Relative Volatility from an Equilibrium Point

Relative volatility from one equilibrium x–y pair, and the vapour composition at another liquid composition for that constant α.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Liquid mole fraction (light)	30.000	%
Vapour mole fraction in equilibrium	55.000	%
Another liquid composition	60.000	%

Calculated results

Parameter	Value	Unit
Relative volatility	2.8519	
Vapour at x′ for constant α	81.053	%

Formula and method

$$\alpha = \frac{y(1-x)}{x(1-y)}, \quad y' = \frac{\alpha x'}{1+(\alpha-1)x'}$$

Variables

x	Liquid mole fraction (light)	-
y	Vapour mole fraction in equilibrium	-
x'	Another liquid composition	-
α	Relative volatility	-
y'	Vapour at x′ for constant α	-

Method and standards

Definition of relative volatility for a binary.

Assumptions and limits

- Binary; constant α between the points.
- α below 1 means the component entered as light is the heavier; the page flags it.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 13 (distillation)
- relative volatility definition
- Eq. (13-33)

Report details

Report reference	FCC-9E21-D6SR (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Relative Volatility from an Equilibrium Point
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/relative-volatility-from-xy

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.