Osmotic Pressure (van 't Hoff)

Osmotic pressure of a dilute solution from concentration, van 't Hoff factor and temperature, for reverse osmosis and membrane estimates.

Method: van 't Hoff π = i c R T

Input parameters

Unit system: SI

Parameter	Value	Unit
Molar concentration of solute	0.60000	mol/L
van 't Hoff factor (ions per formula unit)	2.0000	
Temperature	25.000	°C

Calculated results

Parameter	Value	Unit
Osmotic pressure	29.747	bar
Equivalent water head	303.34	m

Notes for this case

- Ideal dilute solution; real brines deviate (use an osmotic coefficient), and complete dissociation is assumed by i.

Formula and method

$$\pi = i\,c\,R\,T$$

Variables

c	Molar concentration of solute	mol/m³
i	van 't Hoff factor (ions per formula unit)	-
T	Temperature	K
π	Osmotic pressure	Pa
h	Equivalent water head	m

Method and standards

van 't Hoff.

Assumptions and limits

- Dilute ideal solution with complete dissociation. Concentrated brines have an osmotic coefficient below 1 (about 0.9 for seawater), so the ideal result is high: 0.6 mol/L NaCl gives 29.7 bar ideal against about 27 bar measured. Multiply by the osmotic coefficient when it is known.

References

- van 't Hoff π = i c R T

Report details

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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/osmotic-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.