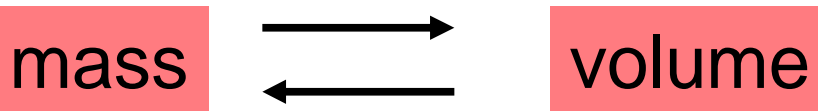


This is a list of the most common relationships used throughout general chemistry calculations. You must know which ideas are related for each and how to use them as conversion factors.

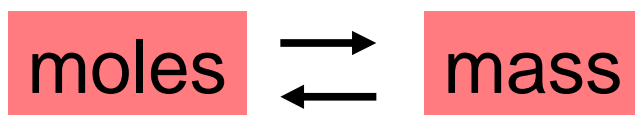
1. Density



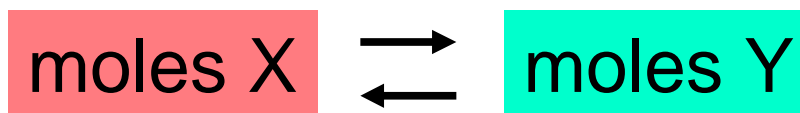
2. Avogadro's Number



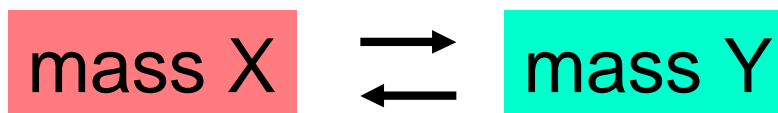
3. Molar mass



4. Stoichiometry

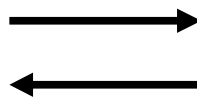


5. Mass percent



1. Density

mass



volume

- convert from mass to volume [Skillbuilder 2.15, p 35](#)

$$0.035 \text{ g} \left(\frac{1 \text{ cm}^3}{0.788 \text{ g}} \right) = 0.044 \text{ cm}^3 \quad (0.035 \text{ g} = 35 \text{ mg})$$

- convert from volume to mass [Skillbuilder Plus, p 35](#)

$$246 \text{ cm}^3 \left(\frac{7.93 \text{ g}}{1 \text{ cm}^3} \right) = 1950 \text{ g} \quad (\text{then to kg})$$

- calculate density directly [Skillbuilder 2.14, p 34](#)

$$\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{9.67 \text{ g}}{0.452 \text{ cm}^3} = 21.4 \text{ g/cm}^3$$

Looks like genuine Pt compared to p 33.

2. Avogadro's Number moles \rightleftharpoons number of things

- convert from moles to number of things [Skillbuilder 6.1, p 156](#)

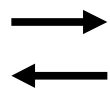
$$8.83 \times 10^{-2} \text{ moles Au} \left(\frac{6.02 \times 10^{23} \text{ Au atoms}}{1 \text{ moles of Au}} \right) = 5.32 \times 10^{22} \text{ Au atoms}$$

- convert from number of things to moles [Problem 20\(a\), p 180](#)

$$4.6 \times 10^{24} \text{ Pb atoms} \left(\frac{1 \text{ mole Pb}}{6.02 \times 10^{23} \text{ Pb atoms}} \right) = 7.6 \text{ mole Pb}$$

3. Molar mass

moles



mass

- convert from moles to mass [Skillbuilder 6.2, p 158](#)

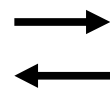
$$2.78 \text{ mol S} \left(\frac{32.07 \text{ g}}{1 \text{ mol S}} \right) = 89.2 \text{ g sulfur}$$

- convert from mass to moles [Skillbuilder 6.4, p 160](#)

$$1.18 \text{ g NO}_2 \left(\frac{1 \text{ mol NO}_2}{46.01 \text{ g NO}_2} \right) = 0.0256 \text{ mol NO}_2$$

4. Stoichiometry

moles X

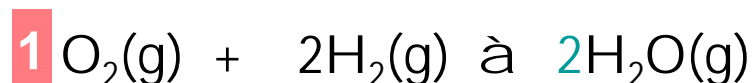


moles Y

- using a compound formula Skillbuilder 6.6, p 163

$$1.4 \text{ mol } \cancel{\text{H}_2\text{SO}_4} \left(\frac{4 \text{ mol O}}{1 \cancel{\text{ mol H}_2\text{SO}_4}} \right) = 5.6 \text{ mol O}$$

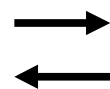
- using a balanced reaction Skillbuilder 8.1, p 236



$$24.6 \text{ mol } \cancel{\text{O}_2} \left(\frac{2 \text{ mol H}_2\text{O}}{1 \cancel{\text{ mol O}_2}} \right) = 49.2 \text{ mol H}_2\text{O}$$

5. Mass percent

mass X



mass Y

- mass of whole to mass of part Skillbuilder 6.8, p 167

$$22 \text{ g NaCl} \left(\frac{39 \text{ g Na}}{100 \text{ g NaCl}} \right) = 8.6 \text{ g Na}$$

- calculating mass percent Skillbuilder 6.9, p 169

$$\text{mass \%} = \left(\frac{\text{mass of part}}{\text{mass of whole}} \right) \times 100 = \left(\frac{2 \times 16.00 \text{ g O}}{60.06 \text{ g acetic acid}} \right) \times 100 = 53.28 \%$$

53.28 % by mass oxygen