Van Laar Activity Coefficients for a Binary Mixture

Activity coefficients of a binary liquid by the van Laar equation from the two end-point constants (ln γ at infinite dilution), with excess Gibbs energy.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Mole fraction of component 1	30.000	%
Van Laar constant A_{12} (= ln $\gamma_1\infty$)	1.6000	
Van Laar constant A_{21} (= ln $\gamma_2\infty$)	0.90000	

Calculated results

Parameter	Value	Unit
Activity coefficient of 1	1.6743	
Activity coefficient of 2	1.1833	
Excess Gibbs energy / RT	0.27243	

Formula and method

$$\ln\gamma_1 = A_{12}\left(\frac{A_{21}x_2}{A_{12}x_1 + A_{21}x_2}\right)^2, \quad \ln\gamma_2 = A_{21}\left(\frac{A_{12}x_1}{A_{12}x_1 + A_{21}x_2}\right)^2$$

Variables

x_1	Mole fraction of component 1	-
A_{12}	Van Laar constant A_{12} (= ln $\gamma_1\infty$)	-
A_{21}	Van Laar constant A_{21} (= ln $\gamma_2\infty$)	-
γ_1	Activity coefficient of 1	-
γ_2	Activity coefficient of 2	-
G^E/RT	Excess Gibbs energy / RT	-

Method and standards

Van Laar equation.

Assumptions and limits

- Positive constants; binary.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 4 (thermodynamics: excess Gibbs energy models)
- van Laar model

Report details

Report reference	FCC-KEH1-F45S (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Van Laar Activity Coefficients for a Binary Mixture
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/separation/van-laar-activity-binary

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.