Chapter 6

Calculations:
Formula Masses, Moles, and Chemical Equations

Diamond is a covalent compound with many carbon atoms

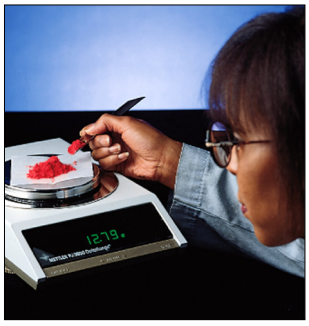
→ **CO 6.1**
Close-up of cut diamonds

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}

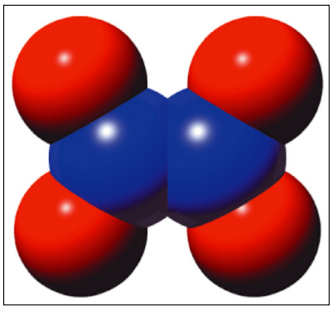
→ Fig. 6.4
Amadeo Avogadro was the first scientist to distinguish between atoms and molecules.

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

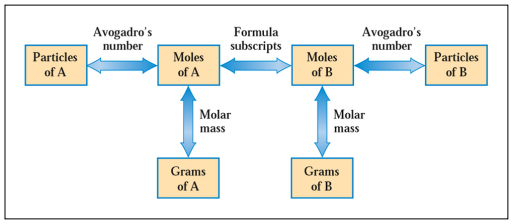
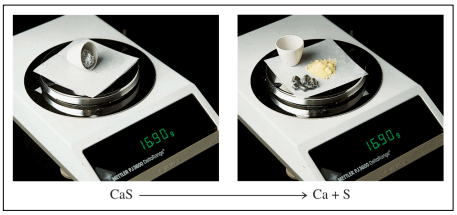


Fig. 6.7
In solving chemical-formula-based problems, the only "transitions" allowed are those between quantities (boxes) connected by arrows.

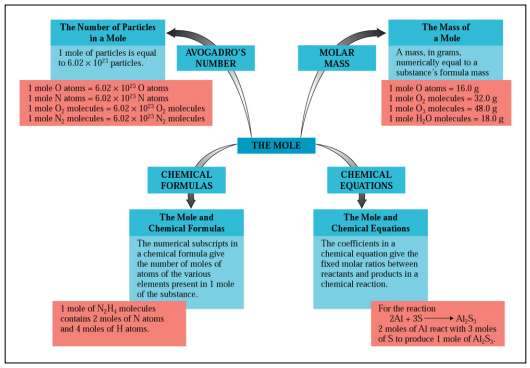
Law of conservation of mass/atoms

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)**

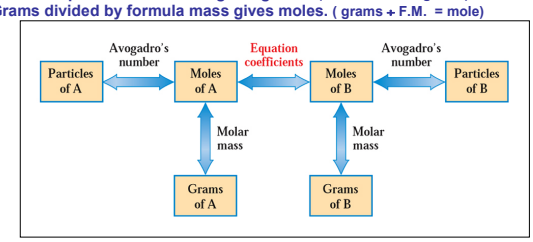


Fig. 6.9 **In solving chemical-equation-based problems, the only "transitions" allowed are those between quantities (boxes) connected by arrows.**

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.