

## Review: Quantities in Chemical Reactions

**Test Helps:** Periodic table, calculator, nomenclature reference sheet

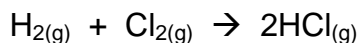
### Test Topics

1. For every problem, **you must have a therefore statement and correct units.**
2. **Avogadro's number:** \_\_\_\_\_. What does it mean?  
\_\_\_\_\_
3. Atomic mass / molecular mass / formula unit mass (units - \_\_\_\_). What does it mean?  
\_\_\_\_\_
4. **Molar mass** (units - \_\_\_\_\_). What does it mean?  
\_\_\_\_\_
5. What is a **mole**? \_\_\_\_\_  
\_\_\_\_\_
6. Convert between mass, moles, and number of particles (follow graphic organizer).
7. Find the **percent composition** of a compound, when given either the molecular formula of the compound OR when given the masses of each element in the compound.
8. Finding the Empirical and Molecular formula
9. **Stoichiometry:** \_\_\_\_\_  
\_\_\_\_\_
10. **Mole Ratio:** \_\_\_\_\_
11. Stoichiometry Problems – solve these using the second graphic organizer
  - a. Finding the **theoretical yield:** \_\_\_\_\_  
\_\_\_\_\_
12. Calculating **percent yield** =
13. Explain why a percent yield won't always be 100%.

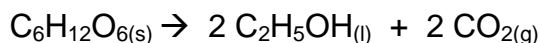
### Review Questions:

1. What is Avogadro's number and what does it mean?
2. How many atoms does a 2.6 mol sample of silver (Ag) have?
3. A necklace contains 0.0342 mol of silver (Ag).
  - a) How many grams of silver are in the necklace?
  - b) How many atoms of silver are there in the necklace?
4. Find the molecular mass and molar mass of carbon dioxide.
5. Find the mass of  $7.38 \times 10^{21}$  formula units of  $\text{Pb}_3(\text{PO}_4)_2$ .
6. What is the percent composition of  $\text{H}_2\text{O}_2$ ?
7. What is the percent composition of a sample that contains 3.45g of sodium and 5.33g of chlorine gas?
8. What's the empirical formula of a molecule containing 65.5% carbon, 5.5% hydrogen, and 29.0% oxygen?

9. If the molar mass of the compound in problem 1 is 110 grams/mole, what's the molecular formula?
10. A 50.51 g sample of a compound made from phosphorus and chlorine is decomposed. Analysis of the products showed that 11.39 g of phosphorus atoms were produced. What is the empirical formula of the compound?
11. Write the molecular formulas of the following compounds:
- A compound with an empirical formula of  $C_2OH_4$  and a molar mass of 88 grams per mole.
  - A compound with an empirical formula of  $C_4H_4O$  and a molar mass of 136 grams per mole.
  - A compound with an empirical formula of  $CFBrO$  and a molar mass of 254.7 grams per mole.
12. How many grams of oxygen are required to react with 9.7 g of magnesium to produce magnesium oxide? Balanced equation:  $2 Mg_{(s)} + O_{2(g)} \rightarrow 2 MgO_{(s)}$
13. Hydrogen and chlorine gases react to form hydrogen chloride gas according to the following reaction:



- If 2 moles of hydrogen react with excess of chlorine, what is the limiting reactant?
  - How many moles of hydrogen chloride will form?
14. Table salt,  $NaCl_{(s)}$ , can be formed by the reaction of sodium metal and chlorine gas:
- $$2 Na_{(s)} + Cl_{2(g)} \rightarrow 2 NaCl_{(s)}$$
- If 45.98g of sodium and excess of chlorine are reacted together
  - How many moles of salt are produced?
  - What mass of salt is produced?
15. Sugar ( $C_6H_{12}O_6$ ) will decompose into ethanol ( $C_2H_5OH$ ) and carbon dioxide over time according to the following reaction:



- What is the theoretical yield of ethanol available from 10.0 g of sugar?
- An experiment done in the lab produces 0.66 g of ethanol from 10.0g of sugar. What is the percent yield?

**ANSWERS:** 2.  $1.6 \times 10^{24}$  atoms 3 a) 3.69 g b)  $2.06 \times 10^{22}$  atoms

4. Molecular mass = 44.01u Molar mass = 44.01 g/mol 5. 9.98 g 6. % O = 94.1% H = 5.9%  
 7. % Na = 39.3 % % Cl = 60.7 % 8.  $C_3H_3O$  9.  $C_6H_6O_2$  10.  $PCl_3$  11. a)  $C_4O_2H_8$  b)  $C_8H_8O_2$   
 c)  $C_2F_2Br_2O_2$  12. 6.4 g 13. a) Hydrogen is LR b) 4 mol HCl 14. a) Na is LR b) 2 mol NaCl  
 c) 116.88g of NaCl 15. a) 5.1 g b) 13%