

Solution preparation & dilution

A concise calculation and bench-planning reference for molar solutions, stock dilutions and unit checks.

Core equations

MOLAR SOLUTION

$$m = C \times V \times M_r$$

m in g; C in mol·L⁻¹; V in L; M_r in g·mol⁻¹.

STOCK DILUTION

$$C_1V_1 = C_2V_2$$

Use consistent volume units. Add solvent to V₂ final volume.

Before you calculate

1 · Define the target

- State concentration and final volume.
- Confirm whether the value is molarity, mass/volume %, volume/volume % or another basis.

2 · Check reagent data

- Use the correct molar mass and hydrate form.
- Account for assay/purity only when your validated procedure requires it.

3 · Convert units

- mL ÷ 1000 = L.
- mg ÷ 1000 = g; µL ÷ 1000 = mL.

4 · Plan the procedure

- Use calibrated glassware appropriate to accuracy needs.
- Record lot, actual mass/volume, date and preparer.

Quick worked checks

0.100 M NaOH, 500 mL
 $m = 0.100 \times 0.500 \times 40.00 = 2.00 \text{ g}$

1.00 M → 0.100 M, 500 mL
 $V_1 = (0.100 \times 500) \div 1.00 = 50.0 \text{ mL}$

Bench workflow & safety checks

The equation gives a quantity. The laboratory workflow determines whether the prepared solution is traceable, safe and fit for use.

Preparation workflow

01 · Review

- Read the approved method, SDS and incompatibilities.
- Choose PPE and engineering controls.

02 · Measure

- Tare correctly and avoid contamination.
- Record actual mass or stock volume, not only the target.

03 · Dissolve / dilute

- Dissolve in less than the final volume where appropriate.
- For corrosive dilution, follow the approved addition order and cooling requirements.

04 · Make to volume

- Allow temperature to equilibrate when volume accuracy matters.
- Bring the meniscus to the mark and mix thoroughly.

05 · Label

- Name, concentration, solvent, date, expiry/retest, hazards and initials.
- Add storage conditions required by the method.

06 · Verify

- Check appearance and calculation independently when required.
- Use analytical verification where concentration is critical.

Common failure modes

Wrong chemical form
Anhydrous and hydrated salts have different molar masses.

Diluent vs final volume
Add solvent to the final mark; do not automatically add V_2 solvent.

Volume basis error
The mass equation requires litres when C is $\text{mol}\cdot\text{L}^{-1}$.

Unrecorded correction
Purity, density or assay corrections must be documented and procedure-based.

SAFETY BOUNDARY

Calculation support is not a laboratory procedure.

This reference does not replace your institution's SOP, risk assessment, SDS, supervision, reagent specification or quality system. Do not prepare or mix chemicals without appropriate training and controls.