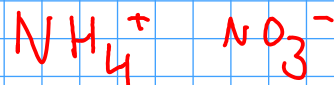


## PERCENTAGE COMPOSITION

- sometimes called "percent composition" or "percent composition by mass"
- the percentage of each element in a compound, expressed in terms of mass

Example: Find the percentage composition of ammonium nitrate.



$$\text{NH}_4\text{NO}_3 : \text{N} : 2 \times 14.01 = 28.02$$

$$\text{H} : 4 \times 1.008 = 4.032$$

$$\text{O} : 3 \times 16.00 = 48.00$$

$$\hline 80.052 \text{ g NH}_4\text{NO}_3 \text{ per mole}$$

$$\% \text{N} = \frac{28.02 \text{ g N}}{80.052 \text{ g NH}_4\text{NO}_3} \times 100\% = 35.0\% \text{N}$$

$$\% \text{H} = \frac{4.032 \text{ g H}}{80.052 \text{ g NH}_4\text{NO}_3} \times 100\% = 5.0\% \text{H}$$

$$\% \text{O} = \frac{48.00 \text{ g O}}{80.052 \text{ g NH}_4\text{NO}_3} \times 100\% = 60.0\% \text{O}$$

So far, we have

- looked at how to determine the composition by mass of a compound from a formula
- converted from MASS to MOLES (related to the number of atoms/molecules)
- converted from MOLES to MASS

Are we missing anything?

- What about SOLUTIONS, where the desired chemical is not PURE, but found DISSOLVED IN WATER?
- How do we deal with finding the moles of a desired chemical when it's in solution?

## MOLAR CONCENTRATION

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

$$M = \text{molarity} = \frac{\text{moles of SOLUTE}}{\text{L SOLUTION}}$$

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

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

↳ "six molar"

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

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

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

$$0.0555 \text{ mol HCl} = 1 \text{ L}$$

$$0.657 \text{ mol HCl} \times \frac{1 \text{ L}}{0.0555 \text{ mol HCl}} = 11.8 \text{ L}$$

What if we used 6.00 M HCl?

$$6.00 \text{ mol HCl} = 1 \text{ L}$$

$$0.657 \text{ mol HCl} \times \frac{1 \text{ L}}{6.00 \text{ mol HCl}} = 0.110 \text{ L}$$

(110 mL)