NAME _____ DATE _____ PERIOD ___

UNIT 7 CHEMICAL FORMULAS AND COMPOUNDS

CONCEPTS:

4.6 Name and write the chemical formulas for simple ionic and molecular compounds, including those that contain the polyatomic ions: ammonium, carbonate, hydroxide, nitrate, phosphate, and sulfate.

5.3 Use the mole concept to determine the number of particles and the molar mass of elements and compounds.

5.4 Determine percent compositions, empirical formulas, and molecular formulas.

NOTEBOOK -TABLE OF CONTENTS for "Chemical Compounds" Chapter 7

DATE	Assignment	Pages	√
1.			
2.			
3.			
4.			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

Ch. 3 & 7 – The Mole

I. Molar Conversions
(p.80-85, 221-226)

Molar Conversions (p.80-85, 221-226)
A. What is the Mole?

- A counting number (like a dozen)
- Avogadro's number (N_A)
- 1 mol = **6.02×10^{23}** items

A VERY large amount!!!!

B. Molar Mass

- Mass of 1 mole of an element or compound.
- Atomic mass tells the...
  - atomic mass units per atom (amu)
  - grams per mole (g/mol)
- Round to 2 decimal places

B. Molar Mass Examples

- carbon
- aluminum
- zinc

B. Molar Mass Examples

- water
  - H_2O
  - 2(1.01) + 16.00 = _____ g/mol
- sodium chloride
  - NaCl
  - 22.99 + 35.45 = _____ g/mol

B. Molar Mass Examples

- sodium bicarbonate
  - $NaHCO_3$
  - 22.99 + 1.01 + 12.01 + 3(16.00) = _____ g/mol
- sucrose
  - $C_{12}H_{22}O_{11}$
  - 12(12.01) + 22(1.01) + 11(16.00) = _____ g/mol

GRAM FORMULA MASS

Name _____

Determine the gram formula mass (the mass of one mole) of each compound below.

◀ Name each compound

1. $KMnO_4$ _____
   potassium permanganate
2. KCl _____
3. Na_2SO_4 _____
4. $Ca(NO_3)_2$ _____
5. $Al_2(SO_4)_3$ _____
6. $(NH_4)_3PO_4$ _____
7. $CuSO_4 \bullet 5H_2O$ _____
   copper (II) sulfate pentahydrate
8. $Mg_3(PO_4)_2$ _____
9. $Zn(C_2H_3O_2)_2 \bullet 2H_2O$ _____
10. $Zn_3(PO_4)_2 \bullet 4H_2O$ _____
11. H_2CO_3 _____
12. $Hg_2Cr_2O_7$ _____
13. $Ba(ClO_3)_2$ _____
14. $Fe_2(SO_3)_3$ _____
15. $NH_4C_2H_3O_2$ _____

• → mean loosely bonded (not to multiply)

• $2H_2O$ is a hydrate with two water molecules attached to the compound (or the salt)

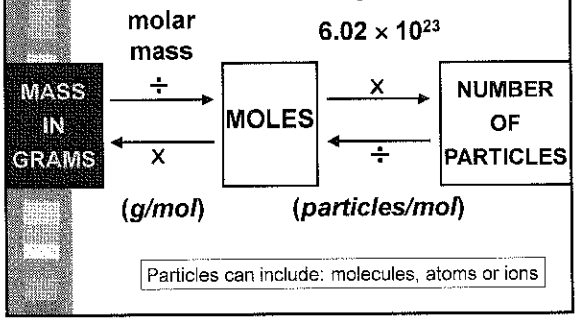
→ find the mass of the salt first then add the mass of the waters.

→ add together the 2 parts

Day 2

C. Molar Conversions

- **Conversion factors used: Molar Mass and Avogadro's number**



Particles can include: molecules, atoms or ions

C. Molar Conversion Examples

- How many moles of carbon are in 26 g of carbon?

_____ = _____ mol C

C. Molar Conversion Examples

- How many molecules are in 2.50 moles of $C_{12}H_{22}O_{11}$?

_____ = _____ molecules $C_{12}H_{22}O_{11}$

C. Molar Conversion Examples

- Find the mass of 2.1×10^{24} molecules of $NaHCO_3$.

_____ = _____ g $NaHCO_3$

NAME _____ PERIOD _____ DATE _____

Unit 7: Part 2 → Using Chemical Formulas

MOLAR CONVERSIONS – CH. 3 & 7

(P. 80-85, 221-226 IN M.C. TEXT)

FOR ALL CALCULATIONS, SHOW YOUR WORK AND INCLUDE UNITS & SIG FIGS

PART A – MOLAR MASS

1. Calculate the molar mass for each of the following compounds. Include units!

calcium nitrate	Formula:	**lead(II) iodide**	Formula:
Molar mass:		Molar mass:	

PART B – MOLAR CONVERSIONS (Show your work and include units!)

2. How many moles of ammonia are in 1.20×10^{25} molecules of ammonia?

Formula:	Molar mass:
Answer:	

3. You need 2.5 moles of aluminum for an experiment. How many atoms of aluminum is this?

Formula:	Molar mass:
Answer:	

4. 380 g of sucrose ($C_{12}H_{22}O_{11}$) are required to make 2 quarts of Kool-Aid. How many molecules of sucrose are used in this recipe?

Formula:	Molar mass:
Answer:	

5. There are 3.20×10^{22} atoms of copper in the outer shell of pennies. How many grams of copper is this?

Formula:	Molar mass:
Answer:	

6. If you pump 40.88 kg of octane (C_8H_{18}) into your gas tank, how many molecules of octane are you pumping? Remember: 1.000 kg = 1000. g

Formula:	Molar mass:
Answer:	

MOLAR CONVERSIONS LAB

Many everyday items are counted in groups in order to make them more manageable. Eggs are counted in dozens; sheets of paper are counted in reams. Since atoms and molecules are so minuscule, it is necessary to count them in groups much larger than 12 or 500. Instead, they are counted in groups called *moles*. The mole is a group of 6.02×10^{23} particles, or *Avogadro's number* of particles.

Counting the individual items in a group as large as the mole is impossible. As a result, a different method is used to count a mole of molecules – *counting by weighing*. The same process is used to count aluminum cans when you take a bag to the recycling center. *A conversion factor* (weight per can) is used to convert the weight of the bag into the number of cans in the bag. In the same way, the *molar mass* of an element or compound is used to convert the mass of a sample into the number of atoms or molecules in that sample.

In this lab, you will perform molar conversions for small samples of two everyday substances, water and chalk.

PROCEDURE

1. Fill a paper cup with water and measure its mass. Drink one mouthful of water and find the new mass of the paper cup. Record the initial and final masses in your data table.
2. Obtain a piece of chalk (calcium carbonate). Wipe it free of dust particles and measure its mass. Write a message with the chalk and find its new mass. Record the initial and final masses in your data table.
3. Create a mini-poster using a piece of construction paper. On the front, make a colorful, eye-catching display that includes the following for each substance:
   - Pictures
   - chemical formula
   - molar mass
   - number of molecules consumed
4. On the back, include the following background information in a neat and organized way:
   - data table (use a ruler)
   - all calculations – Analysis showing all your work for each substance.
   - answers to conclusion questions in complete sentences

DATA

Create a table to display your measurements and the answers to the analysis calculations.

	CHALK	WATER
Initial mass (g)		
Final mass (g)		
Mass Consumed (g)		
Molar Mass (g/mol)		
Molecules Consumed		

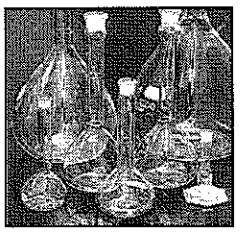
ANALYSIS

1. For each substance, calculate the mass consumed from the data.
2. Calculate the molar mass of each substance. (periodic table)
3. For each substance, calculate the number of molecules consumed using the mass consumed of each compound as the given.

CONCLUSION QUESTIONS – complete sentences

1. Identify the two conversion factors you used and specify how you used each of them.
2. If you consume 5 *grams* each of water and chalk, will you consume more water molecules or more chalk molecules? Explain your answer – include your proof!
3. If you consume 5 *moles* each of water and chalk, will you consume more water molecules or more chalk molecules? Explain your answer – include your proof!

Ch. 3 & 7 – The Mole



II. Molarity
(p. 412-415)

A. Molarity

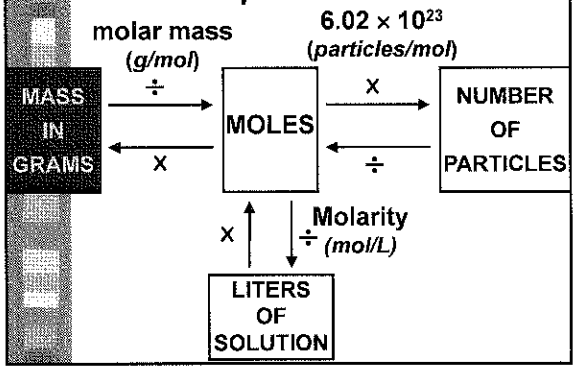
- Concentration of a solution.

$$Molarity\,(M) = \frac{moles\ of\ solute}{liters\ of\ solution}$$

A. Molarity

$2M\ HCl$ What does this mean?

B. Molarity Calculations



B. Molarity Calculations

- How many grams of NaCl are required to make 0.500L of 0.25*M* NaCl?

$$0.25M = \frac{0.25\ mol}{1\ L}$$

_____ g NaCl

B. Molarity Calculations

- Find the molarity of a 250 mL solution containing 10.0 g of NaF.

$$M = \frac{mol}{L}$$

_____ = _____ mol NaF

M = _____ = _____ *M* NaF

Name _____ Period _____ Date _____

MOLARITY – UNIT 7 PART CONTINUED

SOLVE THE FOLLOWING MOLARITY PROBLEMS. SHOW ALL WORK AND INCLUDE CORRECT UNITS AND SIG FIGS!

1. Find the molarity of a solution in which 58 g of NaCl are dissolved in 2.5 L of solution.

2. How many grams of $KMnO_4$ should be used to prepare 2.00 L of a 0.500*M* solution?

3. What volume of 0.25*M* solution can be made from 5.0 g of KCl?

4. Find the molarity of a 450 mL solution containing 13.7 g of $ZnSO_4$.

5. How many grams of $CuCl_2$ are required to make 75 mL of a 0.20*M* solution?

MIXED MOLE QUIZ REVIEW PROBLEMS

****SHOW ALL WORK & ANSWERS MUST INCLUDE THE PROPER UNITS ****

SOLVE THE FOLLOWING MOLAR CONVERSION & MOLARITY PROBLEMS:

1. How many grams would 8.1×10^{21} molecules of sucrose ($C_{12}H_{22}O_{11}$) weigh?
2. How many grams of $AgNO_3$ are required to make 25 mL of a 0.80*M* solution?
3. How many moles are in 53.8 g of magnesium chloride?
4. What volume of 0.15*M* $SrSO_4$ can be made from 23.1 grams?
5. Find the molarity of a 2.50 L solution containing 7 g of potassium fluoride.
6. How many molecules are in 0.845 moles of $NaNO_3$?
7. How many grams of aluminum chloride are required to make 0.50 L of a 1.0*M* solution?
8. How many molecules are in 50.0 g of calcium sulfide?
9. Find the molarity of an 85 mL solution containing 2.6 g of $ZnCl_2$.
10. How many atoms are in a 2.0 kg ingot of gold? (Note mass units.)
11. Find the molarity of a 750 mL solution containing 20.0 g of lithium bromide.

B. Molarity Calculations