

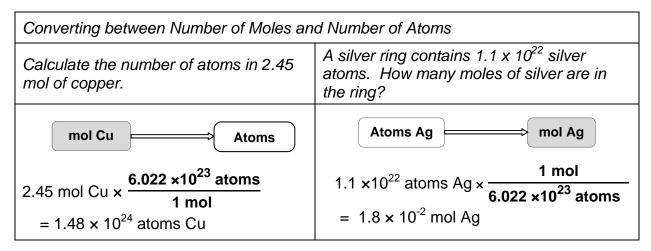
Mole & Molar Mass

Mole (mol): the amount of material counting 6.02214×10^{23} particles

The value of the mole is equal to the number of atoms in exactly 12 grams of pure carbon-12.

- 12.00 g C-12 = 1 mol C-12 atoms = 6.022×10^{23} atoms
- The number of particles in 1 mole is called Avogadro's Number (6.0221421 x 10²³).

$$\frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mol}}$$
 or $\frac{1 \text{ mol}}{6.022 \times 10^{23} \text{ atoms}}$

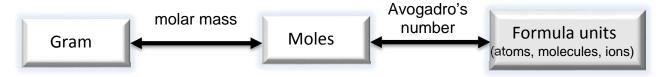


Molar Mass: the mass of 1 mol of atoms of an element

An element's molar mass in g/mol is numerically equal to the element's atomic mass in amu.

$$\frac{1 \text{ mol C}}{12.01 \text{ g C}} \text{ or } \frac{12.01 \text{ g C}}{1 \text{ mol C}}$$

Converting between Mass and Number of Moles	Converting between Mass and Number of Atoms
Calculate the moles of carbon in 0.0265 g of pencil lead.	How many aluminum atoms are in a can weighing 16.2 g?
g C mol C	g Al mol Al atoms Al
$0.0265 \text{ g C} \times \frac{1 \text{ mol C}}{12.01 \text{ g C}}$	$16.2 \text{ gAt} \times \frac{1 \text{ motAl}}{26.98 \text{ gAt}} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mol}}$
$= 2.21 \times 10^{-3} \text{ mol C}$	$= 3.62 \times 10^{23}$ atoms Al



Practice Problems

- 1. How many atoms are there in each of following?
 - (a) 3.75 moles of silver
 - (b) 2.36 moles of xenon
 - (c) 158 kg of phosphorus
- 2. What is the amount, in moles, of each of the following?
 - (a) 449 g of potassium
 - (b) 11.8 g of Ar
 - (c) 2.16 x 10²⁴ atoms of lead
- 3. What is the mass of each of the following?
 - (a) 1.9×10^{24} atoms of Pb (in g)
 - (b) 4.87×10^{25} atoms of Zn (in kg)
 - (c) 2.33 x 10²⁰ atoms of oxygen (in ng)
- 4. How many molecules are in 2.50 moles of CO₂?
- 5. Calculate the mass , in grams, of 0.433 mol of calcium nitrate.

Hint: Formula Weight of $Ca(NO_3)_2 = (AW \text{ of } Ca) + 2(AW \text{ of } N) + 6 (AW \text{ of } O)$

6. Calculate the number of H atoms in 0.350 mol of C₆H₁₂O₆

References:

Tro, Chemistry: A Molecular Approach 2nd ed., Pearson Brown/LeMay/Bursten, Chemistry: The Central Science, 12th ed., Pearson

1. (a) 2.26 × 10^{24} silver atoms; (b) 1.42 × 10^{24} xenon atoms (c) 3.07 × 10^{27} phosphorus atoms **2.** (a) 11.5 moles; (b) 0.295 moles Ar; (c) 3.59 moles **3.** (a) 0.50×10^{24} g; (b) 5.29 kg; (c) 6.19 × 0.50×10^{24} H atoms **4.** 1.51 x 0.50×10^{24} atoms