Errata for the 1st Printing of the 3rd edition of *Thermodynamics and Its Applications*

Author's note: All of these corrections will appear in the 2nd and subsequent printings of the 3rd edition. The printing order can be identified by the lowest number in a sequence of numbers 10 ... to ... 1, found just above the ISBN number on the copyright page (iv) which is the page right before the Table of Contents.

Part I

- p xiii, 2nd paragraph, line 16, "efforts" should be "effects"
- p 30, line 14 change **z** to $\underline{\mathbf{x}}$ in $\delta W = \mathbf{F}\cdot d\underline{\mathbf{x}}$
- p 38, Figure 3.8, $P_1 > P_2 > P_3$ should be $P_3 > P_2 > P_1$
- p 84, Example 4.3, insert (-W) after "net work" the first time it appears on line 9 in the *Solution* part
- p 95, line 3, insert "element δn" after ..."fluid"... ; and in line 2 of the next to the last paragraph, insert "(i.e. the compressor or turbine)" after ... "engine"...
- p 97, Example 4.6, line 3 and below, "done by the compressor on the gas"... and in Eqs. (4-79), (4-82), and (4-83) change − signs to + signs. In Eqs. (4-79), (4-80) and (4-82), change W_σ to W_s and in Eq.(4-80) invert the terms in the ln argument to ln (P_a /P_t)
- p 151, Table 5.2, the function and canonical coordinates entries for enthalpy need to be corrected to read $y^{(1)}$ and $\underline{S}, P, N_i$ $(i= 1, \ldots , n)$, respectively.
- p 179, next to the last line, δz_i not δz_1
- p 182, Eq.(6-12), in the double summation, $\delta^2\underline{U}$ should be $\partial^2\underline{U}$
- p 187, Table 6.1, subscripts containing $\underline{T}$ and $\underline{P}$ should be T and P without underbars.

Part II

- p 274, 2nd paragraph, 2nd line, "could" rather than "would"
- p 286, Eq.(8-161) should read $\gamma_G = \alpha_p V/ (\kappa_T C_v)$ and in the last line before section 8.7, $\varepsilon_x = 0.076$ (or 7.6%) not $\varepsilon_x^{o} = 0.086$ (8.6%).
- p 305, Figure P8.16, delete "Nitrogen" from the label on the supply manifold.
- p 313, Problem 8.25, line 10, “state” not “sate.”
- p 318, last line, and p 319, line 3, $i= 1, \ldots n$ not $i=1, \ldots N$.
- p 326, third equation, − sign after 1st term in large brackets should be +
- p 343, one line below Eq.(9-98), see Section 9.5 not 9.6
- p 351, 2 lines above Eq.(9-145), reference to Eq.(9-95) should be Eq.(9-92)
- p 358, Figure 9.3, invert the γ_1 and γ_2 labels on the left hand graph also the right hand side derivative in the equation at the top of that graph should read $\partial \ln \gamma_1/\partial x_1$
- p 360, 2nd paragraph, line 4, Section 13.4 rather than Section 11.5.
- p 363, 6 lines from bottom, infinitely not inifinitely
- p 367, Eq.(9-208) and work terms in Example 9.8 below should all be positive, e.g. $+\int VdP = +RT \int d\ln P = + (8.314)(300) \ln (1/0.8) = +557$ J/mol N_2 , etc.
- p 368, line 5, change $-\Delta\underline{G}_{net}$ to $-\Delta\underline{G}_{mix}$
- p 381, 1st and 2nd lines of Table, ..."cyclohexane in methyl ethyl ketone"...
- p 400, 2 lines above Eq.(10-44), $k = 1.38048 \times 10^{-23}$ minus sign missing in the exponent
- p 429, 4 lines after Eq.(10-147), " accessible" not "accessbile" and 2 lines above Eq.(10-146), linearly rather than linearily
- p 434, equation above Eq.(10-156), $\underline{U} = \underline{U}^{ideal\ gas} + \langle\underline{U}\rangle$ -- not $\underline{U} = \underline{U}^{ideal\ gas} = \langle\underline{U}\rangle$
- p 437, Table 10.4, last term in the Ree-Hoover exact expansion should be $56.7y^6$

Part II cont

- p 439, equation in Example 10.1, τ in the large brackets should be M
- p 444, last line of text, Eq. (10-78) not Eq. (10-178)
- p 459, Eq.(11-7), $\ln\gamma_i$ should be $\ln\gamma_1$
- p 467, Eq.(11-34), + rather than $-\ kTN_A(...)$
- p 471, Eq.(11-49), $-\ \langle\Phi_{ij}\rangle/kT$, minus sign missing
- p 490, 7th line of text below Eq.(11-88), insert "(see Section 13.4)" after "... method."
- p 507, relabel Eq.(12-9) as (12.9a) in 2 places, and change label for Eq.(12-13) to Eq.(12-9b)
- p 508, Eq.(12-12b) should read

$$\boldsymbol{m}_{\pm} = [\ (\boldsymbol{m}_i)^{\nu\iota}\ (\boldsymbol{m}_j)^{\nu j}\ ]^{1/\nu}$$

- p 513, change Eq.(12-27) and the line below it to read:

$$\delta W_{rev} = \exists d\underline{q} = \exists(\Sigma\ \nu_i z_i)F d\xi = n_e F \exists d\xi \qquad (12\text{-}27)$$

where n_e = net moles of electrons transferred in the reaction per mole of reactant, ξ = the extent of reaction [see Eq.(6-51)] and F = Faraday's constant ...

- p 513, delete the two lines of text below the defining equation for $\exists \equiv \psi_2 - \psi_1$
- p 513, replace the last four lines on the page that includes the equation with:

... Legendre transform with respect to $\underline{S} \rightarrow T$ and $\underline{V} \rightarrow P$ conjugate variable changes, we obtain the total Gibbs free energy $\underline{G}$ in differential form with $Pd\underline{V}$ and $\exists d\underline{q}$ work effects included as

$$d\underline{G} = -\underline{S}dT + \underline{V}dP + \sum \mu_i\, dN_i\ + n_e F\exists d\xi = -\underline{S}dT + \underline{V}dP + (\sum \nu_i\mu_i\ +\ n_e F\exists)d\xi$$

which can be integrated from $\xi = 0$ to 1, noting that $d\underline{G} = 0$ for a system at equilibrium

- p 514, insert subscript rx on all ΔG terms, e.g. ΔG_{rx} , and replace the top 3 lines that includes Eq.(12-28) with:

...at constant $T, P,$ and total mass. Thus, for an isobaric, isothermal, fully reversible electrochemical cell:

$$\Delta G_{rx} = \sum \nu_i\mu_i = -\ n_e F\exists \qquad (12\text{-}28)$$

- p 514, replace Eq.(6-55) at the bottom of the page and the 4 lines above it with:

... any real condition to $\Delta G_{rx}{}^{\square}$ at standard state conditions using a modified form of the criteria of Eq.(6-55) for a reversible chemical reaction at equilibrium. The modified criteria is actually given above in Eq.(12-28) which in the presence of an finite electric potential $\exists$ is not equal to zero.

- p 515, line 1, insert subscript rx on ΔG and ΔG^o terms; and one line below Eq(12-31), change the reference to Eq.(12-13) to Eq.(12-9b)
- p 519, equation below Eq.(12-38), z_i in the exponent term should be z_j
- p 528, Section 12.5, 2nd paragraph, line 2, Rasaiah not Rassiah
- p 535, 3rd paragraph, 3rd line, Zernike not Zernicke
- p 545, Example 12.4, the entry for ρ of 1.798 should be 1.130
- p 546, Figure 12.10, lower line in both graphs should be ¯·¯ (Debye-Huckel) and the line just above it should be ----- (Pitzer extended DH)
- p 548, under (1), $\boldsymbol{m}_{HCl} = 4.5/(\ 1.12 - .001((4.5)(36.5)+(1.33)(58.5))) = 5.126$ mol/kg and one line above the figure change 1.33 to 1.5

Part II cont.

- p 558, Figure 13.1, under Functional groups column,
  2: >CH– (ring) in place of 1:>CH– (ring)
  2: –CH_2– (ring) in place of 1: –CH_2– (ring)
  1: –N= (ring) in place of 2: –N= (ring)
  1: >NH(ring) in place of 2: >NH(ring)
  In addition, the structural formula for Alpha xyz is missing a N atom at the "6 o'clock" position of the six-membered ring.

Part III

- p 594, line 4, $\eta_{Carnot} = (T_H - T_C)/T_H$
- p 595, 2nd paragraph, line 4, change Eq. (14-27) to (14-26)
- p 603, Eq.(14-45), missing subscript "in" on T, should be T_{in}
- p 610, line 5, T_A and point A should be T_B and point B
- p 617, Figure 14.14(b), the state point at the intake and exhaust condition should be D not B.
- p 618, Eq.(14-62), V_D should be V_B
- p 624, Figure P14.4, add to caption, (note that n_s is based on rotational speed in radians per second rather than revolutions per second)
- p 681, 1 line below Eq.(15-61), Eq.(8-121) and Eq.(8-123) should be (9-112) and (9-114)
- p 682, 2 lines above Eq.(15-67), "... the numerator is ... "
- p 686-687, Example 15.5, in the first 4 equations of the solution, the first equal sign (=) should be a minus sign (−)
- p 689, 3rd line, reference to Tables 8.1 and 9.2 should be to Tables 8.1 and 8.2
- p 692, line below Eq.(15-37), reference should be to Eq.(15-95)
- p 699, 3rd paragraph, 1st line, Figure 9.8 not 9.7
- p 704, 3 lines from bottom, reference to Example 15.7 should be to 15.8
- p 708, Example 15.7 should be 15.8
- p 733, Problem 15.22, 2nd paragraph, Figure 15.29 not 8.2
- p 742, line 2, $\partial \chi_i$ should be ∂x_i and on Figure P15.33(b), x-axis label should be $r^{-1/2} + (2r)^{-1}$ and y-axis label should be (K^{-1})
- p 743, part (b), reference to Figure P15.36 should be Figure 15.22
- p 744, Problem 15.37, 5th line, minus sign missing in (<−50°C)
- p 763, line above Eq.(16-30), see Section 9.7 not 8.5
- p 786, equation above Eq.(16-80) summation should run over $j \neq i$
- p 828, 1 line below Eq.(17-11), insert "where C_j is equivalent to the formula vector W_j given in Eq.(16-11)."
- p 837, Eq.(17-44), $n_n^{(\pi)}$ should be $x_n^{(\pi)}$
- p 852, Problem 17.3, part(a), 5th line, Equation (1) should be Eq.(17-54)
- p 856-857, Problem 17.9, all references to Figure P17.10 should be to P17.9
- p 869, Example 18.6, last equation, $P^{(V)} - (\mathsf{HB})^{(V)} = P^{(L)} - (\mathsf{HB})^{(L)}$
- p 870, 3rd equation, $\mathbf{B}_{ext} = \mu_{M^\circ} \mathsf{H}_{ext}$

If you find any more errors in the first printing please forward them to Prof. Jeff Tester at thermo-com@mit.edu . Thanks.

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