

working with molecular weights

aka **molar mass** or **molecular mass**. The term is sometimes used interchangeably with “**formula weight**,” though technically it should only be used for molecules, not non-covalent complexes

the molecular weight (MW) of a compound tells you how much 1 mole (6.02×10^{23} copies) of a molecule weighs
it's given in g/mol (or Daltons (Da), where 1 Da=1 g/mol - see note*)
you can use the molecular weight to convert between mol & mass

$$\begin{aligned} \# \text{ mol} &= \text{mass} / \frac{\text{MW}}{\text{mol}} \\ \text{mol} &= \cancel{\text{g}} \times \frac{\text{mol}}{\cancel{\text{g}}} \end{aligned}$$

$$\begin{aligned} \text{mass} &= \text{mol} \times \text{MW} \\ \text{mass} &= \cancel{\text{mol}} \times \frac{\text{g}}{\cancel{\text{mol}}} \end{aligned}$$

this allows you to
calculate how much
to weigh out to
make solutions
and to calculate the
molarity of solutions

$$\begin{aligned} \text{mass needed} &= \text{molarity} \times \text{MW} \times \text{volume} \\ \text{mass} &= \frac{\cancel{\text{mol}}}{\cancel{\text{L}}} \times \frac{\text{g}}{\cancel{\text{mol}}} \times \cancel{\text{L}} \end{aligned}$$

$$\begin{aligned} \text{molarity} &= (\text{mass} / \text{volume}) / \text{MW} \\ \text{molarity} &= \frac{\cancel{\text{g}}}{\text{L}} \times \frac{\text{mol}}{\cancel{\text{g}}} \end{aligned}$$

*when dealing with biological macromolecules like proteins, MW is often given in **Daltons (Da)** or **kiloDaltons (kDa)**

$$1 \text{ Da} = 1 \text{ g/mol}$$

$$1 \text{ kDa} = 1000 \text{ Da} = 1000 \text{ g/mol}$$

you can think of the Da as shorthand so you don't have to write out g/mol
quick estimates: the average amino acid is ~0.1 kDa so a 1000 amino-acid-long protein would have a MW of ~100 kDa; the average DNA nucleotide is ~300 Da, so multiply length of double-stranded in bp by $300 \times 2 = 600$ to get a rough idea of MW