Liquid Diffusivity by Wilke–Chang

Diffusion coefficient of a dilute solute in a liquid from temperature, solvent viscosity and molar mass and the solute's molar volume (Wilke–Chang).

Method: Perry's Chemical Engineers' Handbook; 9th ed. (McGraw-Hill, 2019); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Temperature	25.000	°C
Solvent viscosity	0.89000	cP
Solvent molar mass	18.015	kg/kmol
Solute molar volume at its normal boiling point	59.200	cm³/mol
Association factor of the solvent	Water (2.26)	

Calculated results

Parameter	Value	Unit
Diffusion coefficient at infinite dilution	1.3670e-05	cm²/s

Notes for this case

- Average error about 10 %; poor for water as the solute (Perry's).

Formula and method

$$D^{\circ}_{AB} = \frac{7.4 \times 10^{-8} (\phi_B M_B)^{1/2} T}{\mu_B V_A^{0.6}} \quad (\mathrm{cm^2/s};\ \mu \text{ cP},\ V_A \text{ cm}^3/\mathrm{mol})$$

Variables

T	Temperature	K
μ_B	Solvent viscosity	Pa·s
M_B	Solvent molar mass	kg/kmol
V_A	Solute molar volume at its normal boiling point	m³/mol
ϕ_B	Association factor of the solvent	-
D°_{AB}	Diffusion coefficient at infinite dilution	m²/s

Method and standards

Wilke–Chang correlation.

Assumptions and limits

- Dilute solute; nonelectrolytes.
- The water association factor is Perry's 2.26; the original Wilke–Chang value 2.6 gives a diffusivity about 7 % higher.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 5
- Eq. (5-214) and association factors (water 2.26, methanol 1.9, ethanol 1.5, propanol 1.2)

Report details

Report reference	FCC-PGP7-5NH7 (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Liquid Diffusivity by Wilke–Chang
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/physical-properties/wilke-chang-liquid-diffusivity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.