Counting Atoms

Mg burns in air (O₂) to produce white magnesium oxide, MgO.

How can we figure out how much oxide is produced from a given mass of Mg?

Counting Atoms

• Chemistry is a quantitative science—we need a “counting unit.”
• The MOLE
• 1 mole is the amount of substance that contains as many particles (atoms, molecules) as there are in 12.0 g of ¹²C.

Particles in a Mole

Avogadro’s Number
Amedeo Avogadro
1776-1856
6.0221367 x 10²³

There is Avogadro’s number of particles in a mole of any substance.

Molar Mass

1 mol of ¹²C
= 12.00 g of C
= 6.022 x 10²³ atoms of C
12.00 g of ¹²C is its MOLAR MASS
Taking into account all of the isotopes of C, the molar mass of C is 12.011 g/mol

PROBLEM: How many moles are represented by 0.200 g of Mg? How many atoms?
Mg has a molar mass of 24.3050 g/mol.

0.200 g • 1 mol
24.31 g
= 8.23 x 10⁻³ mol

How many atoms in this piece of Mg?

8.23 x 10⁻³ mol • 6.022 x 10²³ atoms
1 mol
= 4.95 x 10²¹ atoms Mg