b. mg
c. mm
d. cm

____ 23. Which of these is a measure of the amount of material?
a. density
b. weight
c. volume
d. mass

____ 24. What is the density of 37.72 g of material whose volume is 6.80 $cm^3$?
a. 0.180 $g/cm^3$
b. 5.55 $g/cm^3$
c. 30.9 $g/cm^3$
d. 256. $g/cm^3$

____ 25. When 64.4 is divided by 2.00, the correct number of significant figures in the result is
a. 1.
b. 3.
c. 4.
d. 6.

____ 26. The number of significant figures in the measured value 0.0320 g is
a. 2.
b. 3.
c. 4.
d. 5.

____ 27. Which of these measurements has been expressed to four significant figures?
a. 0.0020 mm
b. 0.0402 mm
c. 30.00 mm
d. 402.10 mm

____ 28. The density of aluminum is 2.70 $g/cm^3$. What is the mass of a solid piece of aluminum with a volume of 1.50 $cm^3$?
a. 0.556 g
b. 1.80 g
c. 4.05 g
d. 4.20 g

____ 29. The dimensions of a rectangular solid are measured to be 1.27 cm, 1.3 cm, and 2.5 cm. The volume should be recorded as (in correct sig figs)

a. 4.128 $cm^3$.
c. 4.13 $cm^3$.
b. 4.12 $cm^3$.
d. 4.1 $cm^3$.

____ 30. How is the measurement 0.000065 cm written in scientific notation?

a. $65 \times 10^{-6}$ cm
c. $6.5 \times 10^{-6}$ cm
b. $6.5 \times 10^{-5}$ cm
d. $6.5 \times 10^{-4}$ cm

____ 31. The number of significant figures in the measurement 0.000305 kg is

a. 2.
c. 6.
b. 3.
d. 7.

____ 32. How would 0.00930 m be expressed in scientific notation?

a. $93 \times 10^{-4}$ m
c. $9.30 \times 10^{-3}$ m
b. $9.3 \times 10^{-4}$ m
d. $9.30 \times 10^{-5}$ m

____ 33. When $6.02 \times 10^{23}$ is multiplied by $9.1 \times 10^{-31}$, the product is:

a. $5.5 \times 10^{-8}$.
c. $5.5 \times 10^{-7}$.
b. $5.5 \times 10^{54}$.
d. $5.5 \times 10^{-53}$.

____ 34. The density of pure diamond is 3.5 $g/cm^3$. What is the volume of a diamond with a mass of 0.25 g?

a. 0.071 $cm^3$
c. 3.75 $cm^3$
b. 0.875 $cm^3$
d. 14 $cm^3$

____ 35. Which of these measurements has been expressed to three significant figures?

a. 0.052 g
c. 3.065 g
b. 0.202 g
d. 500 g

____ 36. How many cm in 1.50 yards?

a. 130.
c. 145
b. 137
d. 150.

____ 37. If you are traveling 50.0 mph (miles per hour), how many feet per second (ft/s) are you traveling?

a. 4,400 ft/sec
c. 34.1 ft/sec
b. 73.3 ft/sec
d. 50.0 ft/sec

____ 38. The mass of Earth is estimated to be $5.972 \times 10^{24}$ kg. Calculate how many tons the Earth weighs?

a. $1.356 \times 10^{21}$ tons
c. $5.423 \times 10^{27}$ tons
b. $6.576 \times 10^{21}$ tons
d. $6.576 \times 10^{-21}$ tons

____ 39. A can of coke contains 355 mL and costs $1.00 from the vending maching. A 2.0 L bottle of coke costs $1.29. How many cans worth of coke are in a 2.0 L bottle of coke.

a. $7.1 \times 10^5$ cans worth
c. 2.3 cans worth
b. 5.6 cans worth
d. 10 cans worth

____ 40. A basketball goal is 10.0 ft. tall. How tall is a basketball goal in centimeters?

a. 47.2 cm
c. 2.11
b. $3.10 \times 10^2$ cm
d. $3.10 \times 10^{-2}$ cm

____ 41. Calculate how many yards are in 3.50 miles?

a. $6.16 \times 10^{3}$ yards
c. $5.65 \times 10^{3}$ yards
b. $5.54 \times 10^{4}$ yards
d. $6.16 \times 10^{-3}$ yards

____ 42. If you are in school for 8.0 hours each day. How many seconds long is the school day?

a. $4.8 \times 10^{2}$ seconds
c. $2.2 \times 10^{-3}$ seconds
b. $2.9 \times 10^{4}$ seconds
d. $6.9 \times 10^{5}$ seconds

____ 43. A werightlifter lifts 260 lb. How many kg was lifted?

a. 570 kg
c. 120 kg
b. 260 kg
d. 100 kg

____ 44. Calculate the mass (in grams) of 9.00 mol of potassium.

a. 279 g P
c. 352 g K
b. 4.34 g K
d. 3.40 g P

____ 45. Calculate the number of moles of helium in a 10.0 g sample of helium.

a. 12.5 mol He
c. 40.0 mol He
b. 2.50 mol He
d. 7.5 mole He

____ 46. How many atoms are present in 8.0 mol of chlorine atoms?

a. 283.6 g Cl
c. $1.33 \times 10^{-23}$ atoms Cl
b. $4.8 \times 10^{24}$ atoms Cl
d. $4.8 \times 10^{23}$ atoms Cl

____ 47. A neutral atom of silicon-30 contains 14 protons. How many electrons does it have?

a. 13
c. 15
b. 14
d. 16

____ 48. Which is the complete symbol for the isotope that has the following subatomic particles: 19 protons, 21 neutrons, and 18 electrons. Replace each "X" below with the correct values and element symbol.

| A. | B. | C. | D. | E. |
|---|---|---|---|---|
| ${}^{40}_{19}K^{-1}$ | ${}^{40}_{21}Sc^{+1}$ | ${}^{38}_{19}K^{+1}$ | ${}^{40}_{19}K^{+1}$ | ${}^{39}_{18}Ar^{+1}$ |

a. A b. B c. C d. D e. E

____ 49. Element X has two known naturally occurring isotopes. The mass and relative abundance of each isotope are shown below.

| Relative Abundance | Mass (amu) |
|---|---|
| 50.57% | 78 |
| 49.43% | 81 |

What is the average atomic mass of Element X to the nearest hundredth of an atomic mass unit?

a. 79.04 amu
c. 7948 amu
b. 79.48 amu
d. 80.48

____ 50. Phosphorus forms the following ion: $^{31}_{15}P^{-3}$ How many electrons does this ion have?
a. 15 b. 12 c. 18 d. 31

____ 51. Magnesium forms the following ion: $^{24}_{12}Mg^{+2}$ How many electrons does this ion have?
a. 14 b. 8 c. 10 d. 12

____ 52. Rutherford's gold-foil experiment led him to conclude that
a. a dense region of positive charge called the nucleus existed in the center of the atom.
b. light was emitted by electrons returning to ground state.
c. J.J. Thomson's plum pudding model of the atom was accurate.
d. alpha particles were a poor choice for a bombardment material.

____ 53. Atoms of the same element that have different masses are called
a. nuclides. b. moles. c. neutrons. d. isotopes.

____ 54. Most of the volume of an atom is occupied by the
a. nucleus. c. electron cloud.
b. protons. d. nuclides.

____ 55. A certain atom has a nucleus containing six protons and eight neutrons and has six electrons orbiting the nucleus. This atom is a form of the element __.
a. magnesium b. carbon c. calcium d. silicon

____ 56. The atomic mass listed in the periodic table is the
a. mass number of the most abundant isotope.
b. relative atomic mass of the most abundant isotope.
c. relative atomic mass of the most stable radioactive isotope.
d. average atomic mass.

____ 57. An isotope of potassium (K) has 19 protons and 22 neutrons. What is this isotope's mass?
a. 19 b. 39 c. 22 d. 41

____ 58. Chlorine has atomic number 17 and mass number 35. It has
a. 18 protons, 18 electrons, and 17 neutrons.
b. 17 protons, 17 electrons, and 52 neutrons.
c. 35 protons, 35 electrons, and 17 neutrons.
d. 17 protons, 17 electrons, and 18 neutrons.

____ 59. An atom is electrically neutral (overall charge of the atom = 0) because
a. the numbers of protons and electrons are equal.
b. the numbers of protons and neutrons are equal.
c. nuclear forces stabilize the charges.
d. neutrons balance the protons and electrons.

____ 60. Experiments with cathode rays by J.J. Thomson led to the discovery of the
a. electron. b. proton. c. neutron. d. nucleus.

____ 61. 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. an equal number of atoms.
b. half as many atoms.
c. 20 times as many atoms.
d. twice as many atoms.

____ 62. Select the correct noble gas configuration for Si.
a. [Ne] $3s^2\ 3p^2$ b. [Ar] $3s^2\ 3p^2$ c. [He] $3s^2\ 3p^2$ d. [Ne] $3s^1\ 3p^3$

____ 63. Which type of electromagnetic radiation travels at the fastest velocity?
a. UV Waves
b. X-Ray Waves
c. Microwaves
d. All waves travel at a constant velocity

____ 64. How much energy is in one photon at a frequency of $1.5 \times 10^{16}$ Hz (or $s^{-1}$)?
a. $4.4 \times 10^{-50}$ J
b. $9.9 \times 10^{-18}$ J
c. $2.0 \times 10^{-8}$ J
d. $3.3 \times 10^{49}$ J

____ 65. The product of the frequency and the wavelength of a wave equals the...
a. distance between wave crests.
b. speed of the wave.
c. time for one full wave to pass.
d. number of waves passing a point in a second.

____ 66. What is the frequency a light source emitting with a wavelength of $2.0 \times 10^{-8}$ m?
a. $1.5 \times 10^{16}$ Hz b. $6.0\ s^{-1}$ c. $3.3 \times 10^{-26}\ s^{-1}$ d. $6.7 \times 10^{-17}$ Hz

____ 67. If electromagnetic radiation A has a lower frequency than electromagnetic radiation B, then compared to B the wavelength of A is
a. shorter.
b. longer.
c. equal.
d. exactly half the length of B's wavelength.

____ 68. Select the correct electron configuration for B.
a. $1s^2\ 2s^2\ 3s^2\ 3p^1$
b. $1s^2\ 2s^2\ 2p^3$
c. $1s^2\ 2s^2\ 2p^1$
d. [Ne] $2s^2\ 2p^2$

____ 69. Select the correct noble gas configuration for Ni.
a. [Kr] $4s^2\ 3d^9$ b. [Ar] $3d^5\ 4s^2\ 4p^3$ c. [Ar] $4s^2\ 3d^8$ d. [Ar] $3d^{10}$

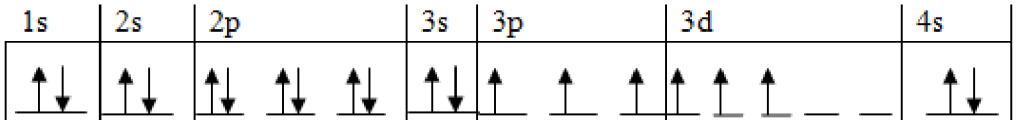
____ 70. What rule or principle states that *electrons will occupy the lowest-energy orbital that can receive it?*
a. Hund's Rule
b. Aufbau Principle
c. Pauli Exclusion Principle

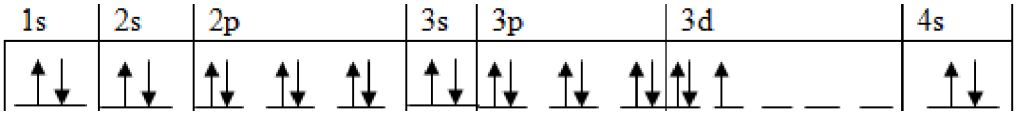
____ 71. Select the correct electron configuration for Cl.
a. $1s^2\ 2s^2\ 2p^6\ 4s^2\ 4p^5$
b. $1s^2\ 2s^2\ 2p^6\ 3s^1\ 3p^6$
c. $1s^2\ 2s^2\ 3s^2\ 3p^6\ 4s^2\ 4p^3$
d. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

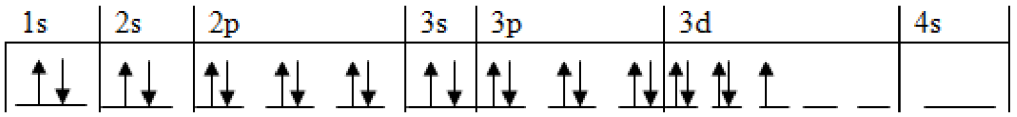
____ 72. What rule or principle states that *orbitals of equal energy are each occupied by one electron before any orbital is occupied by a second electron?*

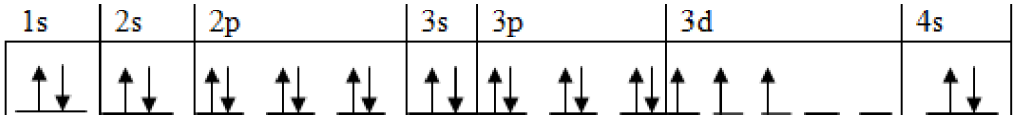
a. Pauli Exclusion Principle
b. Aufbau Principle
c. Hund's Rule

____ 73. Select the correct orbital notation for vanadium (V).

a. 


b. 


c. 


d. 


____ 74. If the frequency of light is $2.5 \times 10^{14}$ Hz, what is the wavelength of the light?

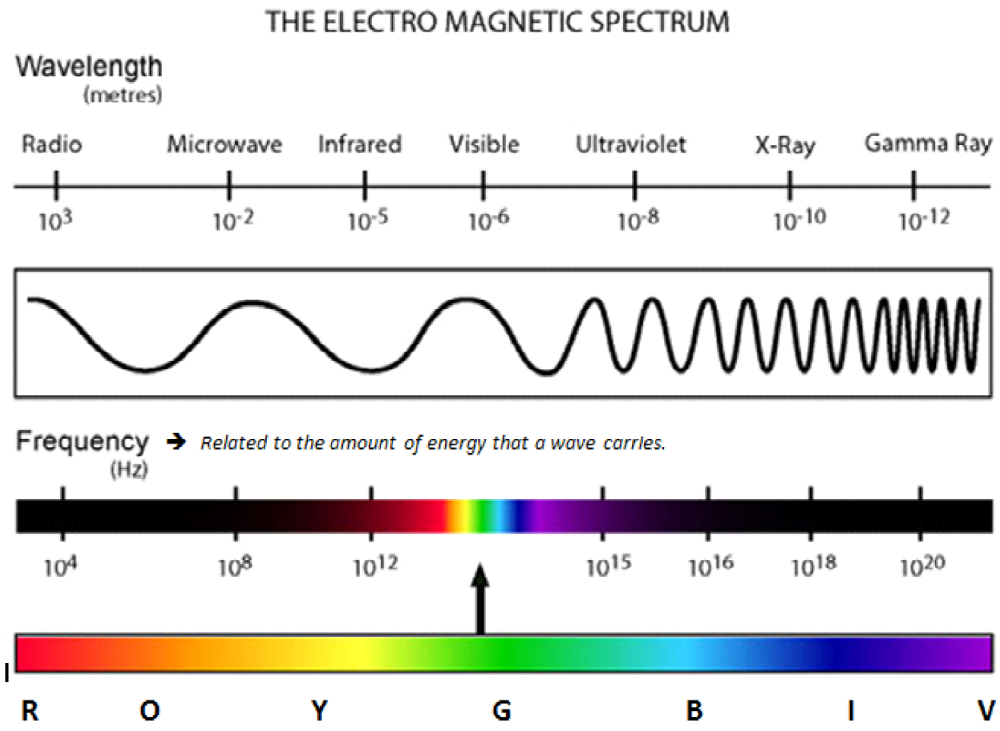
a. $1.2 \times 10^{6}$ m
b. $8.3 \times 10^{5}$ m
c. $7.5 \times 10^{22}$m
d. $1.2 \times 10^{-6}$ m

____ 75. The lowest energy state of an atom is called its _____.

a. excited state
b. Bohr state
c. free state
d. ground state

____ 76. Select the correct electron configuration for krypton.

a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
b. $1s^2\ 3s^2\ 3p^6\ 4s^2\ 4p^5$
c. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2 3d^{10} 4p^6$
d. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10} 4s^2\ 4p^5$




____ 77. Which type of electromagnetic radiation has the highest energy (of the choices listed)?
a. Ultraviolet light
b. Radio waves
c. Microwaves
d. Visible light

____ 78. Which type of radiation has the shortest wavelength? (of the choices listed)
a. X-Ray Waves
b. Infrared waves
c. Visible light Waves
d. Radio waves

____ 79. Which of the following has the greatest electronegativity?
a. F b. N c. O

____ 80. Which of the following has the larger ionization energy?
a. K b. Ca c. Sc

____ 81. A you go right across a period in the periodic table, atomic radii
a. gradually decrease.
b. gradually decrease, then sharply increase.
c. gradually increase.
d. gradually increase, then sharply decrease.

____ 82. As the atomic number of the halogens increases, the ionic radius
a. increases.
b. decreases.
c. remains the same.
d. cannot be determined.

____ 83. Within a group of elements, as the atomic number increases, the atomic radius
a. increases.
b. remains approximately constant.
c. decreases regularly.
d. varies unpredictably.

____ 84. The most characteristic property of the noble gases is that they
a. have low boiling points.
b. are radioactive.
c. are gases at ordinary temperatures.
d. are unreactive.

____ 85. The most active/reactive group of the metals is the
a. lanthanides.
b. transition metals
c. Alkali metals
d. Metalloids

____ 86. The principle that states that the physical and chemical properties of the elements are periodic functions of their atomic numbers is
a. the periodic table.
b. the periodic law.
c. the law of properties.
d. Mendeleev's law.

____ 87. Mendeleev predicted that the spaces in his periodic table represented
a. isotopes.
b. radioactive elements.
c. unstable elements.
d. undiscovered elements.

____ 88. Group 17 elements are the most reactive of the nonmetal elements because they—
a. require only one electron to fill their outer energy level
b. have the highest ionization energies
c. have the largest atomic radii
d. are the farthest to the right in the periodic table

____ 89. The number of valence electrons for Alkaline Earth metals is
a. 2.
b. 8.
c. $n - 1$
d. equal to the period number.

____ 90. The halogens are located on the periodic table in Group
a. 1.
b. 2.
c. 17.
d. 18.

____ 91. For each successive electron removed from an atom, the ionization energy to take one additional electron
a. increases.
b. decreases.
c. remains the same.
d. equals the nuclear charge.

____ 92. Moseley discovered that elements with similar properties occurred at regular intervals when the elements were arranged in order of increasing
a. atomic mass.
b. density.
c. radioactivity.
d. atomic number.

____ 93. The metalloids are located on the periodic table between
a. halogens and noble gases.
b. nonmetals and metals.
c. alkaline-earth metals and other metals.
d. alkali metals and transition metals.

____ 94. Which of the following elements is *not* a metal?
a. H b. K c. Na d. Fr

____ 95. In which period is an element that has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$ when it is in its ground state?
a. Period 1
b. Period 2
c. Period 3
d. Period 4

____ 96. Which of the following elements is a transition metal?
a. calcium
b. iron
c. sodium
d. sulfur

____ 97. Which periodic group or family of elements is *not* correctly matched with its common family name?
a. Group 2: alkaline-earth metals
b. Group 3: alkali metals
c. Group 17: halogens
d. Group 18: noble gases

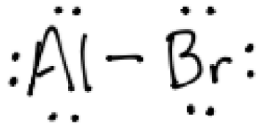
____ 98. Which of the following elements is most similar in behavior to calcium?
a. magnesium
b. sodium
c. sulfur
d. chlorine

____ 99. The periodic law states that
a. no two electrons with the same spin can be found in the same place in an atom.
b. the physical and chemical properties of the elements are functions of their atomic number.
c. wave patterns repeat at regular intervals.
d. the chemical properties of elements can be grouped according to periodicity.

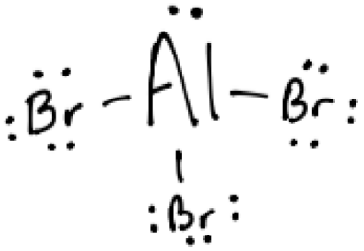
____ 100. A horizontal row in the periodic table is called a(n)
a. family.
b. group.
c. octet.
d. period.

____ 101. Which diagram correctly represents what happens when Al and Br ionically bond?

a.



b.



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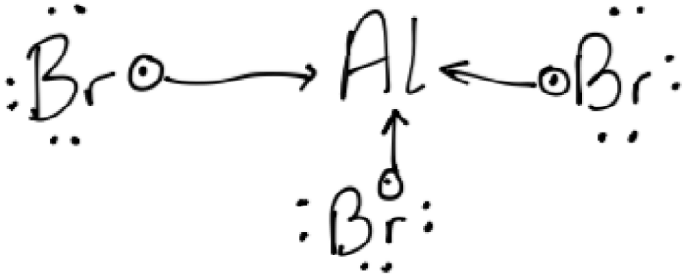
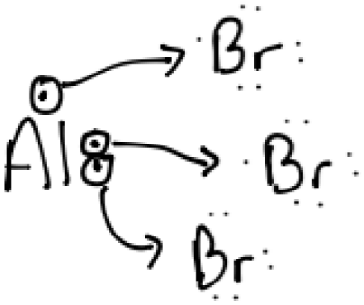
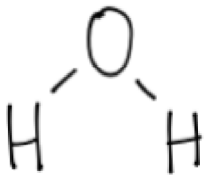


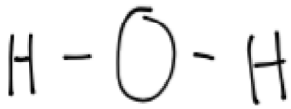
d.

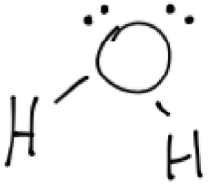


____ 102. Which diagram correctly represents what happens when hydrogen and oxygen covalently bond?

a. 

b. 

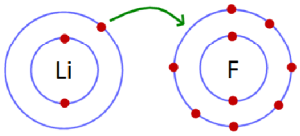
c. 

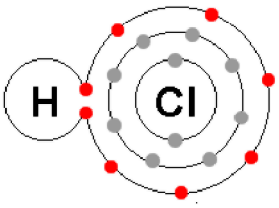
d. 

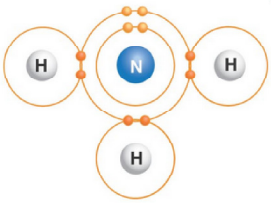
____ 103. Which choice represents the correct Lewis dot diagram for Fluorine?

a.  b.  c.  d. None of these.

____ 104. Which example below illustrates an ionic bond?

a. 


b. 


c. 


____ 105. What type of bond is formed when non-metals bond with other non-metals?
a. ionic b. covalent c. metallic

____ 106. Malleability and ductility are characteristic of substances with
a. covalent bonds. b. ionic bonds. c. Lewis structures. d. metallic bonds.

____ 107. How many valence electrons does phosphorus have?
a. 1 b. 2 c. 5 d. 8

____ 108. The electron configuration of nitrogen is $1s^2\ 2s^2\ 2p^3$. How many more electrons does nitrogen need to satisfy the octet rule?
a. 1 b. 3 c. 5 d. 8

____ 109. What type of bond has a delocalized "sea" of electrons shared among all atoms?
a. ionic b. covalent c. metallic

____ 110. What type of bond involves the "transfer" of valence electrons?
a. ionic b. covalent c. metallic

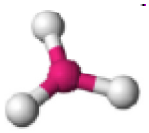
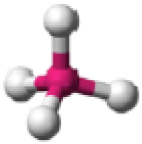
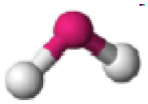
____ 111. What type of bond involves the "sharing" of valence electrons?
a. ionic b. covalent

____ 112. What type of bond is formed between elements that are metals and non-metals?
a. ionic b. covalent c. metallic

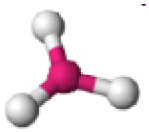
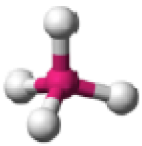
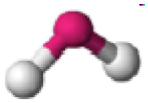
____ 113. What type of bond produces properties such as luster, ductility and malleability?
a. ionic b. covalent c. metallic

____ 114. VSEPR theory is a model for predicting
a. the strength of metallic bonds.
b. the shape of molecules.
c. lattice energy values.
d. ionization energy.

____ 115. Which element has 8 valence electrons to give it a full octet?
a. Calcium c. Helium e. Lead
b. Krypton d. Hydrogen

____ 116. Which molecule below represents the shape that $BeCl_2$ forms according to the VSEPR theory?
a.  b.  c.  d. 

____ 117. Which of the following is NOT an example of a molecular formula?
a. $H_2O$ b. B c. $NH_3$ d. $O_2$

____ 118. Which molecule below represents the shape that $CH_4$ forms according to the VSEPR theory?
a.  b.  c.  d. 

____ 119. If the atoms that share electrons have an unequal attraction for the electrons, the bond is called
a. nonpolar. b. polar. c. ionic. d. dipolar.

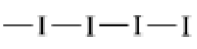
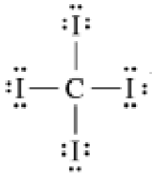
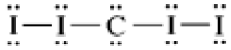
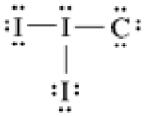
____ 120. What type of bond features delocalized electrons that no longer belong to an individual atom?
a. ionic b. covalent c. metallic

**A.** Cl—H: **B.** :H—Cl: **C.** :H—Cl: **D.** H—Cl:

____ 121. What is the Lewis structure for hydrogen chloride, HCl? (Look Above)
a. A b. B c. C d. D

____ 122. The electrons involved in the formation of a chemical bond are called
a. dipoles.
b. *s* electrons.
c. Lewis electrons.
d. valence electrons.

____ 123. Atoms are ____ when they are combined.
a. more stable
b. less stable
c. not bound together
d. at a high potential energy

**A.**  **B.**  **C.**  **D.** 

____ 124. What is the Lewis structure for carbon tetraiodide, which contains one carbon atom and four iodine atoms? (Look Above)
a. A b. B c. C d. D

____ 125. A polar molecule contains
a. ions.
b. a region of positive charge and a region of negative charge.
c. no bonds.
d. metals