Aim: How do chemists specify the concentration of a solution?

Table T**: Molarity & Parts per Million**

Molarity – moles of solute
liter of solution

solution = solute + solvent

Example: salt water = salt + water

Say, "moles per liter".

Demo: preparing **1.0 liter** of a **1.0 Molar NaCl (aq)**

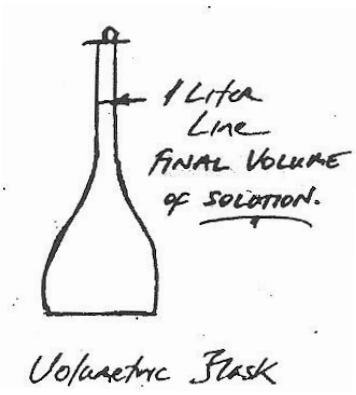
total volume — concentration — solute — water solution

1.0 M = 1.0 mole / 1.0 L

Step 1) NaCl

23 + 35 = 58 g/mole

Weigh 58g NaCl.



2) Transfer it into a volumetric flask.
3) Fill with H_2O to the 1 liter mark.
4) Stopper & shake.

(Note: Since we placed the salt in the flask before adding the water, the combined volume is that of the salt plus the water.)

What if you want less solution? Use a smaller flask, but just keep the same ratio.

1 Mole = 0.5 = 0.25 = 0.1 … etc
1 L 0.5 0.25 0.1

Go to Sample Problems

Chemistry 2\Chille molarity

Molarity = moles of solute / liter of solution

1) Given: **3 moles** of NaOH dissolved in **1.5 L** of solution. Find M.

$M = \frac{mole}{L}$ $M = \frac{3}{1.5}$ $M = 2$

2) Given: **2 moles** of NaOH dissolved in **250 ml** of solution. Find M.

250 mL = 0.25 L

$M = \frac{mole}{L}$ $M = \frac{2}{0.250}$ $M = 8$

3) How many moles of HCl are contained in **5 L** of a **1.5 M** solution?

$M = \frac{mole}{L}$ $\quad 1.5 = \frac{mole}{5}$ $\quad mole = 5(1.5) = 7.5$

4) How many L of a **6 M** solution contains **3 moles** of H_2SO_4?

$M = \frac{mole}{L}$ $\quad 6 = \frac{3}{L}$ $\quad 6(L) = 3$ $\quad L = \frac{3}{6} = 0.5$

5) Given: **147 g** of H_2SO_4 dissolved in **500 ml** of solution. Find M.

500 mL = 0.500 L

H_2SO_4

$2(1) + 32 + 4(16) = 98 \frac{g}{mole}$

$\#\ moles = \frac{given\ mass}{gFM} = \frac{147\ g}{98\ g/mole} = 1.5$

$M = \frac{mole}{L} = \frac{1.5}{0.5}$

$M = 3$

6) How many g of **NaOH** are contained in **750 ml** of **4 M** solution?

750 mL = 0.75 L

NaOH

$23 + 16 + 1 = 40 \frac{g}{mole}$

$M = \frac{mole}{L}$ $\quad 4 = \frac{mole}{0.75}$ $\quad 4(0.75) = mole = 3$

$\#\ moles = \frac{given\ mass}{gFM}$ $\quad 3\ mole = \frac{given\ mass}{40\ g/mole}$ $\quad given\ mass = 120\ g$

7) In what volume must **72 g** of **HCl** be dissolved to make a **4 M** solution?

HCl

$1 + 35 = 36 \frac{g}{mole}$

$\#\ moles = \frac{given\ mass}{gFM}$

$\#\ moles = \frac{72\ g}{36\ g/mole} = 2$

$M = \frac{mole}{L}$ $\quad 4 = \frac{2}{L}$ $\quad 4(L) = 2$ $\quad L = \frac{2}{4} = 0.5$