

# Stoichiometry

<http://www.unit5.org/chemistry/Stoichiometry.htm>

## Learning Objectives/Targets

Worksheet / Lab

### STOICHIOMETRY

#### 10.1 INTERPRETING A CHEMICAL EQUATION

- To relate the coefficients in a balanced chemical equation to:
  - (a) moles of reactants and products
  - (b) liters of gaseous reactants and products

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#### 10.2 MOLE-MOLE RELATIONSHIPS

- To relate the number of moles of two substances in a balanced chemical equation.

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#### 10.3 TYPES OF STOICHIOMETRY PROBLEMS

- To classify the three basic types of stoichiometry problems; mass-mass, mass-volume, and volume-volume.
- To state the procedure for solving a stoichiometry problem, given the balanced equation.

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#### 10.4 MASS-MASS PROBLEMS

- To perform mass-mass stoichiometry calculations.

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#### 10.5 MASS-VOLUME PROBLEMS

- To perform mass-volume stoichiometry calculations.

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#### 10.6 VOLUME-VOLUME PROBLEMS

- To perform volume-volume stoichiometry calculations.

#### 10.7 THE LIMITING REACTANT CONCEPT

- To explain the concept of a limiting reactant.
- To identify the limiting reactant in a chemical reaction, given the number of moles of each reactant.

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#### 10.8 LIMITING REACTANT PROBLEMS

- To perform mass-mass stoichiometry calculations involving a limiting reactant.
- To perform volume-volume stoichiometry calculations involving a gaseous limiting reactant.

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#### 10.9 PERCENT YIELD

- To calculate the percent yield for a reaction, given the actual yield and theoretical yield.

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### BACKGROUND INFORMATION

#### 9.1 Avogadro's Number

- To state the value of Avogadro's number:  $6.02 \times 10^{23}$ .
- To state the mass of Avogadro's number of atoms for any element by referring to the periodic table.

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#### 9.2 Mole Calculations I

- To relate the moles of a substance to the number of particles.

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#### 9.3 Molar Mass

- To calculate the molar mass of a substance, given its chemical formula.

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#### 9.4 Mole Calculations II

- To relate the mass of a substance to the number of particles.

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#### 9.5 Molar Volume

- To state the value for the molar volume of any gas at STP: 22.4 L/mol.
- To relate the density of a gas at STP to its molar mass and volume.

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#### 9.6 Mole Calculations III

- To relate the volume of a gas at STP to its mass and number of particles.

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### 9.7 Percent Composition

- To calculate the percent composition of a compound, given its chemical formula.
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### 9.8 Empirical Formula

- To calculate the empirical formula of a compound, given experimental data for its synthesis.
  - To calculate the empirical formula of a compound, given its percent composition.
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### 9.9 Molecular Formula

- To calculate the molecular formula of a compound, given its empirical formula and molar mass.
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## Vocabulary

actual yield  
excess reactant

limiting reactant  
percent yield

stoichiometry  
theoretical yield

## Labs/Activities

- (1) [S'mores Activity pdf](#) (3) [Baking Soda Limiting Reagent pdf](#)  
(2) [Nuts and Bolts Activity pdf](#) (4) [Reactions of Copper pdf](#)

## Worksheets

- (5) [Vocabulary - Stoichiometry pdf](#) (14) [Percent Yield pdf](#)  
(6) [Island Diagram](#) (Reference sheet) (15) [Energy and Stoichiometry pdf](#)  
(7) [Stoichiometry - Problem Sheet 1 pdf](#) (16) [Bags of Fertilizer pdf \(key\) pdf](#)  
(8) [Stoichiometry - Problem Sheet 2 pdf](#) (17) [Dentistry & Fluoride pdf \(key\) pdf](#)  
(9) [Generic stoichiometry pdf](#) (18) [Stoichiometry Practice Problems pdf](#)  
(10) [Generic pdf](#) (19) [Difficult Stoichiometry Problems pdf](#)  
(11) [Easy Stoichiometry pdf](#) (20) [Math of the Chemical Equations - answers pdf](#)  
(12) [Limiting Reactants pdf](#) (21) [Topics List pdf](#)  
(13) [Visualizing Limiting Reactants pdf](#) (22) [Textbook Questions pdf](#)

LECTURE OUTLINE: [Unit 9 Notes - Stoichiometry pdf](#) (20 pages) ([students](#)) [pdf](#)

## Calendar

- Day 1 – Stoichiometry (5), (6)  
Day 2 – Mole Island Calculations (7)  
Day 3 – Limiting Reactants Stoichiometry (8) [WEBSITE for Chemistry Textbook](#)  
Day 4 – Work Day: Stoichiometry  
Day 5 – Limiting Reactants (12)  
Day 6 – Percent Yield and Energy (14), (15)  
Day 7 – QUIZ: Ideal Stoichiometry  
Day 8 – LAB: Stoichiometry (3)  
Day 9 – Work Day (10), (16), (17), (18), (19)  
Day 10 – S'mores Lab (1), (18)  
Day 11 – QUIZ: Stoichiometry 2  
Day 12 – LAB: Reactions of Copper (4)  
Day 13 – LAB: Reactions of Copper  
Day 14 – LAB: Reactions of Copper