

Vapor pressure depression.

$$\Delta P = \chi_s P_0$$

ΔP Vapor pressure depression.

χ_s Mole fraction of solute.

P_0 Vapor pressure of pure solvent.

Boiling-point elevation

$$\Delta T = K_b m$$

ΔT Boiling-point elevation ($^{\circ}\text{C}$ or K).

K_b Ebullioscopic constant ($\text{K}\cdot\text{kg}\cdot\text{mol}^{-1}$).

m Molality of solute ($\text{mol}\cdot\text{kg}^{-1}$).

Freezing-point depression

$$\Delta T = K_f m$$

ΔT Freezing-point depression ($^{\circ}\text{C}$ or K).

K_f Cryoscopic constant ($\text{K}\cdot\text{kg}\cdot\text{mol}^{-1}$).

m Molality of solute ($\text{mol}\cdot\text{kg}^{-1}$).

Osmotic pressure

$$\pi V = n R T$$

π Osmotic pressure (atm).

V Volume of solution (L).

n Number of moles of solute (mol).

R Ideal gas constant ($0.082057 \text{ atm}\cdot\text{L}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$).

T Absolute temperature (K).

Selected Freezing-point depression and Boiling-point elevation constants

Compound	K_f $\text{K}\cdot\text{kg}\cdot\text{mol}^{-1}$	K_b $\text{K}\cdot\text{kg}\cdot\text{mol}^{-1}$	Freezing-point ($^{\circ}\text{C}$)	Boiling-point ($^{\circ}\text{C}$)
Water	1.86	0.512	0	100.0
Acetic acid	3.9	3.07	17	118.1
Acetone	2.40	1.71	-94.8	56.2
Benzene	5.12	2.53	5.4	80.2
Carbon tetrachloride	29.8	4.95	-22.8	76.8
Cyclohexane	20.1	2.79	6.5	81.4

Vapor pressure of water at different temperatures

T ($^{\circ}\text{C}$)	P (mmHg)	T ($^{\circ}\text{C}$)	P (mmHg)	T ($^{\circ}\text{C}$)	P (mmHg)
0	4.5840	35	42.221	80	355.63
5	6.5449	40	55.391	85	434.04
10	9.2123	45	71.968	90	526.41
15	12.795	50	92.648	95	634.61
20	17.546	55	118.23	100	760.00
25	23.776	60	149.61	105	906.07
30	31.855	70	234.03	110	1074.56