Concentration Conversions: % w/w, g/L, Molarity and Normality

Converts a solution concentration between mass per cent (w/w), g/L, molarity (mol/L) and normality (eq/L) from the solute's molar mass and the solution density.

Method: Definitions of concentration units

Input parameters

Unit system: SI

Parameter	Value	Unit
Concentration known as	Mass per cent (w/w)	
Mass fraction of solute (if known)	10.000	%
Molarity (if known)	1.0000	mol/L
Mass per volume (if known)	100.00	g/L
Molar mass of the solute Sulphuric acid 98.08; sodium hydroxide 40.00; hydrochloric acid 36.46.	98.080	kg/kmol
Equivalents per mole (H^+ or OH^- per molecule)	2.0000	
Density of the solution	1,066.0	kg/m³

Calculated results

Parameter	Value	Unit
Mass per cent (w/w)	10.000	%
Mass per volume	106.60	g/L
Molarity	1.0869	mol/L
Normality (eq/L)	2.1737	mol/L

Notes for this case

- The solution density changes with concentration and temperature: take it from a density table for the actual strength.

Formula and method

$$\gamma = w\rho = \frac{cM}{1000}$$

$$c = \frac{1000\,\gamma}{M}, \quad N = c\,z$$

Variables

known	which concentration is known	-
w	mass fraction	-
c	molarity	mol/m³
γ	mass per volume	kg/m³
M	molar mass	kg/kmol
z	equivalents per mole	-
ρ	solution density	kg/m³
N	normality	eq/m³

Method and standards

Mass per volume is mass fraction times solution density; dividing by the molar mass gives molarity; multiplying by equivalents per mole gives normality. SI units are used inside (mol/m³ = mmol/L).

Assumptions and limits

- Density at the solution's actual strength and temperature.

References

- Definitions of concentration units

Report details

Report reference	FCC-PD5H-F6P2 (the same inputs always give the same reference)
Generated	17 November 2026, 19:34 UTC
Calculator	Concentration Conversions: % w/w, g/L, Molarity and Normality
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/chemical/solutions/concentration-conversions

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.