

Gas Constants

Course/Text	Rxn *(note direction)*	Dimensionless Equil. Constant	"Henry's Law Const" [units]
Aquatic (1.76) Morel & Hering	$A(g) \rightleftharpoons A(aq)$	$K_{eq} = \frac{A(aq)}{A(g)}$	$K_H = \frac{[A(aq)]}{pA}$ [M atm ⁻¹]; $K_{eq} = (K_H)(RT)$ (e.g. $K_{H,CO_2} = 10^{-1.46}$ M atm ⁻¹)
Isotopes / Marine Chem Bill Jenkins Notes	$A(g) \rightleftharpoons A(aq)$	$K_{eq} = \frac{A(aq)}{A(g)}$	$[A(aq)] = \frac{K_{eq}}{RT} pA$; $K_H = K_{eq}/RT$ (if $R = 8.2 \times 10^{-2} \frac{L \cdot atm}{mol \cdot K}$, K_H units: [M atm ⁻¹])
Environ. Org. Chem (1.86) Schwartzbach, Gschwend, Imboden.	$A(aq) \rightleftharpoons A(g)$	$K_{iaw} = \frac{A(g)}{A(aq)}$	$K_{iH} = \frac{pA}{[A(aq)]}$ [atm M ⁻¹] [bar M ⁻¹]; $K_{iaw} = K_{iH}/RT$ (e.g. $K_{CO_2,H} = 10^{1.46}$ atm M ⁻¹) $K_{iH} = (K_{iaw})(RT)$ (if R [L atm / mol K]; K_{iH} has units: [atm M ⁻¹].)

Other common gas constants

"Bunsen sol. coeff, β_A " (Jenkins)

$$[A(aq)] = (\beta_A)(pA) \quad \beta_A \text{ units: } \left[\frac{mL}{atm} \right]$$

Convert:

$$\frac{mL}{L} [A(aq)] \rightarrow \text{mol/kg} [A(aq)]$$

$$\frac{mL}{L_{sw}} \times \frac{L}{1.025 kg} \times \frac{mol}{22.4 \times 10^3 mL} = \frac{mol}{kg}$$

"Bunsen absorption coeff"
 β is in units

$$\frac{cm^3 \text{ gas at } 0^\circ C, 1 \text{ atm}}{cm^3 \text{ water at given } T.}$$

Relationships

$$K_{eq} = 1/K_{iaw} \quad K_{eq} = K_H RT$$

$$K_H = 1/K_{iH} \text{ (atm M}^{-1}\text{)} \quad K_{iaw} = K_{iH}/RT$$