Freezing Point Depression of a Solution

Freezing point lowering of a dilute solution from molality, van 't Hoff factor and the solvent's cryoscopic constant (water 1.86 K·kg/mol).

Method: ΔT_f = i K_f b (colligative property)

Input parameters

Unit system: SI

Parameter	Value	Unit
Molality of solute	1.0000	mol/kg
van 't Hoff factor	1.0000	
Cryoscopic constant (K·kg/mol) 1.86 for water.	1.8600	
Freezing point of the pure solvent	0	°C

Calculated results

Parameter	Value	Unit
Depression	1.8600	K
Freezing point of the solution	-1.8600	°C

Notes for this case

- Dilute solutions; concentrated glycol and brine follow their own tables.

Formula and method

$$\Delta T_f = i K_f b, \quad T_f = T_0 - \Delta T_f$$

Variables

b	Molality of solute	mol/kg
i	van 't Hoff factor	-
K_f	Cryoscopic constant (K·kg/mol)	-
T_0	Freezing point of the pure solvent	K
ΔT_f	Depression	K
T_f	Freezing point of the solution	K

Method and standards

Colligative property.

Assumptions and limits

- Dilute ideal solution; good to about 1 mol/kg, and a note appears above that. A depression that would reach absolute zero is rejected.

References

- ΔT_f = i K_f b (colligative property)

Report details

Report reference	FCC-39QK-1C5S (the same inputs always give the same reference)
Generated	17 November 2026, 19:48 UTC
Calculator	Freezing Point Depression of a Solution
Method last reviewed	12 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/solutions/freezing-point-depression

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.