Corrections: An Introduction to Statistical Mechanics and Thermodynamics

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1. Page xv.

   "an historical" should be "a historical"

2. Page 3, middle of the page

   "but it did nt seem" should be "but it did not seem"

3. Page 12, Equation (2.2):

   On the second line, the third subscript should not be

   $$p_{y,i}$$

   Instead, it should refer to the z-component

   $$p_{z,i}$$

   The three components of the momentum should read

   $$p_{x,i}, p_{y,i}, p_{z,i}$$

4. Page 15, Figure for Road map:

   second box on the right should read:
   Configurational entropy of an ideal gas

   Third box on the right should read:
   Energy-dependent entropy of an ideal gas

   T and P in the last box should be in italics (T and P).

5. Page 17, third line after eq. (3.2)

   'is a finite or countable' should be 'is finite or countable'

6. Page 21. eq. (3.23) Should have more space before the conditions.

   The LaTeXversion that I printed out was correct.

$$\sum_{y=1}^6 \delta_{s,x+y} = \left\{ \begin{array}{ll} 1 & 1 \le s-x \le 6 \\ 0 & \text{otherwise} \end{array} \right. \tag{1}$$

   The appearance in the book was not. I would suggest that instead of

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\begin{equation}\label{sum on y}
\sum_{y=1}^6 \delta_{s,x+y}
=\left\{
\begin{array}{ll}
  1 & 1 \le s-x \le 6 \\
  0 & \text{otherwise}
\end{array}
\right.
\end{equation}
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   it should be

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\begin{equation}\label{sum on y}
\sum_{y=1}^6 \delta_{s,x+y}
=\left\{
\begin{array}{ll}
  1 & \text{    } 1 \le s-x \le 6 \\
  0 & \text{    otherwise}
\end{array}
\right.
\end{equation}
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7. Page 26, eq. (3.44) is missing a factor of p in the denominator under the square root. Instead of

$$\frac{\sigma_S}{\langle S \rangle} = \frac{\sqrt{p(1-p)N}}{pN} = \sqrt{\frac{1-p}{N}} \tag{2}$$

it should read

$$\frac{\sigma_S}{\langle S \rangle} = \frac{\sqrt{p(1-p)N}}{pN} = \sqrt{\frac{1-p}{pN}} \tag{3}$$

8. Page 31, Equation (3.70):

   After the second equality symbol it should be 1st derivative instead of 2nd derivative

9. Page 33, Equation (3.78):

   In the last line of the equation, there should be no s. The line should read

   $$= -\ln n + \ln(N-n) + \ln p - \ln(1-p)$$

   followed by the equation number (3.78)

10. Page 54, third line after "5.4.1 Sum of Two Random Numbers"

    [1,6] should be [0,6]

11. Page 60, Problem 5.8:

    The equation should read

    $$P(\vec{p}) = X \exp\left[-\beta \frac{|\vec{p}|^2}{2m}\right]$$

12. Page 64, Equation (6.10):

    The transformation is

    $$x = \frac{p^2}{2m}$$

    or

    $$p^2 = 2mx$$

    $$p = (2mx)^{-1/2}$$

    and

    $$p\,dp = m\,dx$$

    or

    $$dp = (2mx)^{-1/2} m\,dx$$

    so that Equation (6.10) should be:

$$
\begin{aligned}
\Omega_E(E,N) &= S_n \int_0^\infty p^{3N-1}\delta\left(E-\frac{p^2}{2m}\right)dp \\
&= S_n \int_0^\infty (2mx)^{(3N-1)/2}\delta(E-x)\,(2mx)^{-1/2} m\,dx \\
&= S_n m (2mE)^{3N/2-1}
\end{aligned}
$$

13. Page 66, Equation (6.16).
    Instead of

    $$\Gamma(m+1) = m! = \int_{-\infty}^{0} e^{-t}\,t^m dt$$

    the equation should read

    $$\Gamma(m+1) = m! = \int_{0}^{\infty} e^{-t}\,t^m dt$$

14. Page 66, Equation (6.20)

    This equation reflects the earlier error. The last factor in Equation (6.20) should be:

    $$(2mE)^{3N/2-1}$$

15. Page 67, Equation (6.22):

    The factors on the second line of the equation should read:

    $$(E_A)^{3N_A/2-1}\,(E-E_A)^{3N_B/2-1}$$

16. Page 67, Equation (6.23):

    The right-hand side of the equation should be:

    $$\left(\frac{3N_A}{2}-1\right)\frac{1}{E_A}-\left(\frac{3N_B}{2}-1\right)\frac{1}{E-E_A}$$

17. Page 67, Equation (6.24):

    The equation should read:

    $$E_{A,\max} \approx \langle E_A \rangle = \left(\frac{3N_A-2}{3N-4}\right)E$$

18. Page 68, Equation (6.27):

    The right-hand side of the equation should read:

$$-\left(\frac{3N_A}{2}-1\right)\frac{1}{E_A^2}-\left(\frac{3N_B}{2}-1\right)\frac{1}{(E-E_A)^2}$$

19. Page 70, eq. (6.37)

    k_B should be k

20. Page 81, Equation (7.34)

    The summation limits $i=1, i>j$ should be $i>j$.

    The equation should read:

$$H(q,p)=\sum_{j=1}^{N}\frac{|\vec{p}_j|^2}{2m}+\sum_{j=1}^{N}\sum_{i>j}^{N}\phi(\vec{r}_i,\vec{r}_j)$$

21. Page 81, Equation (7.35)

    The summation limits $i=1, i\neq j$ should be $i>j$. This error occurs in two sums.

    The equation should read:

$$\begin{aligned} H(q,p) \;=\; & \sum_{j=1}^{N_A}\frac{|\vec{p}_{j,A}|^2}{2m}+\sum_{j=1}^{N_B}\frac{|\vec{p}_{j,B}|^2}{2m} \\ & +\sum_{j=1}^{N_A}\sum_{i>j}^{N_A}\phi(\vec{r}_{i,A},\vec{r}_{j,A})+\sum_{j=1}^{N_B}\sum_{i>j}^{N_B}\phi(\vec{r}_{i,B},\vec{r}_{j,B}) \\ & +\sum_{j=1}^{N_A}\sum_{i=1}^{N_B}\phi(\vec{r}_{i,A},\vec{r}_{j,B}) \end{aligned}$$

22. Page 81, Equation (7.36)

    The summation limits $i=1, i>j$ should be $i>j$.

    The equation should read:

$$H_A(q_A,p_A)=\sum_{j=1}^{N_A}\frac{|\vec{p}_{j,A}|^2}{2m}+\sum_{j=1}^{N_A}\sum_{i>j}^{N_A}\phi(\vec{r}_{i,A},\vec{r}_{j,A})$$

23. Page 81, Equation (7.37)

    The summation limits $i = 1, i \neq j$ should be $i > j$.

    The equation should read:

$$H_B(q_B, p_B) = \sum_{j=1}^{N_B} \frac{|\vec{p}_{j,B}|^2}{2m} + \sum_{j=1}^{N_B} \sum_{i>j}^{N_B} \phi(\vec{r}_{i,B}, \vec{r}_{j,B})$$

24. Page 82, eq. (7.38)

    The equation should read:

$$H_{AB}(q_A, q_B) = \sum_{j=1}^{N_A} \sum_{i=1}^{N_B} \phi(\vec{r}_{i,A}, \vec{r}_{j,B}) \tag{4}$$

25. Page 84, just above eq. (7.48)

    "derviative" is misspelled, it should be "derivative"

26. Page 90, Eq. (8.13).

    The left side of the equation should read

$$\ln P(\vec{p}_1) = -\beta|\vec{p}_1|^2/2m + \text{constants}, \tag{5}$$

27. Page 90, second line of text from the bottom.

    "functon" should be "function"

28. Page 91, eq. (8.13) reads

$$P(\vec{p}_1) = -\beta|\vec{p}_1|^2/2m + \text{constants}, \tag{6}$$

    and it should read

$$\ln P(\vec{p}_1) = -\beta|\vec{p}_1|^2/2m + \text{constants}, \tag{7}$$

29. Page 92, eq.(8.14) should read

$$P(\vec{p}_1) = \left(\frac{\beta}{2\pi m}\right)^{3/2} \exp\left(-\beta\frac{|\vec{p}_1|^2}{2m}\right)$$

30. Page 92, eq.(8.15) should read

$$P(p_{1,x}) = \sqrt{\frac{\beta}{2\pi m}} \exp\left(-\beta \frac{p_{1,x}^2}{2m}\right)$$

31. Page 93, eq.(8.17) should read

$$F\Delta t = \int_0^\infty \sqrt{\frac{\beta}{2\pi m}} \exp\left(-\beta \frac{p_x^2}{2m}\right) 2p_x \frac{NA\Delta t p_x}{Vm} dp_x$$

32. Page 93, eq.(8.18) should read

$$P = \frac{2N}{Vm}\sqrt{\frac{\beta}{2\pi m}} \int_0^\infty \exp\left(-\beta \frac{p_x^2}{2m}\right) p_x^2 dp_x$$

33. Page 106, line 6

    "entriely" should be "entirely"

34. Page 111, line following eq. (10.4)

    "from (0,0) to the point (1,1)"

    should read

    "from (0,0) to the point (x,y)"

35. Page 115, Problem 10.1:

    Drop the requirement of calculating the difference in the value of the function along two different paths. The last paragraph should read:

    Derive an explicit expression for $r_y(y)$ and show that the new differential is exact. Calculate the total path integral around the square bounded by the points $(1, 1), (1, 2), (2, 2)$, and $(2, 1)$.

36. Page 122, Problem 11.3, part 2

    The equation should change T to T_j in two places. The corrected version should read:

$$\left\{C_j(T_j) = A_j T_j^3 | j = 1, \ldots, N\right\}$$

37. Page 128, just above Eq. (12.19)

"with respect to the independent variable T."

should read

"with respect to the independent variable P."

38. Page 138, eq. (14.1)

k_b should be k_B

39. Page 139, Equations (14.7), (14.8), and (14.9)

The subscripts in the text are incorrect.

Equation (14.7) should read:

$$\left(\frac{\partial G}{\partial T}\right)_{P,N} = -S$$

Equation (14.8) should read:

$$\left(\frac{\partial G}{\partial P}\right)_{T,N} = V$$

Equation (14.9) should read:

$$\left(\frac{\partial G}{\partial N}\right)_{T,P} = \mu$$

40. Page 145, eq.(14.36) should read

$$\begin{aligned}
\frac{\partial(u,v)}{\partial(r,s)}\frac{\partial(r,s)}{\partial(x,y)} &= \begin{vmatrix} u_r & u_s \\ v_r & v_s \end{vmatrix}\begin{vmatrix} r_x & r_y \\ s_x & s_y \end{vmatrix} \\
&= \begin{vmatrix} u_r r_x + u_s s_x & u_r r_y + u_s s_y \\ v_r r_x + v_s s_x & v_r r_y + v_s s_y \end{vmatrix} \\
&= \begin{vmatrix} u_x & u_y \\ v_x & v_y \end{vmatrix} \\
&= \frac{\partial(u,v)}{\partial(x,y)}
\end{aligned} \tag{8}$$

41. Page 145, eq.(14.38)
    In two places, $r.s$ should be r, s

42. Page 158, Equation (15.6) should have a factor of 1/2 on the right side

$$dU \approx -\frac{T}{2}\left(\frac{\partial^2 S}{\partial X^2}\right)_U (dX)^2 + TdS$$

43. Page 159, Equation (15.8) should have a factor of 1/2 on the right side

$$\left(\frac{\partial^2 U}{\partial X^2}\right)_S = -\frac{T}{2}\left(\frac{\partial^2 S}{\partial X^2}\right)_U > 0$$

44. Page 159, eq. (15.9). Instead of

$$dU = TdS - PdV - \mu dN = TdS + đW - \mu dN$$

    should be

$$dU = TdS - PdV + \mu dN = TdS + đW + \mu dN$$

45. Page 161, eq. (15.18). Instead of

$$dF = -SdT - PdV - \mu dN = -SdT + đW - \mu dN$$

    the equation should be

$$dF = -SdT - PdV + \mu dN = -SdT + đW + \mu dN$$

46. Page 165, last line in Section 15.6
    "maximization" should be "minimization"

47. Page 168, below Eq.(16.2)
    ΔS should be ΔV

48. Page 170, third line from the bottom
    "an stability condition" should read "a stability condition"

49. Page 175, Problem 16.2

The text states that the change in energy when a rubber band is stretched is $-\tau dL$. This is incorrect. It should read $+\tau dL$.

The equation

$$dU = TdS + \tau dL$$

is correct.

50. Page 182, eq. (17.16). Change from

$$d\mu = \left(\frac{S}{N}\right) dT - \left(\frac{V}{N}\right) dP$$

to

$$d\mu = -\left(\frac{S}{N}\right) dT + \left(\frac{V}{N}\right) dP$$

51. Page 185, Section 17.8. Change $T - P$ to $P - T$

52. Page 186, first two paragraphs on the page should read

"Consider a process that starts with a gas on the coexistence curve (or infinitesimally below it) at a temperature T_o and pressure P_o. Raise the temperature of the gas at constant pressure. When the temperature is above T_c, the pressure is increased until it is above P_c. At this point, the temperature is again lowered until it is at the original value at T_o. Now lower the pressure until the original value of P_o is reached. The system has now returned to the original temperature and pressure, *but on the other side of the coexistence curve*. It is now in the liquid phase.

Since the coexistence curve was not crossed anywhere in the entire process, the fluid was taken smoothly from the gas to the liquid phase without undergoing a phase transition. The initial (gas) and final (liquid) phases must, in some sense, represent the same phase. Considering how obvious it seems that water and steam are different, it might be regarded as rather surprising to discover that they are not fundamentally different after all."

53. Page 186, equation (17.18) should read

$$\left(\frac{\partial F}{\partial V}\right)_{T,N} = -P < 0 \tag{9}$$

54. Page 187, equation (17.19) should read

$$\left(\frac{\partial^2 F}{\partial V^2}\right)_{T,N} = -\left(\frac{\partial P}{\partial V}\right)_{T,N} = \frac{V}{\kappa_T} > 0 \qquad (10)$$

55. Page 187, below eq. (17.19)

"We know from the previous discussion of the $P-V$ diagram of the van der Waals gas the van der Waals model predicts predicts an unstable region."

should be

"We know from the previous discussion of the $P-V$ diagram of the van der Waals gas that the model predicts an unstable region."

56. Page 189, right above eq. (17.28), change from

"On the other hand, we know from the Gibbs–Duhem equation from eq. (**??**) in Section **??**, that "

to

"On the other hand, we know from the Gibbs–Duhem equation from eq. (**??**) in Section **??**, that if we have the same number of particles on both sides of the transition, then"

57. Page 189, eqs. (17.28) and (17.29). Change from

$$\mu_Y - \mu_X = \left(\frac{S}{N}\right) dT - \left(\frac{V}{N}\right) dP$$

and

$$\mu_{Y'} - \mu_{X'} = \left(\frac{S'}{N}\right) dT - \left(\frac{V'}{N}\right) dP$$

To

$$\mu_Y - \mu_X = -\left(\frac{S}{N}\right) dT + \left(\frac{V}{N}\right) dP$$

and

$$\mu_{Y'} - \mu_{X'} = -\left(\frac{S'}{N}\right) dT + \left(\frac{V'}{N}\right) dP$$

58. Page 190, second paragraph, fifth line. Change

$\{x_k^{(j)} = N_k^j/N|k = 1,\ldots,K\}$,

to

$\{x_k^{(j)} = N_k^{(j)}/N^{(j)}|k = 1,\ldots,K\}$,

59. Page 190, four lines from the bottom

$F = 2+2-3 = 0$ should be $F = 2+1-3 = 0$

60. Page 192, Problem 17.2

In part 1, the problem says to plot V as a function of P. It should read:

> Write a program to compute and plot P as a function of V at constant T for the van der Waals gas.

61. Page 195, eq. (18.5). Change from

$$c_X(T) = \frac{N}{T}\left(\frac{\partial S}{\partial T}\right)_{X,N}$$

to

$$c_X(T) = \frac{T}{N}\left(\frac{\partial S}{\partial T}\right)_{X,N}$$

62. Page 195, eq. (18.6) Change from

$$đQ = c_X(T)dT$$

to

$$đQ = Nc_X(T)dT$$

63. Page 204, Eq. (19.12)

The third term on the right side of the equation should be

$$-E\left(\frac{\partial(\ln\Omega_R(E_T))}{\partial E_T}\right)$$

instead of

$$-E\left(\frac{\partial \Omega_R(E_T)}{\partial E_T}\right)$$

64. Page 205, Eq. (19.15)

    The third term on the right side of the equation should be

    $$\frac{\partial \ln \Omega_R(E_T)}{\partial E_T} = \beta_R = \beta = \frac{1}{k_B T}$$

    instead of

    $$\frac{\partial \Omega_R(E_T)}{\partial E_T} = \beta_R = \beta = \frac{1}{k_B T}$$

65. Page 206,

    The second term on the right side of Eq. (19.20) should be

    $$-H(p,q)\left(\frac{\partial(\ln \Omega_R(E_T))}{\partial E_T}\right)$$

    instead of

    $$-H(p,q)\left(\frac{\partial \Omega_R(E_T)}{\partial E_T}\right)$$

66. Page 206, Eq. (19.21) should read

    $$\beta = \beta_R = \frac{\partial(\ln \Omega_R(E_T))}{\partial E_T}$$

67. Page 208, eq.(19.32) needs a comma between $\frac{\partial q_j}{\partial t} \frac{\partial p_j}{\partial t}$

    to give $\frac{\partial q_j}{\partial t}, \frac{\partial p_j}{\partial t}$

68. Page 209, in the first line after eq (19.39)

    "interpetation"

    should be

    'interpretation"

69. Page 212, eq. (19.56) $\frac{d\beta}{dT} = \frac{d\beta}{dT}\left(\frac{1}{k_B T}\right)$ should be $\frac{d\beta}{dT} = \frac{d}{dT}\left(\frac{1}{k_B T}\right)$

70. Page 213, Eq. (19.61)

The first line of the equation is correct, but the first summation in the exponent of the second line is not. For clarity, the summation index should be changed from j to k, and the summation should be from $k = 1$ to $3N$, and $\vec{p}_j$ should become p_k The equation should read:

$$\begin{aligned} Z &= \frac{1}{h^{3N}N!}\int dp \int dq \, \exp\left[-\beta\left(\sum_{j=1}^{N}\frac{|\vec{p}_j|^2}{2m} + \sum_{j=1}^{N}\sum_{i>j}^{N}\phi(\vec{r}_i,\vec{r}_j)\right)\right] \\ &= \frac{1}{h^{3N}N!}\int dp \exp\left[-\beta\sum_{k=1}^{3N}\frac{p_k^2}{2m}\right]\int dq \, \exp\left[-\beta\sum_{j=1}^{N}\sum_{i>j}^{N}\phi(\vec{r}_i,\vec{r}_j)\right] \\ &= \frac{1}{h^{3N}N!}\left(2\pi m k_B T\right)^{3N/2}\int dq \, \exp\left[-\beta\sum_{j=1}^{N}\sum_{i>j}^{N}\phi(\vec{r}_i,\vec{r}_j)\right], \end{aligned}$$

71. Page 215, three lines above eq. (19.66)

“and infinitesimal quantity.”

should be

“an infinitesimal quantity.”

72. Page 217, first line

“algorithhm” should be ”algorithm’

73. Page 220 eq. (19.82). Change

$$\omega_j$$

to

$$\omega_1$$

74. Page 222, Problem 19.6

Remove sentence:

“ Boltzmann’s constant can again be taken as $k_B = 1$, but the variable should also be included explicitly in the program.”

This sentence is found in the square brackets below the equation.

75. Page 228, Eq.(20.4)

The plus signs at the beginning of the second to last and third to last lines should be minuses. The equation should read

$$\begin{aligned}
\ln P(E,N) &= \ln\Omega(E,V,N) + \ln\Omega_R(E_T - E, V_R, N_T - N) \\
&\quad - \ln\Omega_T(E_T, V_T, N_T) \\
&\approx \ln\Omega(E,V,N) + \ln\Omega_R(E_T, V_R, N_T) \\
&\quad -E\frac{\partial}{\partial E_T}\ln\Omega_R(E_T, V_R, N_T) \\
&\quad -N\frac{\partial}{\partial N_T}\ln\Omega_R(E_T, V_R, N_T) \\
&\quad - \ln\Omega_R(E_T, V_T, N_T)
\end{aligned}$$

76. Page 230, the second and third lines after eqn.(20.13)

The current lines have
"proportional to $\sqrt{(N_{eq})}$ and $\sqrt{(N_{eq})}$,"
which should read
" proportional to $\sqrt{\langle E_{eq}\rangle}$ and $\sqrt{\langle N_{eq}\rangle}$,"

77. Page 250, the first line after the title of subsubsection 22.2.2, and above eqn. (22.20)

"c_ns"

should be

"the set of coefficients $\{c_n\}$"

78. Page 254, The paragraph immediately before eqn.(22.36)

"P_ns"

should be

" the set of quantities $\{P_n\}$"

79. Page 255, the last line of eq. (22.40) should read

$$\int_{\{c_n\}} \sum_n \sum_m P_{\{c_n\}} c_m^* c_n \langle m|\mathcal{A}|n\rangle = \langle\mathcal{A}\rangle$$

80. Page 266, eq. (23.39). Change the equation from

$$\begin{aligned}\frac{\partial}{\partial\beta}\langle\mathcal{A}\rangle &= \frac{1}{Z}\sum_n \langle n|\mathcal{A}|n\rangle(-E_n)\exp(-\beta E_n) \\ &= -\left[\langle\mathcal{A}E\rangle + \langle\mathcal{A}\rangle\langle E\rangle\right] \qquad (11)\end{aligned}$$

to

$$\begin{aligned}\frac{\partial}{\partial\beta}\langle\mathcal{A}\rangle &= \frac{1}{Z}\sum_n \langle n|\mathcal{A}|n\rangle(-E_n)\exp(-\beta E_n) - \frac{1}{Z^2}\frac{\partial Z}{\partial\beta}\sum_n \langle n|\mathcal{A}|n\rangle\exp(-\beta E_n) \\ &= \langle\mathcal{A}\rangle\langle H\rangle - \langle\mathcal{A}H\rangle \qquad (12)\end{aligned}$$

81. Page 268, last line in eq.(23.48)
$\prod_{j=1}^{N}\left(\sum_{n_1}\exp(-\beta E_{n_1})\right)$
should be
$\prod_{j=1}^{N}\left(\sum_{n_j}\exp(-\beta E_{n_j})\right)$

82. Page 271, first line

”an magnetic field” should be ”a magnetic field”

83. Page 271, Eq. (23.61)

The B in the equation should be an h.

84. Page 272, in the gray box. Change x^{-n} to x^n.

After the equation, change the text to:
“for $|x| < 1$, occur frequently in quantum statistical mechanics. The savvy student should expect it to appear on tests—and not only know it, but know how to derive it.”

85. Page 280

In Problem 23.8 and 23.9, specify that there are N diatomic molecules.

86. Page 287, eq. (24.22)

The third line of the equation should read

$$\approx \left(\frac{\hbar}{4\pi^2c^2}\right)\frac{\omega^3}{1+\beta\hbar\omega-1}$$

instead of

$$\approx \left(\frac{\hbar}{4\pi^2 c^2}\right) \frac{\omega^3}{1 - \beta\hbar\omega - 1}$$

87. Starting with eq. (25.5) on page 292, change
    x_k to $\tilde{x}_k$,
    x_{-k} to $\tilde{x}_{-k}$,
    and
    $x_{k'}$ to $\tilde{x}_{k'}$.

    This change should be made on pages 292 and 293.

88. Page 295, second line from the top

    "diffcult' should be "difficult'

89. On pages 296-298, change
    $\dot{x}_k$ to $\dot{\tilde{x}}_k$

    On page 296, in the second line of eq. (25.25),
    $\dot{x}'_k$ should be $\dot{\tilde{x}}_{k'}$

90. Page 300

    Eq. (25.38) should read

$$Z_{class} = \prod_k \frac{1}{h} \left[(2\pi m k_B T)^{1/2} \left(2\pi k_B T / K(k)\right)^{1/2} \right]$$

91. Page 300, eq. (25.41), change from

$$\begin{aligned} U &= \frac{\partial(\beta F)}{\partial \beta} \\ &= -\frac{\partial(\ln Z_{class})}{\partial \beta} \\ &= -\frac{\partial}{\partial \beta}\left[-3N \ln \beta - \sum_k \ln\left(\hbar\omega(k)\right) \right] \\ &= 3N\frac{1}{\beta} = 3Nk_B T \end{aligned} \tag{13}$$

to

$$\begin{aligned} U &= \frac{\partial(\beta F)}{\partial\beta} \\ &= -\frac{\partial(\ln Z_{class})}{\partial\beta} \\ &= -\frac{\partial}{\partial\beta}\left[-N\ln\beta - \sum_k \ln\left(\hbar\omega(k)\right)\right] \\ &= N\frac{1}{\beta} = Nk_BT \end{aligned} \tag{14}$$

In the line following this equation, change $3k_B$ to k_B.

92. Page 300

    Eq. (25.42) should read

$$Z_{QM} = \prod_k \left[\exp(-\beta\hbar\omega/2)(1 - \exp(-\beta\hbar\omega)^{-1}\right]$$

93. Page 302, on the line before eq. (25.46), change

    (one for each polarization direction)

    to

    (two for the transverse modes, and one for the longitudinal mode).

94. Page 303, eq. (25.49)

$$\epsilon_D = \frac{\pi}{L}\left(\frac{6N}{\pi}\right)^{1/3} v$$

    should be

$$\epsilon_D = \frac{\pi}{L}\left(\frac{6N}{\pi}\right)^{1/3} \hbar v$$

95. Page 304, eq. (25.56), change from

$$
\begin{aligned}
U_{Debye} &\approx \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\int_0^{\Theta_D/T} dx\, x^2 \\
&\approx \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{1}{3}\left(\frac{\Theta_D}{T}\right)^3 \\
&\approx \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{1}{3}\left(\frac{\hbar v}{k_B}\left(\frac{6\pi^2N}{L^3}\right)^{1/3}\frac{1}{T}\right)^3 \\
&\approx \frac{L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{\hbar^3v^3}{k_B^3}\left(\frac{6\pi^2N}{L^3T^3}\right) \\
&\approx 3Nk_BT
\end{aligned} \tag{15}
$$

to

$$
\begin{aligned}
U_{Debye} &\approx \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\int_0^{\Theta_D/T} dx\, x^2 \\
&= \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{1}{3}\left(\frac{\Theta_D}{T}\right)^3 \\
&= \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{1}{3}\left(\frac{\hbar v}{k_B}\left(\frac{6\pi^2N}{L^3}\right)^{1/3}\frac{1}{T}\right)^3 \\
&= \frac{L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{\hbar^3v^3}{k_B^3}\left(\frac{6\pi^2N}{L^3T^3}\right) \\
&= 3Nk_BT
\end{aligned} \tag{16}
$$

96. Page 305, change eq. (25.59) from

$$
\begin{aligned}
U_{Debye} &\approx \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3v^3}\frac{\pi^4}{15} \\
&\approx L^3\frac{\pi^2}{10\hbar^3v^3}(k_BT)^4 \\
&\approx V\frac{\pi^2}{10\hbar^3v^3}(k_BT)^4
\end{aligned} \tag{17}
$$

to

$$U_{Debye} \approx \frac{3L^3(k_BT)^4}{2\pi^2\hbar^3 v^3}\frac{\pi^4}{15} \tag{18}$$
$$= L^3\frac{\pi^2}{10\hbar^3 v^3}(k_BT)^4$$
$$= V\frac{\pi^2}{10\hbar^3 v^3}(k_BT)^4$$

97. Page 305, Step 1 in the Summary of the Debye approximation should have number instead of number¡

98. Page 312, second line

    “single particle state” should be “single-particle state”

99. Page 313, third line from the top

    “mecanical” should be “mechanical”

100. Page 313, first line after eq. (26.22)

    “sum over all energy eigenstates”

    should be

    “sum over all energy levels”

101. Page 313, eq.(26.24) and eq.(26.25) have too many parentheses. at the end.

    I changed one set of ( ) to [ ] .

102. Page 315, in the last line, ‘number particles’ should be ‘number of particles’

103. Page 322, Section 26.16

    The second to last paragraph in this section begins with “Finally, we use eq. (**??**) or eq. (**??**) to find the energy as a function of T and N (the latter through the function $\mu = \mu(T, N)$)”

    The sentence should have a period at the end.

104. Page 333, the beginning of the first line after eq. (27.39)
"where the last two lines comes from"
should be
"where the last two lines come from"

105. Page 333, in the second line of the last paragraph of Subsection 27.8,
"is of the order of 10^{12} of more"
should be
"is of the order of 10^{12} or more"

106. Page 341, in the second line after the section title, "28.8 Compressibility of Metals"

"fermion" should be "fermions"

107. Page 342, last sentence in Section 28.8

"Fermi–Einstein"

should be

"Fermi–Dirac"

108. Page 360, first line below eq. (29.25). The inline equation should be

$\mu \approx \epsilon_F = (\epsilon_C + \epsilon_V)/2$

instead of

$\mu \approx \epsilon_F = (\epsilon_H + \epsilon_L)/2$

109. Page 361, In three places in eqs. (29.32) and (29.34),

k_b should be k_B

110. Page 372, eq. (30.18)

should read

$$Z_j = \sum_{\tau_j = \pm 1} \exp[\beta J \tau_j] = \exp[\beta J] + \exp[-\beta J] = 2\cosh(\beta J)$$

111. Page 372, in the first line under "30.4.1 Transfer Matrix,"
$\sigma_{n+1} = \sigma_1$
should read
$\sigma_{N+1} = \sigma_1$

112. Page 374, eq. (30.32) should read

$$\tilde{T}_{1,2}\tilde{T}_{2,3}\tilde{T}_{3,4} = RT_{1,2}R^{-1}RT_{2,3}R^{-1}RT_{3,4}R^{-1} = RT_{1,2}T_{2,3}T_{3,4}R^{-1}$$

instead of

$$\tilde{T}_{1,2}T'_{2,3}\tilde{T}_{3,4} = RT_{1,2}R^{-1}RT_{2,3}R^{-1}RT_{3,4}R^{-1} = RT_{1,2}T_{2,3}T_{3,4}R^{-1}$$

The left side is different.

113. Page 383, in the first line in the second paragraph after eq. (30.73),

'will be given by value of the order parameter'

should be

'will be given by the value of the order parameter' '

114. Page 387, Problem 30.3, Part 1, beginning of the fourth line:
"temperature J"
should read
"temperature T".