Equilibrium Constant from ΔG° and van 't Hoff Temperature Correction

Equilibrium constant from the standard Gibbs energy of reaction, and its value at another temperature by the van 't Hoff equation with a constant heat of reaction.

Method: K = exp(−ΔG°/RT); van 't Hoff $\ln(K_2/K_1) = -(\Delta H°/R)(1/T_2 - 1/T_1)$

Input parameters

Unit system: SI

Parameter	Value	Unit
Standard Gibbs energy of reaction at T_1	-32.900	kJ/mol
Temperature of ΔG°	25.000	°C
Standard heat of reaction	-92.200	kJ/mol
Temperature of interest	426.85	°C

Calculated results

Parameter	Value	Unit
Equilibrium constant at T_1	580,538	
Equilibrium constant at T_2	3.0974e-04	
ln K_2	-8.0798	

Notes for this case

- Constant ΔH° over the range; for wide ranges integrate with heat capacities.

Formula and method

$$K_1 = e^{-\Delta G^\circ / RT_1}, \quad \ln\frac{K_2}{K_1} = -\frac{\Delta H^\circ}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

Variables

ΔG°	Standard Gibbs energy of reaction at T_1	J/mol
T_1	Temperature of ΔG°	K
ΔH°	Standard heat of reaction	J/mol
T_2	Temperature of interest	K
K_1	Equilibrium constant at T_1	-
K_2	Equilibrium constant at T_2	-
$\ln K_2$	ln K_2	-

Method and standards

Thermodynamics.

Assumptions and limits

- Constant ΔH°.

References

- K = exp(−ΔG°/RT); van 't Hoff $\ln(K_2/K_1) = -(\Delta H°/R)(1/T_2 - 1/T_1)$

Report details

Report reference	FCC-HH1B-VDED (the same inputs always give the same reference)
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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/reactors/equilibrium-constant-vant-hoff

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.