

Determining the empirical formula from experimental data

A formula and chemical equation show:

The numbers and kinds of atoms

The ratio of the different kinds of atoms/particles

The mole ratios of the reactants and products

It does NOT tell you the grams – just ratios in moles!

Example:

What is the empirical formula for Iron Oxide? Fe_xO_y

Iron + Oxygen \rightarrow Iron ? Oxide

Mass of crucible/cover	10.00 g.
Mass of cruc/cover/iron	15.50 g.
Mass of iron	_____ g.

Mass of oxide/cruc/cover	17.00 g.
Mass of oxide	_____ g.
Mass of oxygen used	_____ g.

Now you know how many grams of iron and how many grams of oxygen went into the making of the iron ? oxide. The problem is that the formula doesn't show exact masses but mole ratios which are related to mass ratios. You will have to look at the periodic table to see how much a mole of each weighs! (= atomic mass in grams)

_____ g. of Iron = _____ moles of iron

_____ g. of oxygen = _____ moles of oxygen

Formulas don't have parts of atoms – they are whole numbers so we must convert these ratios (if not nice whole numbers) to whole numbers.

_____ moles of iron: _____ oxygen (from above)

To do this, simply divide by the smallest number of moles present. Round off to the nearest whole number.

What is the formula for the Iron Oxide? _____

What is its name (with the Roman numeral)? _____

More problems to try: (We'll make it simpler by not including the crucible and cover data)

1. When 100.00 grams of fat is decomposed into its elemental components, the following information was determined: 76.50 g of carbon, 12.20 g. of Hydrogen, 11.3 g of oxygen.
What is the formula for the fat?
2. Calculate the empirical formula of the compound that contains 1.0 g S for each 1.5 g O.
3. What is the empirical formula of a compound if a 50.0 g sample of it contains 9.1 g Na, 20.6 g Cr, and 22.2 g O?