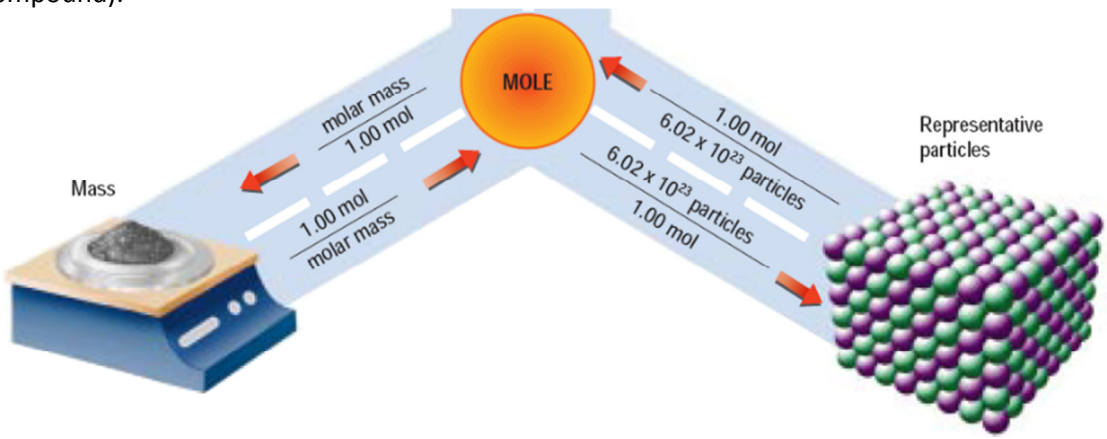
Mole Conversions with Compounds Name Key - Mr. Sudbury

We previously studied mole conversions using individual atoms. The mole concept also applies to formulas. One mole of any compound is equal to 6.022 x 10^{23} particles (*formula units* for ionic compounds, or *molecules* for covalent compounds.) You can also find the mass of a mole of a compound by calculating the gram formula mass (AKA molar mass of the compound).



Show all work on separate paper: *(Hint: The gram formula masses of these compounds are on your "counting atoms & Gram Formula Mass" assignment.)*

1. Find the number of moles in each of the following masses. *Answer to the correct amount of sig figs.*

   a. 64.1 g of Fe_2O_3
   GFM = 160 g/mol

   $$64.1\ g\ Fe_2O_3 \left| \frac{1\ mol\ Fe_2O_3}{160\ g/mol\ Fe_2O_3} \right. = 0.401\ mol\ Fe_2O_3$$

   b. 78.1 g of $CaCl_2$
   GFM = 110 g/mol

   $$78.1\ g\ CaCl_2 \left| \frac{1\ mol\ CaCl_2}{110\ g/mol\ CaCl_2} \right. = 0.710\ mol\ CaCl_2$$

   c. 546 g of K_2SO_3
   GFM = 158 g/mol

   $$546\ g\ K_2SO_3 \left| \frac{1\ mol\ K_2SO_3}{158\ g/mol\ K_2SO_3} \right. = 3.46\ mol\ K_2SO_3$$

   d. 35.2 g of H_2O_2
   GFM = 34 g/mol

   $$35.2\ g\ H_2O_2 \left| \frac{1\ mol\ H_2O_2}{34\ g/mol\ H_2O_2} \right. = 1.04\ mol\ H_2O_2$$

2. Find the mass of each of the following compounds given the quantity in moles:

   a. 1.22 mol potassium permanganate ($KMnO_4$) GFM = 158 g/mol

   $$1.22\ mol\ KMnO_4 \left| \frac{158\ g\ KMnO_4}{1\ mol\ KMnO_4} \right. = 193\ g\ KMnO_4$$

   b. 2.44 mol Potassium nitrate (KNO_3) GFM = 101 g/mol

   $$2.44\ mol\ KNO_3 \left| \frac{101\ g\ KNO_3}{1\ mol\ KNO_3} \right. = 246\ g\ KNO_3$$

c. 14.5 mol aluminum sulfate ($Al_2(SO_4)_3$) GFM = 342 g/mol

$$14.5 \text{ mol } Al_2(SO_4)_3 \left| \frac{342 \text{ g } Al_2(SO_4)_3}{1 \text{ mol } Al_2(SO_4)_3} \right. = 4960 \text{ g } Al_2(SO_4)_3$$

d. 9.37 x 10^{-2} mol copper(II) nitrate ($Cu(NO_3)_2$) GFM = 188 g/mol

= 0.0937

$$0.0937 \text{ mol } Cu(NO_3)_2 \left| \frac{188 \text{ g } Cu(NO_3)_2}{1 \text{ mol } Cu(NO_3)_2} \right. = 17.6 \text{ g } Cu(NO_3)_2$$

3. Find the number of moles: 1 mol = 6.022×10^{23} particles

a. 3.01 x 10^{23} ammonium bromide particles (NH_4Br)

$$3.01 \times 10^{23} \text{ } NH_4Br \text{ particles} \left| \frac{1 \text{ mol } NH_4Br}{6.022 \times 10^{23} \text{ } NH_4Br \text{ particles}} \right. = 0.500 \text{ mol } NH_4Br$$

b. 8.08 x 10^{22} molecules of C_2H_6

$$8.08 \times 10^{22} \text{ molecules } C_2H_6 \left| \frac{1 \text{ mol } C_2H_6}{6.022 \times 10^{23} \text{ molecules } C_2H_6} \right. = 0.135 \text{ mol } C_2H_6$$

c. 7.41 x 10^{23} sodium chloride (NaCl) formula units.

$$7.41 \times 10^{23} \text{ particles NaCl} \left| \frac{1 \text{ mol NaCl}}{6.022 \times 10^{23} \text{ NaCl particles}} \right. = 1.23 \text{ mol NaCl}$$

d. 200.0 g sodium chloride (NaCl) GFM: 58 g/mol

$$200.0 \text{ g NaCl} \left| \frac{1 \text{ mol NaCl}}{58 \text{ g NaCl}} \right. = 3.448 \text{ mol NaCl}$$

4. Find the number of particles, molecules, or formula units: Remember: 1 mol of ANYTHING = 6.022×10^{23} of that "thing."

a. 1.004 mol sodium acetate ($NaC_2H_3O_2$)

$$1.004 \text{ mol } NaC_2H_3O_2 \left| \frac{6.022 \times 10^{23} \text{ } NaC_2H_3O_2 \text{ particles}}{1 \text{ mol } NaC_2H_3O_2} \right. = 6.05 \times 10^{23} \text{ } NaC_2H_3O_2 \text{ particles}$$

b. 2.5 mol potassium sulfite (K_2SO_3)

$$2.5 \text{ mol } K_2SO_3 \left| \frac{6.022 \times 10^{23} \text{ } K_2SO_3 \text{ particles}}{1 \text{ mol } K_2SO_3} \right. = 1.5 \times 10^{24} \text{ } K_2SO_3 \text{ particles}$$

c. 94.0 g NaCl formula units GFM: 58 g/mol

$$94.0 \text{ g NaCl} \left| \frac{1 \text{ mol NaCl}}{58 \text{ g NaCl}} \right| \frac{6.022 \times 10^{23} \text{ NaCl particles}}{1 \text{ mol NaCl}} = 9.76 \times 10^{23} \text{ NaCl particles}$$

d. 69.45 g H_3PO_4 GFM = 98 g/mol

$$69.45 \text{ g } H_3PO_4 \left| \frac{1 \text{ mol } H_3PO_4}{98 \text{ g } H_3PO_4} \right| \frac{6.022 \times 10^{23} \text{ } H_3PO_4 \text{ particles}}{1 \text{ mol } H_3PO_4} = 4.268 \times 10^{23} \text{ } H_3PO_4 \text{ particles}$$