**ERRATA for** *An introduction to Chemical Thermodynamics*, **Second edition 2009**

**Page 15, line 11** ...of one calcium carbide molecule into ...

**Page 25, last line** In the literature, the term exergonic is used for processes that can deliver work and for processes that need work to go the term endergonic is used.

**Page 29, first equation from top** ~~k~~J/mol

**Page 42, following eq. 4.5** Footnote added: "Important to note is that the reference temperature for this coefficient is taken to be 0 K which is correct for gasses. For other substances, other reference temperatures may apply."

**Page 41, line 5** ...of one calcium carbide molecule into ...

**Page 44, second line from bottom** ...whereas the enthalpy does not.

**Page 48, line 12** ...the reversible heat plus the lost work, ...

**Page 52, second and third equation from top** $$\frac{Q}{T} = \frac{Q_{\text{rev}} + W_{\text{lost}}}{T} = \Delta S + \Delta S_{\text{irr}}$$

which implies that

$$\Delta S_{\text{irr}} \geq 0$$

**Figure 5.4, legend** Horizontal axis velocity in m/s, vertical axis probability density.

**Page 57, eq. 6.5** $$\left(\frac{\partial G}{\partial \xi}\right)_{eq} = 0 \quad \text{and} \quad \left(\frac{\partial^2 G}{\partial \xi^2}\right)_{eq} > 0$$

**Page 61, second equation** $$K = \frac{a(\mathrm{Ag}^+)a(\mathrm{Cl}^-)}{a(\mathrm{AgCl})} \approx s^2$$

**Page 66, Table 6.2, page 66** $\Delta_{vap}H^{\ominus} = 30.7$ kJ/mol

**Page 75, Figure 7.4** $V_v - V$ and $V - V_l$ interchanged.

**Page 88, legend figure 8.8** Characteristic shape of a Langmuir isotherm in a semi-logarithmic plot.

**Page 89, paragraph below first equation** ...occurring when the pressure equals $p = K^{-1}p^{\ominus}$.

**Page 97, Label horizontal axis figure 9.5** "mole fraction"

**Page 97, Label horizontal axis figure 9.6** "mole fraction"

**Page 99, legend figure 9.8** $Tx$-diagrams ...

**Page 106, eq 10.6** $$\Delta_{mix}H = \frac{1}{2}nx_Ax_B\tilde{h}_{AB}$$

**Page 106, equation at bottom of page** $$x_{B,max} = \exp\left(-\frac{h_{AB}}{RT}\right)$$

**Page 106, bottom line** For the *solubility parameter* defined as $h_{AB}/RT$ one finds -5.5 for sweet water at room temperature.

**Page 109, top equation** $$\Delta_{vap}S(x_B) = \Delta_{vap}S + \Delta_{mix}S_A(x_B) = \Delta_{vap}S - Rx_B$$

**Page 109, third equation** $$\Delta T = \frac{RT_{vap}}{\Delta_{vap}S}x_B$$

**Page 113, below eq. 11.2** $$f_j = p_j \exp\left(\frac{(p_j - p^\ominus)B_j}{RT}\right)$$

and the last two equations of the intermezzo

$$V_j = \frac{\partial V}{\partial n_j} = \frac{RT}{p_j} + B_j$$

and

$$\mu_j = \mu_j^\ominus + RT \ln \frac{p_j}{p^\ominus} + (p_j - p^\ominus)B_j$$

**Page 115, second equation from top** $$\Delta_{mix}\mu_B = \frac{\partial \Delta_{mix} G}{\partial n_B} = RT \ln x_B + \frac{1}{2}(1 - x_B)^2 h_{AB}$$

**Page 117, table 11.1** $10^{-3}$

**Page 117, equation below table 11.1** $$\kappa^{-1} \approx 0.3\sqrt{\frac{m^\ominus}{I}}\ \mathrm{nm}$$

**Page 123, line 5 from bottom** ... between the two parts.

**Page 142, 3rd paragraph from bottom** According to Prigogine, "in the linear regime, the total entropy production in a system subject to flow of energy and matter reaches a minimum value at the non-equilibrium stationary state".

**Page 154, add to bottom last paragraph** Also, there is a special situation that arises when the second virial coefficient vanishes. Whereas for gases this defines the Boyle temperature, for macromolecular solutions this defines the theta condition such as the theta temperature.

**Page 157, eq. 15.5** . . . be expressed as

$$a = RTK_2V_A$$

where $V_A$ denotes the molar volume of the solvent.

**Page 159, equation at bottom** $$F^g_{j,m} = -M_j g$$

**Page 162, ea. 15.10** $$c(r) \approx c_0 \exp\left\{\frac{(M_p - \rho V_p)\omega^2}{2RT}(r^2 - r_0^2)\right\}$$

**Page 163, eq. 15.11** $$c(r) \approx c_0 \exp\left\{\frac{Z_{eff}FE}{RT}(z - z_0)\right\} \tag{1}$$

**Page 165, first equation** $$\frac{\Pi}{RT} = \frac{c}{M} + [B_{HS} - K_2V_m]\left(\frac{c}{M}\right)^2 + \cdots$$

**Page 165, second equation** $$\frac{\Pi}{RT} = \frac{c}{M}\left\{1 + B_{1s}\frac{c_s}{M_s}\right\} + \left[B_{HS} - K_2V_m\left\{1 + (2B_{1s} - B_{2s})\frac{c_s}{M_s}\right\}\right]\left(\frac{c}{M}\right)^2 + \cdots$$

**Page 165, third and fourth equation** $$B_{1s} = \frac{2\pi}{3}\mathcal{N}(d + d_s)^3$$

and

$$2B_{1s} - B_{2s} = \frac{2\pi}{3}\mathcal{N}d_s^2(3d + 2d_s)$$

**Page 169, last equation of embedded text** $$\theta = \frac{1}{N}\frac{a}{\Xi}\frac{d\Xi}{da} = \frac{1}{N}\frac{d\log\Xi}{d\log a}$$

**Page 171, Eq. 16.7** $\Xi = \sum_{n,m} \binom{N-n+1}{n-m} \binom{n-1}{m} a^n u^m K^n \simeq \left( \frac{1 + aKu + \sqrt{4aK + (1-aKu)^2}}{2} \right)^N$

**Page 174, Bottom** $[\mathrm{B}^+](V + \Delta V) = \Delta V c_B$

**Page 180, Embedded text, first paragraph** ... the <u>Landau potential</u> or <u>semi grand potential</u>

**Page 182, fifth line from bottom** ...and hence $\Xi_2 = a^2(K_t^2 u_t + gK_g^2 u_g)$.

**Page 189, first equation**

$$\begin{aligned} \Delta G &\approx n_{s,in}\mu_{s,in} - n_{s,tot}\mu_s^i + n_{s,out}\mu_{s,out} \\ &= RT \left\{ n_{s,in} \ln \frac{n_{s,in}}{n_{o,in}} + n_{s,out} \ln \left( \frac{n_{s,out}}{n_{s,tot}} \frac{n_{o,in}}{n_{o,out}} \right) \right\} < 0 \end{aligned}$$

**Page 190, Embedded text**

$$\begin{aligned} \frac{d(c_{s,in} - c_{s,out})}{dt} &= \frac{1}{V_{in}} \frac{dn_{s,in}}{dt} - \frac{1}{V_{out}} \frac{dn_{s,out}}{dt} \\ &= AJ_s \left( \frac{1}{V_{out}} + \frac{1}{V_{in}} \right) \\ &= -\frac{AD_s}{L} \left( \frac{1}{V_{out}} + \frac{1}{V_{in}} \right) (c_{s,in} - c_{s,out}) \end{aligned}$$

The above equation is a linear differential equation which yields an equilibration time scale that is equal to

$$\tau = \left\{ \frac{AD_s}{L} \left( \frac{1}{V_{out}} + \frac{1}{V_{in}} \right) \right\}^{-1}$$

**Page 191, third equation from top** $J_s = -\frac{kT}{f} \frac{dc_s}{dz}$

**Page 192, second equation from bottom** $\theta = \frac{\sum_{k=1}^{n} k[\mathrm{ML}_k]}{[\mathrm{M}]}$

**Page 192, equation at bottom** $[\mathrm{L}]_{tot} = [\mathrm{L}]_{in} + \frac{V_{in}}{V_{in} + V_{out}} \sum_{k=1}^{n} k[\mathrm{ML}_k]$

o

**Page 193, eq. 17.3** $r = \frac{[\mathrm{Cl}^-]_{in}}{[\mathrm{Cl}^-]_{out}} = \frac{Z[\mathrm{M}^{Z+}]}{2[\mathrm{Cl}^-]_{out}} + \sqrt{\left( \frac{Z[\mathrm{M}^{Z+}]}{2[\mathrm{Cl}^-]_{out}} \right)^2 + 1}$