

7-3 Using Chemical Formulas

Formula mass – sum of atomic masses for all atoms in a compound, molecule, or ion (amu).

Molar Mass – Same number as formula mass but in g / mol
(Mass is often called weight, molar mass usually reported)

Find Formula mass and Molar mass of H₂O

H → 1.0 amu or g/mol

O → 16.0 amu or g/mol

Formula mass

H₂O → 2H + 1O → 2*(1.0 amu) + 16.0 amu = 18 amu

Molar mass

18 g / mol

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Find molar mass (molecular weight) of CO₂

C O₂
12.0 g/mol + 2*(16.0 g/mol)
12.0 g/mol + 32.0 g/mol

44.0 g/mol

Find molar mass of H₂SO₄

H₂ S O₄
2*(1.0 g/mol) + 32.1 g/mol + 4*(16.0 g/mol)
2 g/mol + 32.1 g/mol + 64.0 g/mol

128.1 g/mol

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Using Molar Mass to convert grams to moles

How many moles of CO₂ are in a 100.0 g sample?

I need to use...

Molar mass of CO₂ → 44.0 g/mol

$$100.0 \text{ g CO}_2 \left(\frac{1 \text{ mole CO}_2}{44.0 \text{ g CO}_2} \right) = 2.27 \text{ moles CO}_2$$

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Find number of molecules, formula units, ions, and atoms

How many molecules of CO₂ are in a 5 mole sample?

$$5 \text{ mol CO}_2 \left(\frac{6.02 \times 10^{23}}{1 \text{ mol}} \right) = 3.01 \times 10^{24} \text{ molecules CO}_2$$

How many atoms are in a 5 mole sample of CO₂?

$$3.01 \times 10^{24} \text{ molecules} \left(\frac{3 \text{ atoms}}{1 \text{ molecule}} \right) = 9.03 \times 10^{24} \text{ atoms}$$

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Percentage Composition

Find percentage of an element in a compound...

$$\frac{\text{Mass of element in compound}}{\text{Mass of compound}} \times 100 = \% \text{ element}$$

To create a 100 g sample of CO₂, 72.7 g of oxygen is needed. What is the percentage of oxygen in CO₂?

$$\frac{72.7 \text{ g O}}{100.0 \text{ g CO}_2} \times 100 = 72.7\%$$

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7-3 Using Chemical Formulas

Percentage Composition

Find percentage of an element in a compound...

$$\frac{\text{mass of element in 1 mole of compound}}{\text{molar mass of compound}} \times 100 = \% \text{ element}$$

What is the percentage of oxygen in CO₂?

$$\frac{32.0 \text{ g O}}{44.0 \text{ g CO}_2} \times 100 = 72.7\%$$

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