

## Mass to Mole and Mole to Mass Calculations

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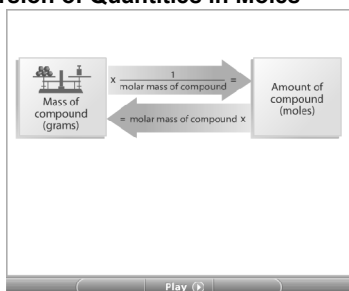
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### Visual Concepts

#### Conversion of Quantities in Moles



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### Dimensional Analysis

- What are the dimensions of a chemical reaction?
  - grams (g)
  - moles (mol)
  - kilograms (kg)
  - moles (mol)
  - liters (L)
  - moles (mol)
  - milliliters (ml)

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Calculations

*use molar mass*      *use Avogadro's number*  
*conversion factors*    *conversion factors*

**Grams** ↔ **Moles** ↔ **Atoms**

**Everything must go through  
Moles!!!**

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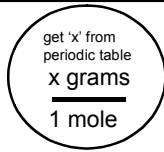
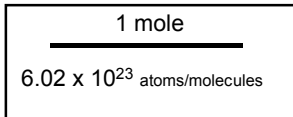
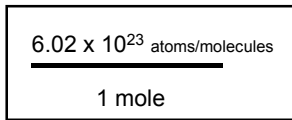
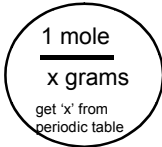
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**Conversion Factors**




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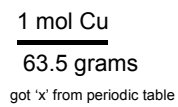
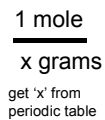
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**Conversion Factors**

To convert grams to moles  
Using dimensional analysis

$$15 \text{ grams of Cu} \times \frac{1 \text{ mol Cu}}{63.5 \text{ grams}} = ? \text{ mol Cu}$$




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### Dimensional Analysis

- So how what do you do with it?

$$\frac{15 \text{ grams of Cu}}{1} \times \frac{1 \text{ mol Cu}}{63.5 \text{ grams}} = .236 \text{ mol Cu}$$

Multiply across the top  $\frac{15 \times 1}{63.5} = .236$   
and divide by the bottom

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### Dimensional Analysis

**Let's Practice!**

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### Conversion Factors

To convert moles to grams  
Using dimensional analysis

$$\frac{2.5 \text{ mol of Cu}}{1} \times \frac{63.5 \text{ g of Cu}}{1 \text{ mol Cu}} = ? \text{ g Cu}$$

$\frac{x \text{ grams}}{1 \text{ mole}}$   
get 'x' from  
periodic table

$\frac{63.5 \text{ grams}}{1 \text{ mol Cu}}$   
got 'x' from periodic table

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**Dimensional Analysis**

- So how what do you do with it?

$$\frac{2.5 \text{ mol of Cu}}{1} \times \frac{63.5 \text{ g}}{1 \text{ mol Cu}} = 158.75 \text{ g Cu}$$

Multiply across the top  $\frac{2.5 \times 63.5}{1} = 158.75$   
and divide by the bottom 1

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**Dimensional Analysis**

**Let's Practice!**

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**Conversion Factors**

$$\frac{6.02 \times 10^{23} \text{ atoms/molecules}}{1 \text{ mole}}$$

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**Conversion Factors**

$$\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ atoms/molecules}}$$

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**How many atoms of Cu are present in 35.4 g of Cu?**

$$\frac{35.4 \text{ g Cu}}{63.5 \text{ g Cu}} \times \frac{1 \text{ mol Cu}}{1 \text{ mol Cu}} \times \frac{6.02 \times 10^{23} \text{ atoms Cu}}{1 \text{ mol Cu}}$$

$$= 3.4 \times 10^{23} \text{ atoms Cu}$$

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**Conversion Factors**

get 'x' from periodic table

$$\frac{x \text{ grams}}{1 \text{ mole}}$$

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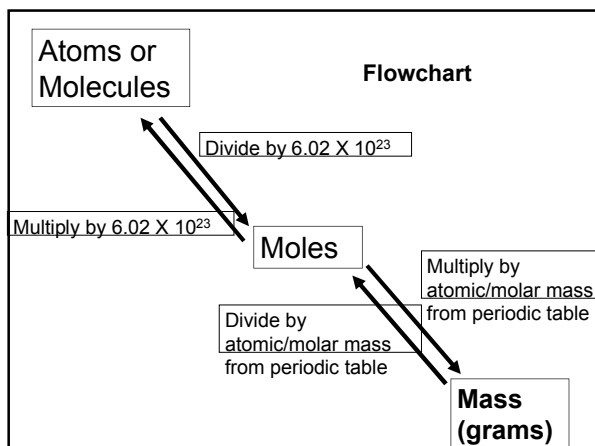
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Atoms/Molecules and Grams

**How many atoms of Cu are present in 35.4 g of Cu?**



35.4 g Cu	$\frac{1 \text{ mol Cu}}{63.5 \text{ g Cu}}$	$\frac{6.02 \times 10^{23} \text{ atoms Cu}}{1 \text{ mol Cu}}$
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**= 3.4 X 10<sup>23</sup> atoms Cu**

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Learning Check!

**What is the mass (in grams) of 1.20 X 10<sup>24</sup> molecules of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)?**



$1.20 \times 10^{24} \text{ molecules-C}_6\text{H}_{12}\text{O}_6$	$\frac{1 \text{ mol C}_6\text{H}_{12}\text{O}_6}{6.02 \times 10^{23} \text{ molecules-C}_6\text{H}_{12}\text{O}_6}$	$\frac{180. \text{ g C}_6\text{H}_{12}\text{O}_6}{1 \text{ mol-C}_6\text{H}_{12}\text{O}_6}$
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**= 358.8 g C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>**

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