Liquid Surface Tension by the Parachor (Macleod–Sugden)

Surface tension of a liquid from its parachor and the liquid and vapour molar densities by the Macleod–Sugden relation σ^¼ = P(ρ_L − ρ_V).

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Parachor (cm³·g^¼/(s^½·mol))	206.00	
Liquid density	876.00	kg/m³
Vapour density	0.30000	kg/m³
Molar mass	78.110	kg/kmol

Calculated results

Parameter	Value	Unit
Surface tension	28.449	mN/m

Notes for this case

- Densities in mol/cm³ in the relation give dyn/cm (= mN/m); the calculator converts from kg/m³.

Formula and method

$$\sigma^{1/4} = [P](\rho_L - \rho_V) \quad (\sigma \text{ dyn/cm};\ \rho \text{ mol/cm}^3)$$

Variables

$[P]$	Parachor (cm³·g^¼/(s^½·mol))	-
ρ_L	Liquid density	kg/m³
ρ_V	Vapour density	kg/m³
M	Molar mass	kg/kmol
σ	Surface tension	N/m

Method and standards

Macleod–Sugden relation.

Assumptions and limits

- Pure, nonassociated liquids.
- The fourth power makes the result sensitive to density: the default 876 kg/m³ and the preset's 879 kg/m³ differ by 0.3 % but give 28.5 and 28.8 mN/m.

References

- Perry's Chemical Engineers' Handbook
- 9th ed. (McGraw-Hill, 2019)
- sec. 2 (surface tension: parachor method of Macleod and Sugden)

Report details

Report reference	FCC-4DQR-50P8 (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Liquid Surface Tension by the Parachor (Macleod–Sugden)
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/macleod-sugden-surface-tension

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.