



The Mole Concept

Content Objective:

I can calculate percent composition.

Criteria for Success:

I can determine the molar mass of an individual element in a compound.

I can determine the molar mass of an entire compound.

I can use the molar mass of an individual element in a compound and the molar mass of an entire compound to calculate the percentage composition of a given chemical compound.

Notes

Percent Composition

A. _____ is the percent by mass of each element in a compound.

1. According to the law of _____, the molar ratio of elements in a specific compound is constant, regardless of the compound's source or method of preparation.
2. To determine the mass percent of an element in a compound, determine the total mass contributed from the individual element and then divide it by the total mass of the ENTIRE compound.

Guided Practice

1. Find the percentage composition of copper (I) sulfide.

2. As some salts crystallize from a water solution, they bind water molecules in their crystal structure. Sodium carbonate forms such a hydrate, in which 10 water molecules are present for every formula unit of sodium carbonate. Find the mass percentage of water in sodium carbonate decahydrate, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, which has a molar mass of 286.14g/mol.

m m of →

$\frac{\text{part}}{\text{whole}} \times 100 =$

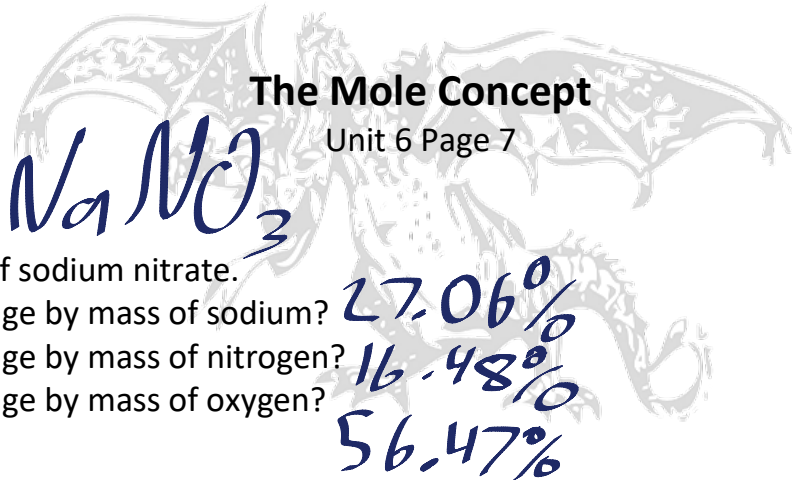
$\frac{10\text{H}_2\text{O}}{\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}} \times 100 =$

62.9%

$\frac{180}{286.14} \times 100 =$

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Independent Practice

1-3. Calculate the percentage of sodium nitrate.

1. What is the percentage by mass of sodium? 27.06%
2. What is the percentage by mass of nitrogen? 16.48%
3. What is the percentage by mass of oxygen? 56.47%

4. What is the mass percentage of water in the hydrate $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?

$$\frac{5\text{H}_2\text{O}}{\text{CuSO}_4 \cdot 5\text{H}_2\text{O}} \times 100 = 36.06\%$$

5-6. Zinc chloride is 52.02% chlorine by mass.

5. What mass of chlorine is contained in 80.3g of zinc chloride?
6. How many moles of chlorine is this?

$$80.3 \times 0.5202 = 41.77\text{g} \times \frac{1 \text{ mol}}{35.45 \text{ g}} = 1.18 \text{ mol}$$

Oreo Cookie Challenge

Imagine that a single oreo cookie represents one molecule of the covalent compound dicookie monostuffide. Use the information provided below about the formula for this compound and the mass measurements that you collect to complete the data table about percent composition below

Chemical Formula for dicookie monostuffide = Co_2St

Co=cookie
St=stuffing

Data table 1: Percent composition of dicookie monostuffide

Element	Mass of One Atom of Element	Number of Atoms in One Molecule of the Compound	Total Mass Contributed to molecule from Element	Total Mass of Compound	% Composition of Each Element in Compound
Co					
St					