MOLAR CONCENTRATION

- unit: MOLARITY (M): moles of dissolved substance per LITER of solution

$$M = \text{MOLARITY} = \frac{\text{moles of solute}}{\text{L solution}}$$

6.0 M HCl solution: $\frac{6.0 \text{ mol HCl}}{\text{L}}$

There are 6.0 moles of hydrochloric acid in each liter of this solution, so you can write this relationship another way:

$$6.0 \text{ mol HCl} = 1 \text{ L}$$

If you have 0.250 L (250 mL) of 6.0 M HCl, how many moles of HCl do you have?

$$0.250 \text{ L} \times \frac{6.0 \text{ mol HCl}}{1 \text{ L}} = \boxed{1.5 \text{ mol HCl}}$$

If you need 0.657 moles of hydrochloric acid, how many milliliters of 0.0555 M HCl do you need to measure out?

$0.0555\ \text{mol HCl} = 1\ \text{L}$ $\quad 1\ \text{mL} = 10^{-3}\ \text{L}$

$$0.657\ \text{mol HCl} \times \frac{1\ \text{L}}{0.0555\ \text{mol HCl}} \times \frac{\text{mL}}{10^{-3}\ \text{L}} = 11800\ \text{mL solution}$$

... too large for lab-scale work

What if we used 6.00 M HCl?

$6.00\ \text{mol HCl} = 1\ \text{L}$ $\quad 1\ \text{mL} = 10^{-3}\ \text{L}$

$$0.657\ \text{mol HCl} \times \frac{1\ \text{L}}{6.00\ \text{mol HCl}} \times \frac{\text{mL}}{10^{-3}\ \text{L}} = 110.\ \text{mL}$$

... is a reasonable volume for CHM 100 lab.

You have a 250.g bottle of silver(I) chloride (AgCl). How many moles of AgCl do you have?

g ⟷ mol, need FW

Ag: 107.9 x 1
Cl: 35.45 x 1
143.35 g AgCl = 1 mol AgCl

$$250.\text{g AgCl} \times \frac{1\ \text{mol AgCl}}{143.35\ \text{g AgCl}} = \boxed{1.74\ \text{mol AgCl}}$$

How many moles of NaOH are present in 155 mL of 1.50 M NaOH?

vol ⟷ mol, look for molarity (M)

mL = 10^{-3} L 1.50 mol NaOH = 1 L

$$155\ \text{mL} \times \frac{10^{-3}\ \text{L}}{\text{mL}} \times \frac{1.50\ \text{mol NaOH}}{1\ \text{L}} = \boxed{0.233\ \text{mol NaOH}}$$