

Concentration Calculations

Convert molarity to mg/ml and mg/ml to molarity

Normally, our concentrations are given in units of milligrams per milliliter (mg/ml), but often data sheet quality assurance data are expressed in molarity (moles per liter, M) or fractions of that — e.g., micromolar (μM , 10^{-6} M) or nanomolar (nM, 10^{-9} M).

Below are calculations to convert between these units. Or visit our website to use online calculators and worksheets.



[ATSBio.com/calculators](https://www.atsbio.com/calculators)

FROM (mg/ml) TO molarity (M)

Divide the concentration (mg/ml) by the molecular weight (Da or mg/mmol). We will use the example of a typical immunotoxin that has a molecular weight of 210 kDa (or 2.1×10^5 mg/mmol) —the molecular weight is usually found on the data sheet — and a common concentration is 1.0 mg/ml.

$$\begin{aligned} \frac{1.0 \text{ mg/ml}}{2.1 \times 10^5 \text{ mg/mmol}} &= 0.48 \times 10^{-5} \text{ mmole/ml} \\ &= 4.8 \times 10^{-6} \text{ mmole/ml} \\ &= 4.8 \mu\text{M} \end{aligned}$$

On the left side, the mg units cancel each other, leaving units of mmole/ml that is equal to moles/liter or molar (M). Therefore, 0.48×10^{-5} mmole/ml = 0.48×10^{-5} M or 4.8×10^{-6} M. This, of course, can be expressed as 4.8 μM , or 4.8 micromolar.

In summary: concentration (grams per liter) \div molecular weight (grams per mole) = moles per liter.

FROM molarity (M) TO (mg/ml)

Multiply the molar concentration (M or moles per liter) by the weight (Da or mg/mmol). We will use the example of an immunotoxin at 1.0 nM concentration (or 1.0×10^{-9} moles per liter) and molecular weight of 210 kDa (or 2.1×10^5 mg/mmol).

$$\begin{aligned} 1.0 \times 10^{-9} \text{ mole/L} \times 2.1 \times 10^5 \text{ g/mole} &= 2.1 \times 10^{-4} \text{ g/L} \\ &= 2.1 \times 10^{-1} \mu\text{g/ml} \\ &= 0.21 \mu\text{g/ml} \end{aligned}$$

On the left side, the mole units cancel each other, leaving units of g/L. Therefore, 2.1×10^{-4} g/L = 2.1×10^{-1} $\mu\text{g/ml}$ = 0.21 $\mu\text{g/ml}$.

In summary: molar concentration (moles per liter) \times molecular weight (grams per mole) = grams per liter.