

Name: HANSENPeriod: Date:

Mole Test Review 2013

Knowledge and Skills Check List:

☐ Mole

- ☐ Define mole *→ An amount of a substance* using a word definition and mathematically
- ☐ Know who is responsible for defining the number of particles in a mole - Avogadro 6.02×10^{23}

☐ Molar Mass/Formula Mass

- ☐ What is molar mass? *mass of 1 mole of substance*
- ☐ What is the unit for molar mass? *g/mol*
- ☐ Be able to calculate the molar mass of a compound, such as CO_2 (answer = 44.009 g/mol)

Atom = smallest unit of Element
molecule = smallest unit of Nonmetal compound
Formula Unit = smallest unit of metal + non metal compound

☐ Percent Composition By Mass

- ☐ Know definition of percent composition.
- ☐ Because percent means parts per 100, the percents by mass of all the elements of a compound must always add up to 100.
- ☐ Formula to calculate percent composition

$$\frac{\text{Mass of element in one mol of compound}}{\text{Molar mass of compound}} \times 100 = \% \text{ by mass of the element}$$

Calculation for CO_2 :
 $\text{C } 1(12) = 12$
 $\text{O } 2(16) = 32$
 $\text{Total} = 44 \text{ g/mol}$ (labeled as molar mass)

Percent composition calculation for CO_2 :
 $\frac{12}{44} \times 100 = 27\%$
 $\frac{32}{44} \times 100 = 73\%$

☐ Conversions among mass, moles, and number of particles

- ☐ Be able to write the proper formula of the compound in the question.
- ☐ Know how to calculate moles, if given molar mass
- ☐ Know how to calculate molar mass, if given moles
- ☐ Do your conversion problems on the following pages!!

Use 1 for mole

Use periodic table for Mass = Grams (g)

Use 6.02×10^{23} Avogadro's # for Particle or Atom or Molecule or

Form. Unit

☐ Empirical Formula and molecular formula

- ☐ What is an empirical formula? ... (reduced formula)
- ☐ What is a molecular formula? ... (actual formula)
- ☐ The empirical formula may or may not be the same as the actual molecular formula. If the two formulas are different, the molecular formula will always be a simple multiple of the empirical formula.
- ☐ For calculating empirical formula from percent composition:
 - Convert % directly to grams of the element ($20.4\% = 20.4 \text{ g}$)
 - Calculate moles of the element example: $20.4 \text{ g C} \times \frac{1 \text{ mol C}}{12.011 \text{ g/mol C}} = 1.698 \text{ mol C}$
 - Calculate the simplest ratio of moles of the elements by dividing each number of moles by the smallest value in the mol ratio
 - Multiply the numbers of moles in the ratio by the smallest number that will produce a ratio of whole numbers

☐ Significant Figure ID

- All non-zero numbers are significant
- All "sandwiched" (captive) zeros are significant
- All leading zeros are NOT significant
- All trailing zeros are significant if there is a decimal in the number
- All trailing zeros before the decimal are NOT significant

☐ Significant Figure Calculations:- or + Use Least # decimal places from givens ; \div or \times use Least Sig Figs

*Practice Formula Writing!!! Practice Naming!!!

18. Which has the larger percent by mass of sulfur, H_2SO_3 or $\text{H}_2\text{S}_2\text{O}_8$?

$$\begin{array}{l} \text{H } 2(1) = 2 \\ \text{S } 1(32) = 32 \\ \text{O } 3(16) = 48 \\ \hline 82 \end{array}$$

$$\rightarrow \frac{32}{82} \times 100 = 39\%$$

Larger Percent of Sulfur

$$\begin{array}{l} \text{H } 2(1) = 2 \\ \text{S } 2(32) = 64 \\ \text{O } 8(16) = 128 \\ \hline 194 \end{array}$$

$$\rightarrow \frac{64}{194} \times 100 = 33\%$$

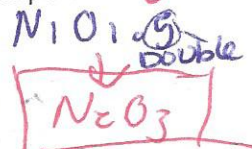
Double when .5

19. A blue solid is found to contain 36.84% nitrogen and 63.16% oxygen. What is the empirical formula?

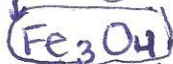
- ① ÷ by mass
② ÷ by slow #
③ = white rom.

$$\frac{14}{2.6} = 5.38$$

$$\frac{16}{8.9} = 1.79$$



20. Iron forms 2 different compounds with oxygen. Which one is made of 72.40% iron and 27.60% oxygen? What is the Empirical Formula?



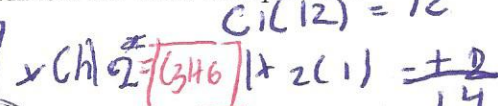
$$\frac{55.8}{1.29} = 43.25$$

$$\frac{16}{1.29} = 1.24$$

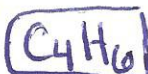
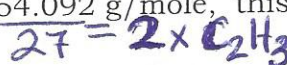
21. An empirical formula for a common fuel is known to be CH_2 . If this fuel is known to have a molecular mass of 42.081 g/mole, what is the molecular formula for this compound?

- ① mass of formula
② ÷ mass by formula mass

$$\frac{42.081}{14} = 3$$



22. An empirical formula for a different fuel is known to be C_2H_3 . If this fuel is known to have a molecular mass of 54.092 g/mole, this other fuel has what molecular formula?



$$\begin{array}{l} 2(12) = 24 \\ 3(1) = 3 \\ \hline 27 \end{array}$$

Multiple Choice (Practice Test Questions): ... show your work on test questions just as you are expected to on assignments.

23. What is the percent composition of oxygen in water?

a. 1g/mL

b. 90% oxygen

c. 88.809% oxygen

d. 11.2% oxygen

$$\begin{array}{l} \text{H } 2(1) = 2 \\ \text{O } 1(16) = 16 \\ \hline 18 \end{array}$$

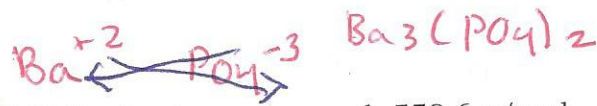
24. What is the molar mass of Barium Phosphate?

a. 232.2g/mol

b. 184.3g/mol

c. 601.9 g/mol

d. 559.6 g/mol



$$\begin{array}{l} \text{Ba } 3(137.3) = 411.9 \\ \text{P } 2(31.0) = 62 \\ \text{O } 8(16) = 128 \\ \hline 601.9 \end{array}$$

25. How many atoms are contained in a 3.0 mole sample aluminum?

a. 6.0×10^{23}

b. 1.2×10^{24}

c. 1.8×10^{24}

d. 2.4×10^{24}

$$\frac{3 \text{ mole} \times 6.02 \times 10^{23}}{1 \text{ mole}}$$

26. What is the total number of nitrogen atoms in 0.25 moles of NO_2 gas?

a. 1.5×10^{23}

b. 6.0×10^{23}

c. 3.0×10^{23}

d. 1.2×10^{24}

$$\frac{0.25 \text{ mole} \times 6.02 \times 10^{23}}{1 \text{ mole}}$$