

Name: _____

Key

You will be able to use your own study guide during your final.

2012 January Study Guide

1. A neutral group of atoms held together by covalent bonds is a

Molecule

2. A(n) _____ shows the types and numbers of atoms joined in a single molecule of a molecular compound.

LDS or Molecular Formula

3. If two covalently bonded atoms are identical, the bond is

non-polar covalent

4. If the atoms that share electrons have an unequal attraction for the electrons, the bond is called

polar

5. A covalent bond results when _____ are shared.

electrons

6. A chemical bond resulting from the electrostatic attraction between positive and negative ions is called a(n)

Ionic Bond

7. Nonpolar covalent bonds are not common because

Most atoms have different electronegativities,

8. The greater the electronegativity difference between two bonded atoms, the greater the percentage of

ionic character the bond has

9. If the difference in electronegativity is between 0.5 and 2.1, the bond is

Polar Covalent

10. Electronegativity values: Na = 0.9; Cl = 3.2; O = 3.4; Br = 3.0; H = 2.2. The pair of elements that forms a bond with the most ionic character is

a. Na and Cl 2.3

b. H and Cl 1.1

c. O and Br 0.4

d. Br and Cl 0.2

11. The type of bond in Br₂ (electronegativity for Br is 2.8) is

Non-polar covalent

12. What are the things you need to know to draw a Lewis structure of a molecule?

Number of each atom

Valence electrons for each atom,

13. In drawing a Lewis structure, the central atom is the atom with the lowest electro-

negativity, written first, or closest to center of periodic table.

NaCl ← Ionic formula
↑ 1 is a formula unit

H_2O Molecular
↑ 1 is a molecule
~~look up~~
~~in back~~
~~index~~

Name: _____

You will be able to use your own study guide during your final.

14. Be able to define a formula unit, ionic formula, and molecular formula

Formula unit → smallest ratio of cations to anions
in an ionic compound

16. Name the compound CF_4 .

Carbon tetrafluoride

19. The model for predicting the shape of a molecule that is based on the repulsion of electrons for each other is called

VSEPR ~~VSPR~~

20. Use VSEPR theory to predict the shape of the hydrogen chloride molecule, HCl .

$\text{H}-\text{Cl}$ Linear 1 BR

21. Use VSEPR theory to predict the shape of the water molecule, H_2O .

$\text{H}-\text{O}-\text{H}$ Bent
2 BR
2 LBP

22. The equal but opposite charges present in the two regions of a polar molecule create a(n) _____
(See your Polar Bears and Penguins Handout)

Dipole

24. A molecule of hydrogen chloride is polar because

The chlorine has a higher electronegativity & hogs the electrons.

25. Carbon shows a very strong tendency to form

Covalent Bonds

26. How many covalent bonds can a carbon atom usually form?

4

27. When a carbon atom forms four covalent bonds, the bonds are directed toward the corners of a

Pyramid

28. When carbon forms four covalent bonds, what is the bond angle?

109°

29. Carbon atoms readily join with atoms of which other elements?

Carbon & other elements

30. What are two allotropic forms of carbon?

diamond & graphite

31. Define allotrope: See back

32. Compare the hardness of diamond and graphite.

↑ Hard ↑ Soft

35. Why are functional groups important?

— They predict how they'll react.
Molecules with the same functional groups have similar properties

Name: _____

You will be able to use your own study guide during your final.

36. All organic compounds containing the same functional group properties have similar

38. The systematic names of alcohols end in

- a. -al.
- b. -one.

- c. -ol.
- d. -oic.

ethanol
isopropyl alcohol
methanol

41. What is the difference in an alkane, alkene, and alkyne?

only single bonds

at least 1 = bond

← at least one ≡ bond

47. As the atomic masses of the elements in the periodic table increase, the number of atoms in 1 mol of each element

~~Decreases~~ Stay the same. 1 mol = 6.02×10^{23} atoms

48. An Avogadro's constant amount of any element is equivalent to

1 mole = atomic mass in grams

49. The molar mass of an element is the mass of one mole How is it calculated?

Ex

H₂O

H - 2 (1.01)
O - 1 (16.00)

18.02 g

50. What 7 gases are diatomic at STP?

H₂, O₂, N₂, Br₂, Cl₂, I₂, F₂

52. Define empirical formula

See def section

53. The empirical formula may not represent the actual composition of a unit of a(n)

Molecules, Ex C₂H₆ molecular formula
CH₃ empirical formula

55. Of the following molecular formulas for hydrocarbons, which is an empirical formula?

- a. CH₄
- b. C₂H₂

can't be reduced

- c. C₃H₆
- d. C₄H₁₀

58. A chemical reaction has NOT occurred if the products have

the same properties of the reactants.

Name: _____

You will be able to use your own study guide during your final.

59. What are the ways we can tell a reaction has occurred? Bubbles; color change;
~~change~~ Noise, light, explosion; precipitate; heat in or out.

60. A solid produced by a chemical reaction in solution that separates from the solution is called _____
precipitate

61. $C(s) + O_2(g) \rightarrow CO_2(g) + \text{energy}$ is a chemical reaction because The products
are different from the reactants.
↑ Have different properties.

62. The word equation for the reaction shown in 61 is

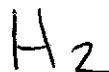
Carbon + Oxygen gas yield carbon dioxide gas + energy.

64. The products and the reactants in the reaction shown have the same number of atoms of
each type of element.

66. What is a nonspontaneous reaction?

↳ A rxn that won't occur w/o energy being

67. In writing an equation for a reaction that produces hydrogen gas, the correct representation of hydrogen gas is

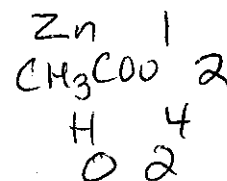
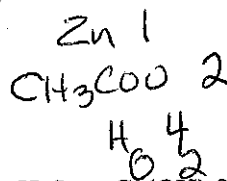
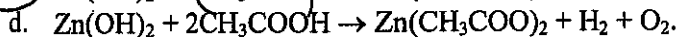
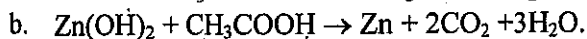
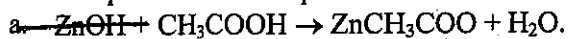


added.

71. According to the law of conservation of mass, the total mass of the reacting substances is

= total mass of products

72. The complete balanced equation for the reaction between zinc hydroxide and acetic acid is



76. Which coefficients correctly balance the formula equation $CaO + H_2O \rightarrow Ca(OH)_2$?



77. When balancing a chemical equation, insert coefficients to

Make there be equal #'s of each atom
on both sides of the equation.

78. In an equation, the symbol for a substance in water solution is followed by l, s, g, or aq?

aq

Name: _____

You will be able to use your own study guide during your final.

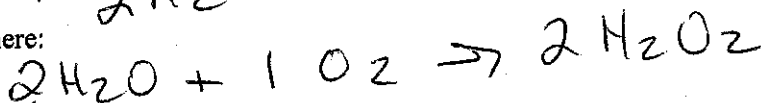
79. In the chemical equation $\text{CaCO}_3(s) \rightarrow \text{CaO}(s) + \text{CO}_2(g)$, 3 mol of CaCO_3 will decompose into how many moles of CaO and CO_2 ?

3 moles CaO & 3 moles CO_2

81. Write an example of a decomposition reaction here:



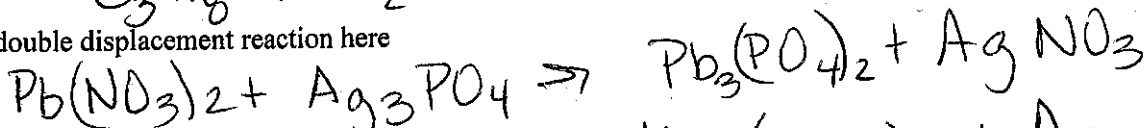
82. Write an example of a synthesis reaction here:



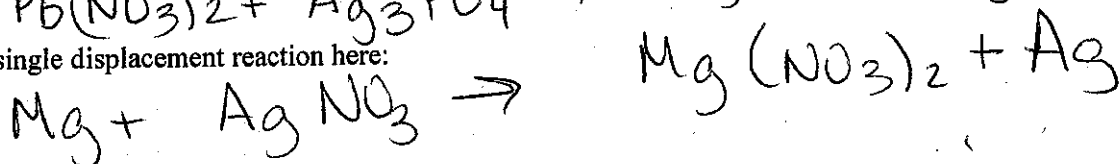
83. Write an example of a combustion reaction here.



84. Write an example of a double displacement reaction here



85. Write an example of a single displacement reaction here:



86. Define activity

↑ tendency to react w water & acids

87. If metal X is lower than metal Y in the activity series, then metal X

Studley Dudley

Metal Y will replace X in

88. If a certain metal is placed in an ionic solution containing another metal and no reaction occurs, then the metal originally in the solution is (think Studley-Dudley)

more active, higher on a compound

89. The coefficients in a chemical equation represent the

mole ratios

92. Define "mole ratio"

activity table

Top of pg 321

94. In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, what is the mole ratio of nitrogen to ammonia?

1:2

99. When the limiting reactant in a chemical reaction is completely used, the

reaction stops

100. In the reaction $\text{A} + \text{B} \rightarrow \text{C} + \text{D}$, if the quantity of B is insufficient to react with all of A, which is the limiting reactant?

B

101. The substance that restricts the participation of other reactants in a chemical reaction is known as the

limiting reactant

102. The mole ratio of oxygen to phosphorus(V) oxide in the reaction $\text{P}_4(s) + 5\text{O}_2(g) \rightarrow \text{P}_4\text{O}_{10}(s)$ is

5:1

103. To determine the limiting reactant in a chemical reaction, one must know the

Balanced, chemical reaction, Molar Masses, grams of reactants, Mole Ratios

Name: _____

You will be able to use **your own study guide** during your final.

92

105. In most chemical reactions, the amount of product obtained is more or less than the theoretical yield?

Less

106. What is the maximum possible amount of product obtained in a chemical reaction?

Theoretical Yield

108. The excess reactant when a fuel is burned is (look up combustion reaction if you don't know what the reactants are).

O₂ (you run out of fuel)

109. What happens to the volume of a gas during compression?

decreases

110. By which process do gases take the shape of their container?

Expansion

111. What does the constant bombardment of gas molecules against the inside walls of a container produce?

Pressure

112. An ideal gas is an imaginary gas

that follows all the ideal gas laws

113. Unlike in an ideal gas, in a real gas

can

114. Why would the pressure of a sample of gas at a constant volume fall 0.5 atm?

The Volume increased. $P_1 V_1 = P_2 V_2$

115. Equal volumes of diatomic gases under the same conditions of temperature and pressure contain the same number of

Molecules

117. The volume of a gas is 600.0 mL when the pressure is 1.00 atm. At the same temperature, what is the pressure at which the volume of the gas is 3.0 L?

$\frac{600}{1} = \frac{3000}{P}$
a. 0.5 atm
b. 5.0 atm

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

- c. 0.20 atm
- d. 800 atm

$PV = nRT$
 $P = \frac{nRT}{V} = (0.0821)$

119. A sample of argon gas at standard pressure occupies 2000. mL. At constant temperature, what volume does the gas occupy if the pressure increases to 1.5 atm?

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{2000}{1} = \frac{3000}{1.5}$

3000 mL

120. A 500 mL sample of gas is collected at 750. mm Hg. If the temperature remains constant and the pressure falls to 600. mm Hg, what is the new volume?

$\frac{500}{750} = \frac{x}{600}$

$\frac{300000}{750} = 400$

$\frac{300000}{750} = 400$

121. If V_1 is the original volume, V_2 is the new volume, T_1 is the original Kelvin temperature, and T_2 is the new Kelvin temperature, how is Charles's law expressed mathematically?

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Name: _____

You will be able to use your own study guide during your final.

273.15
15
288.15

125. Calculate the approximate volume of a 0.600 mol sample of gas at 15.0°C and a pressure of 1.10 atm.

1.05 L

$$PV = nRT$$

$$V = \frac{nRT}{P} = \frac{(0.600)(0.0821)(288)}{1.1}$$

126. Calculate the approximate temperature of a 0.75 mol sample of gas at 2 atm and a volume of 10 L.

$$T = \frac{PV}{nR} = \frac{2(10)}{(0.0821)(0.75)} = 324 \text{ } ^\circ\text{K}$$

128. According to Avogadro's law, 1 L of H₂(g) and 1 L of O₂(g) at the same temperature and pressure

have the same # of molecules

129. In the reaction $2C + O_2(g) \rightarrow 2CO(g)$, what is the volume ratio of O₂ to CO?

1:2

134. What is vaporization?

The process of turning from liquid to gas.

136. Acetic acid is found in significant quantities in

vinegar

138. Bases react with acids to produce salt and H₂O

140. In water, hydroxides of Group 2 metals

are strong bases

143. A Brønsted-Lowry acid is

a molecule or ion that can donate

144. A Brønsted-Lowry base is a(n)

a molecule or ion that can accept a proton.

146. How many H⁺ ions will a monoprotic acid release upon dissociation?

1

147. Define amphoteric

Molecule or ion that can act as an acid or base.

152. The pH of a basic solution is

> 7

153. A water solution whose pH is 7 is neutral, acidic, or basic?

