

Elements and Molecules

Intro: All matter is made of atoms and there is a limited number of different types of atoms (elements). Molecules are composed of specific combinations of atoms. Different molecules can be made up of different elements or the same elements in differing proportions.

27	28
Co	Ni
58.93	58.69

↑
Any pure sample of Co will always have same Avg atomic mass

↑
Any pure sample of Ni will have same Avg atomic mass

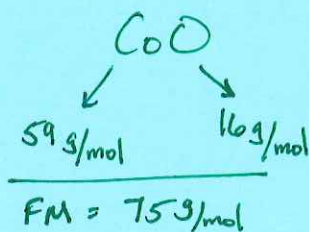
→ This fact allows us to test samples for purity!

↙ ↘
True for both % of atomic structure of each element

Molecules

Ⓚ Atoms Combine in whole # ratios to make molecules Ⓚ

Cobalt (II) oxide



* Mass proportions of Cobalt to Oxygen will ALWAYS be the same for any pure sample of CoO

* Since each atom in CoO has ~~the~~ constant avg atomic mass the mass ratios will also be constant

Law of Definite Proportions

$$\frac{16 \text{ g O}}{75 \text{ g Sample}} = 21\% \text{ O}$$

$$\frac{59 \text{ g Co}}{75 \text{ g Sample}} = 79\% \text{ Co}$$

% Composition by Mass

If % Composition by mass for CoO anything But 21% O, 79% Co we know sample is not pure!

* We use % Composition by mass to determine purity of substances

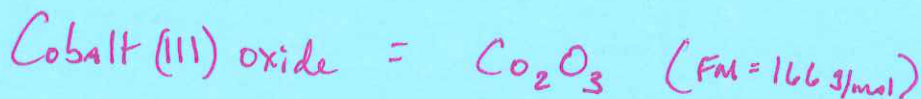
? Will All Cobalt & Oxygen Compounds be the same? ?

Remember: Same elements can sometimes combine in different ratios

BUT they will form DIFFERENT molecules

↳ For different molecules % Composition by mass will be different!

Law of Multiple Proportions



$$\frac{48 \text{ g O}}{166 \text{ g Sample}} = 29\% \text{ by mass O}$$

$$\frac{118 \text{ g Co}}{166 \text{ g Sample}} = 71\% \text{ by mass Co}$$

% Composition different BUT elements still combine in whole # ratios!

Elements/Molecules can be combined to form Mixtures



Because of constant masses based on atomic structure



Can still use % Composition by mass data to determine how much of mixture is a particular substance