
Chapter 6

Calculations:

Formula Masses, Moles, and Chemical Equations

Diamond is a covalent compound with many carbon atoms

→ **CO 6.1**
Close-up of cut diamonds



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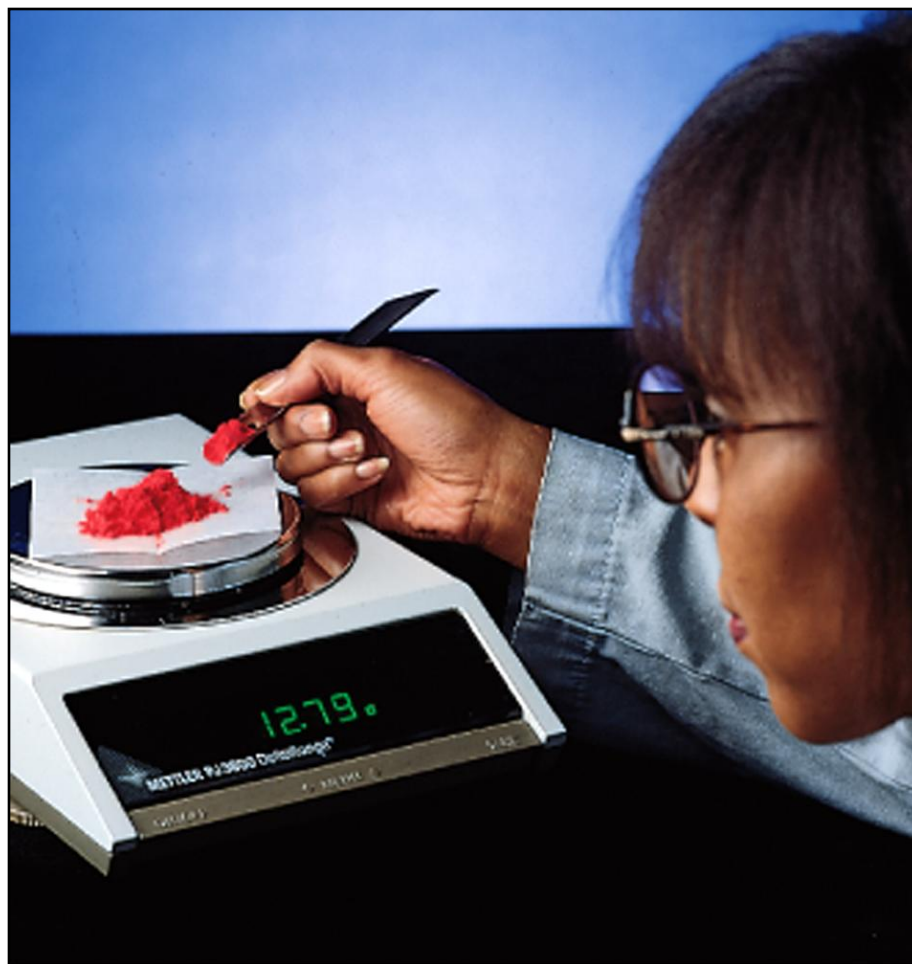
Molar mass: The mass units



← Fig. 6.1
Oranges may be bought in units of mass or units of amount.

First chemical compound need to be weighed

→ Fig. 6.2
A basic process in chemical laboratory work is determining the mass of a substance.



Mole is a counting unit used by chemists



← Fig. 6.3
**Everyday counting
units.**

Unlike a dozen Avogadro's number is large: 6.0022×10^{23}

→ Fig. 6.4

Amadeo Avogadro was the first scientist to distinguish between atoms and molecules.



Edgar Fahs Smith Collection, University of Pennsylvania

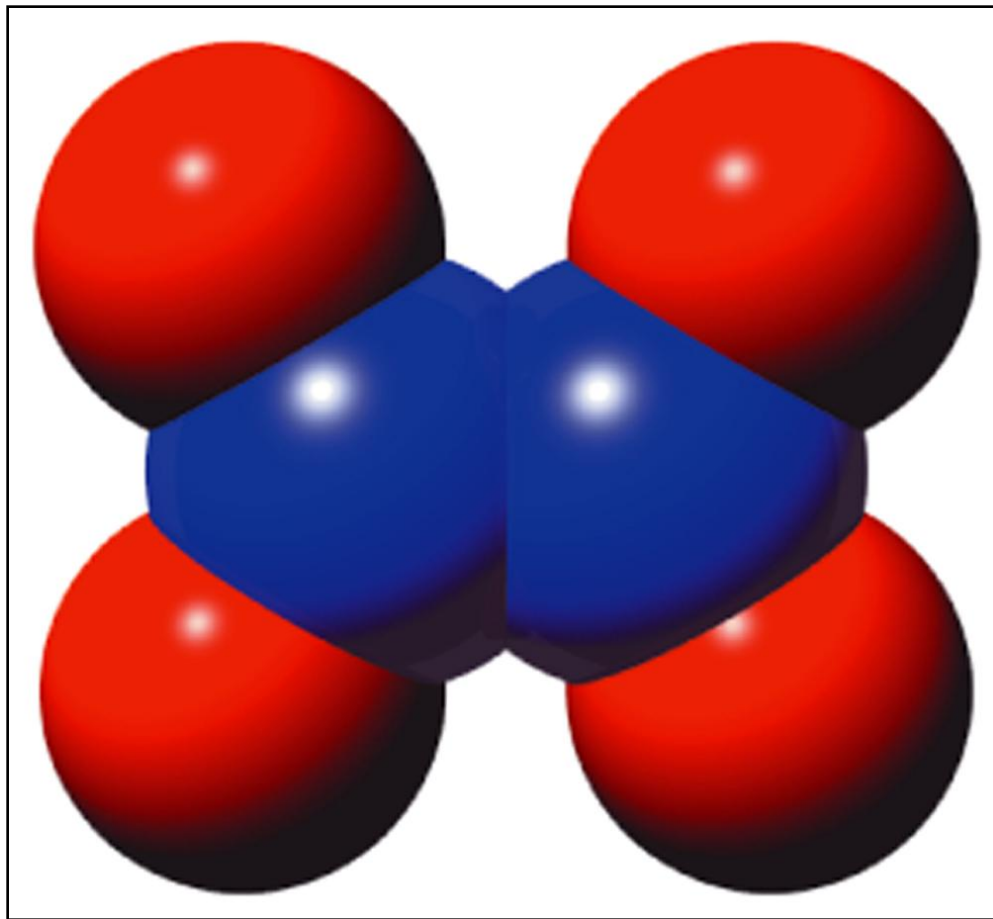
Formula Masses in grams gives a Mole of a chemical compound



Fig. 6.5

The mass of a mole depends on the substance.

To get the Formula Masse first find the types of atoms in the compound



← Fig. 6.6
**A computer-generated
model of the molecular
compound N_2O_4 .**

Moles multiplied by Avogadro's number gives number of atoms and molecules

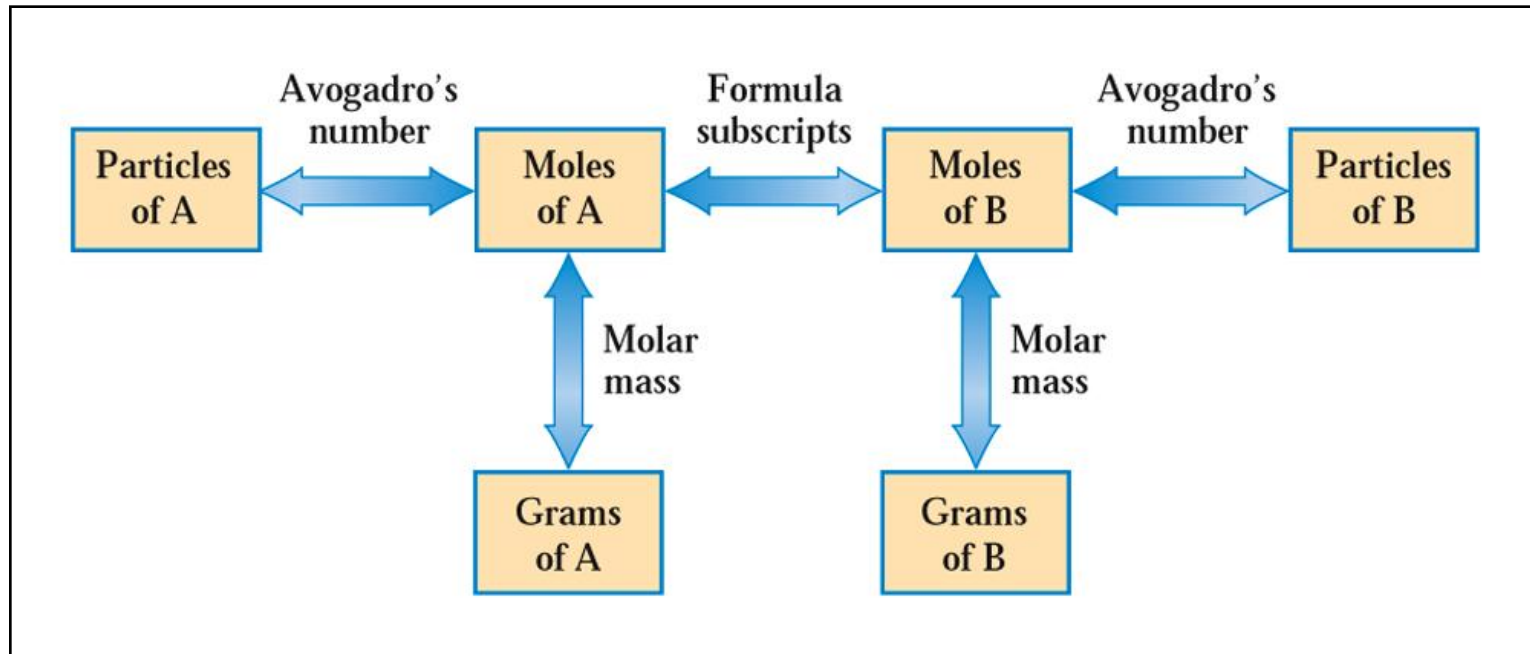


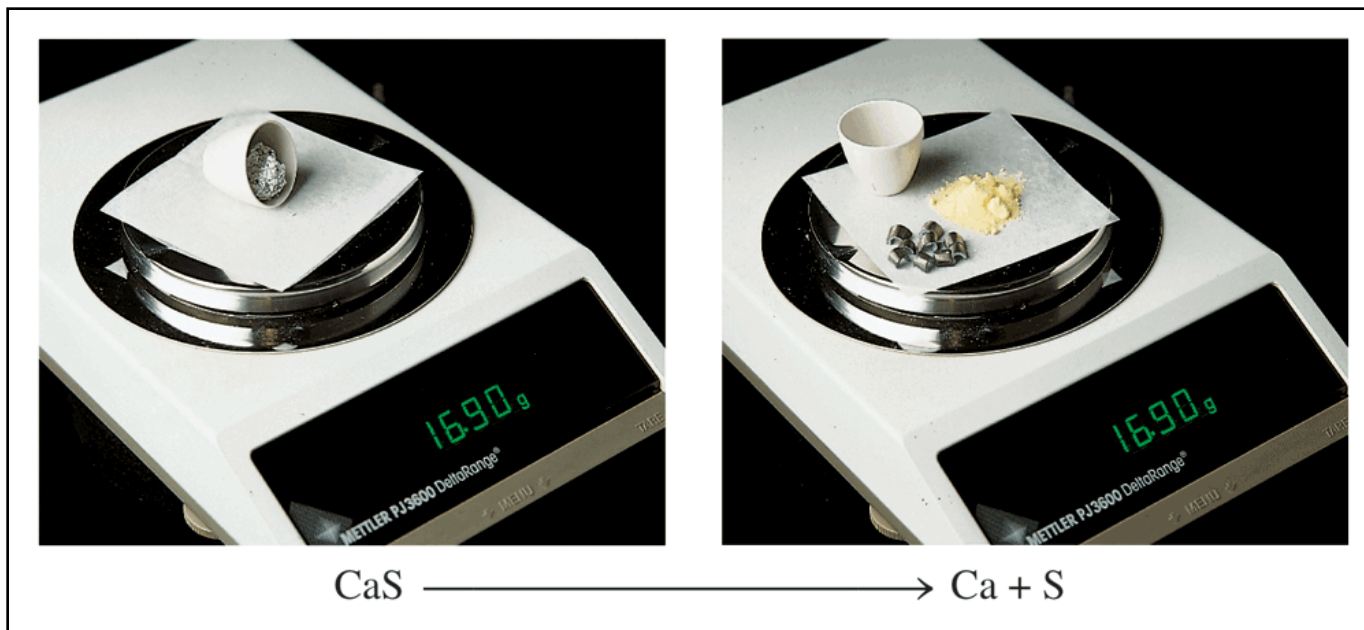
Fig. 6.7

In solving chemical-formula-based problems, the only “transitions” allowed are those between quantities (boxes) connected by arrows.

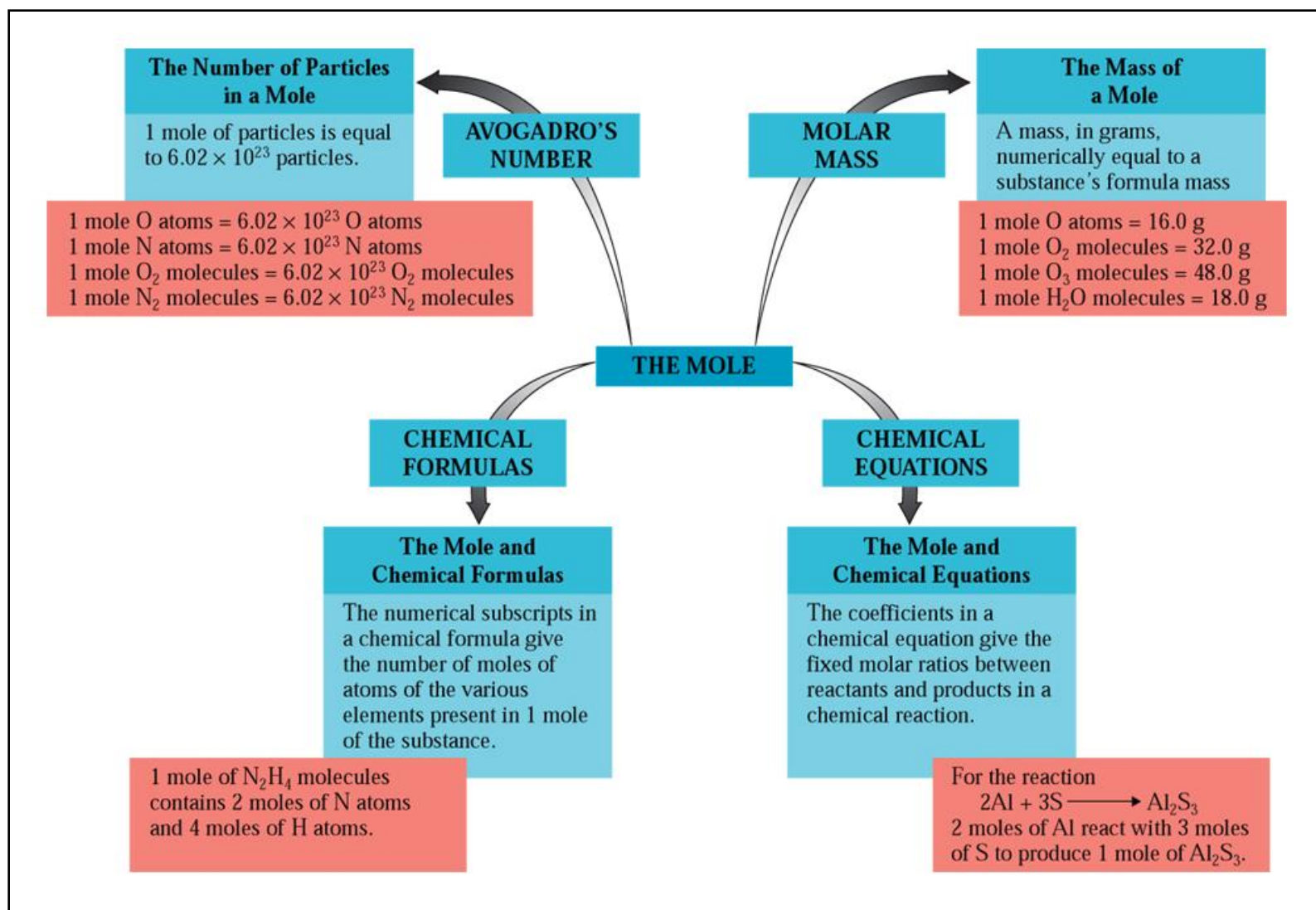
Law of conservation of mass/atoms

Fig. 6.8

When 16.90g of the compound CaS is decomposed into its constituent elements, the Ca and S produced has an identical mass of 16.90g.



Conversion factors in chemical calculations: Stoichiometry



→ CAG 6.1

Mole conversion to grams and particles

- Moles multiplied by Avogadro's number gives number of atoms and molecules(**mole x N = particles**)
- Mole multiplied formula mass gives grams. (**mole x F.M. = grams**)
- Grams divided by formula mass gives moles. (**grams ÷ F.M. = mole**)

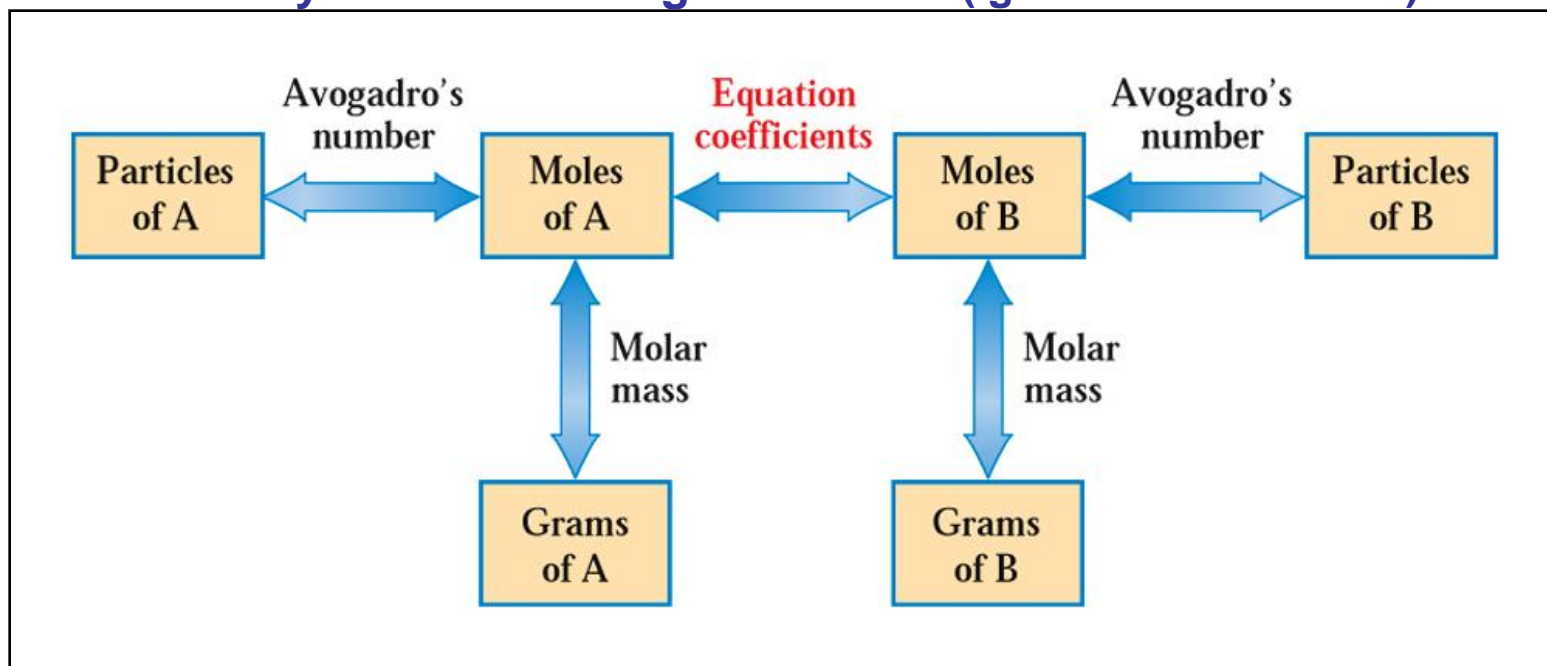


Fig. 6.9 In solving chemical-equation-based problems, the only “transitions” allowed are those between quantities (boxes) connected by arrows.

What does 16-20-0 means in fertilizer?

NITROGEN 16.0% PHOSPHATE 20.0%

→ CC 6.1



Air bag should have right amount reactants to produce gas or baby will crush.



Courtesy of Daimler Chrysler Corporation

← Fig. 6.10
**Testing apparatus for
measuring the effects
of air bag deployment.**