

### Ch. 3: Stoichiometry

#### Avogadro's Number

- **Mole:** a measuring unit
  - 1 mole of atoms =  $6.022 \times 10^{23}$  atoms

#### Counting Atoms Using Moles

- A mole is the **exact number of atoms** present in a sample that weighs the element's atomic weight
  - Ex. 1 mole of Fe =  $6.022 \times 10^{23}$  atoms = 55.847 g
  - Ex. What is the mass in grams of 4.30 moles of Al?  
Molar mass of Al = 26.98 g/mol

$$4.3 \text{ mol Al} \times \frac{26.98 \text{ g}}{1 \text{ mol Al}} = 116 \text{ g of Al}$$

- The molar mass of a molecule is the **sum of the atomic weight** of all the atoms in a molecule
- **Molecular/formula weight:** molar mass of a compound
  - Ex. What is the molar mass of methane gas  $\text{CH}_4$ ?  
Molar mass of carbon = 12.01 g/mol  
Molar mass of hydrogen = 1.01 g/mol

$$\text{Methane} = 12.01 + 4(1.01) = 16.04 \text{ g/mol}$$

#### Percent Composition by Mass

- **Percent Composition:** the percent by mass, of each element in the compound
- **Formula:**
  - % composition of an element =  $\frac{(\# \text{ of atoms of the element}) \times (\text{molar mass of element})}{\text{Molar mass of the compound}} \times 100\%$
  - Ex. Calculate the percent composition by mass of  $\text{C}_3\text{H}_8$   
Molar mass of  $\text{C}_3\text{H}_8$  =  $3(12.01) + 8(1.01) = 44.11 \text{ g/mol}$

$$\% \text{ of C} = \frac{3(12.01)}{44.11} \times 100\% = 81.68\%$$

#### Empirical and Molecular Formula

- **Empirical Formula:** the simplest whole number ratio of element in a composition
  - Does NOT tell the number of atoms in a molecule

#### How to find the Empirical Formula from % mass

##### Part A: Determine Empirical Formula

1. Convert the data from % to grams for each element
2. Convert from grams to moles for each element by dividing atomic mass
3. Divide each value by the smallest of the values and round answers to the nearest whole number

# Chemistry 111 Lab Answers

**C Cleary**



## **Chemistry 111 Lab Answers:**

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Christofield,2023-06-12      **University of Illinois Directory** University of Illinois (Urbana-Champaign campus),1949  
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## Table of Contents Chemistry 111 Lab Answers

1. Understanding the eBook Chemistry 111 Lab Answers
  - The Rise of Digital Reading Chemistry 111 Lab Answers
  - Advantages of eBooks Over Traditional Books
2. Identifying Chemistry 111 Lab Answers
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Chemistry 111 Lab Answers
  - User-Friendly Interface
4. Exploring eBook Recommendations from Chemistry 111 Lab Answers
  - Personalized Recommendations
  - Chemistry 111 Lab Answers User Reviews and Ratings
  - Chemistry 111 Lab Answers and Bestseller Lists
5. Accessing Chemistry 111 Lab Answers Free and Paid eBooks
  - Chemistry 111 Lab Answers Public Domain eBooks
  - Chemistry 111 Lab Answers eBook Subscription Services
  - Chemistry 111 Lab Answers Budget-Friendly Options
6. Navigating Chemistry 111 Lab Answers eBook Formats
  - ePub, PDF, MOBI, and More
  - Chemistry 111 Lab Answers Compatibility with Devices
  - Chemistry 111 Lab Answers Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Chemistry 111 Lab Answers
  - Highlighting and Note-Taking Chemistry 111 Lab Answers
  - Interactive Elements Chemistry 111 Lab Answers
8. Staying Engaged with Chemistry 111 Lab Answers

- Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Chemistry 111 Lab Answers
9. Balancing eBooks and Physical Books Chemistry 111 Lab Answers
- Benefits of a Digital Library
  - Creating a Diverse Reading Collection Chemistry 111 Lab Answers
10. Overcoming Reading Challenges
- Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Chemistry 111 Lab Answers
- Setting Reading Goals Chemistry 111 Lab Answers
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Chemistry 111 Lab Answers
- Fact-Checking eBook Content of Chemistry 111 Lab Answers
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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