

Front inside cover: h/e^2 should be 25800 Ω .

p. 8

The eigenstate solution in Exercise #1.2 is correct for V_{12} real; more generally the eigenstate is a superposition of the two states with equal weight $1/\sqrt{2}$ and a phase factor $e^{i\phi} = \pm|V_{12}|/V_{12}$ multiplying the second term.

p. 21

last three basis vectors of cuprite structure should be:

$$\frac{a}{4}(3\hat{x} + 3\hat{y} + \hat{z}), \frac{a}{4}(3\hat{x} + \hat{y} + 3\hat{z}), \frac{a}{4}(\hat{x} + 3\hat{y} + 3\hat{z}).$$

p. 27

Figure 1.18: Caption (a) should read "...showing the threefold symmetry of the [111] axis of crystalline silicon."

p. 31

On the right-hand side of the first line of the equations before (1.37), there should be a left-hand bracket, i.e., $\langle \psi_{n, \vec{Q}/2 - d\vec{k} - \vec{Q}} |$

p. 33

Equation (1.39) should read

$$\vec{k} = \frac{\nu_1}{N_1} \vec{b}_1 + \frac{\nu_2}{N_2} \vec{b}_2 + \frac{\nu_3}{N_3} \vec{b}_3.$$

p. 35

In Exercise 1.15, second paragraph, second sentence, should read "In the above solution, there are two sets of degenerate eigenstates ..." (not three).

p. 41

The last two lines of (1.50) should have $u_{n\vec{k}}$ divided by \sqrt{V} to be consistent with the definition (1.14).

p. 52

Equation (1.68) should read

$$\frac{1}{m_{\text{eff}}} = \frac{1}{m} + \frac{2}{m^2} \sum_m \frac{|p_{mn}|^2}{E_n(0) - E_m(0)}$$

i.e., \hbar^2 should not appear.

p. 85

In the caption of Fig. 2.9, the formula should read $\mu \approx (E_c + E_v)/2$.

p. 95

The first equation on this page should read

$$I \sim e^{-(E_g - eV_{\text{ext}})/k_B T}.$$

p. 98

The last line of the last full paragraph should read, “when $k_B T$ is much less than the gap energy.”

p. 111

The last line should read, “... k_y runs from $-m\omega_c L_x/2\hbar$ to $m\omega_c L_x/2\hbar$.”

p. 115

The quantum density of states factor at the bottom of the page should have a factor $e^{-E/k_B T}$, with no μ , consistent with Eq. (2.20), for low-density electrons.

p. 116

In the next-to-last paragraph, the Hall resistance should be $R_H = h/e^2\nu$.

p. 117

After the formula $J_x = nev_x$, the total density should be defined as $n = \nu N/A$, where ν is the number of full Landau levels. Then the following equation should read

$$E_y = \frac{J_x A}{\nu N e} B_z,$$

and $\Phi = B_z A = N\Phi_0$. Finally, Equation (2.50) should read

$$E_y = \frac{N\Phi_0}{\nu N e} J_x = \left(\frac{h}{e^2}\right) \frac{J_x}{\nu} = R_H J_x.$$

p. 131

In Equation (3.9) and (3.11), the $\sqrt{2}$ factors should all be replaced by 2. This also affects (3.12) and (3.13) below.

In Equation (3.10), the exponential terms should have the form

$$e^{i(\vec{k}\cdot\vec{R} - \omega t)}.$$

p. 132

Equation (3.12) should be

$$\frac{K}{M} \begin{pmatrix} 4 \cos ka - 4 & 0 \\ 0 & 2 \cos ka - 2 \end{pmatrix} = -\omega^2 \begin{pmatrix} x0 \\ y0 \end{pmatrix}$$

Equation (3.13) should be

$$\omega_L = (\omega_0 a \sqrt{2})k,$$

$$\omega_T = (\omega_0 a)k,$$

p. 135

\vec{u}_l^0 in (3.15) and (3.18) should be just \vec{u}^0 , without subscript; it is the polarization vector of the wave.

p. 143

In Exercise 3.8, the equation for energy should have U/V on the left side of the equation, not just U .

p. 151

Before equation (3.47) should read, “We define the *permittivity* of the medium.”

Before equation (3.49) should be added, “We will often refer to ϵ as the *dielectric constant* of the medium, though technically the dielectric constant is defined as the unitless ratio ϵ/ϵ_0 .”

p. 152

For clarity, the leftmost term of Eq. (3.53) should read $\vec{k} \times (\vec{k} \times \vec{E})$.

p. 159

The vertical axis of Fig. 3.18(b) should be labeled as x_3 .

p. 160

For clarity, the leftmost term of Eq. (3.71) should read $\hat{u} \times (\hat{u} \times \vec{\eta} \hat{D})$.

p. 168

Equation (3.80) should read

$$n_1 E_0^{(i)} \cos \theta_i - n_1 E_0^{(r)} \cos \theta_r = n_2 E_0^{(t)} \cos \theta_t.$$

p. 169

Eq. (3.84) and the equation before it should be given for $\langle \vec{S} \rangle$ (the time average), not just \vec{S} .

p. 171

Eq. (3.88) should be given for $\langle \vec{S} \rangle$ (the time average), not just \vec{S} .

p. 209

In the next-to-last line of the text, $|i\rangle$ should be $|\psi_i\rangle$.

p. 212

The term in parentheses should be written $(a_{k_3}^\dagger + a_{-k_3})$ to conserve momentum with the same k_3 in each term.

p. 219

In Exercise 4.18, last line should read “ $\rho V = MN$, where M is the mass of an atom and N is the number of unit cells, ...”

p. 221

Equation (4.110) should have π^4 , not π^2 .

p. 223

In the equation after equation (4.113), both terms should be negative. The integral of $\partial f/\partial \varepsilon$ is equal to -1 , and the integral of $\varepsilon^2 \partial f/\partial \varepsilon$ is equal to $-\pi^2/3$.

p. 227

In the equation after (4.123), the third term inside the large parentheses should have c_k^2 ; i.e., it should be squared just as in the second term.

p. 243

The second line of (5.32) should have $\sqrt{2}$ in the denominator.

p. 244 The first line of (5.33) should have 2 in the denominator, not numerator, and the second line should have $\sqrt{2}$ in the denominator, not numerator.

p. 248

The right-hand side of the equation in the text following Eq. (5.47) should be multiplied by a factor of 2π .

p. 252

In first line of the last equation, the exponential factor should be $e^{i|\vec{k}_1 - \vec{k}_2|r \cos \theta}$ (missing r).

p. 253

In the first line of Eq. (5.63), the factor $(1 - N_{\vec{k}'})$ should be inside the summation over \vec{k}' .

p. 260

The beginning of the last paragraph is better written as follows:

“From Equation (4.62) in Section 4.4, the average amplitude of the displacement is given by the average amplitude per mode times the number of modes:

$$x_0^2 = \frac{2\hbar N_k}{M\omega},$$

where we have written $\rho V = MN$, with M the mass of the unit cell and N the number of cells (which is also equal to the number of phonon modes).”

p. 262

The first full paragraph should begin, “Using the definition of the field operators (4.66)...”

p. 265

The potential energy in the equation after (5.88), and in equation (5.89), should be written as $U(r)$, not the electric potential $V(r)$.

p. 276

In Exercises 5.18 and 5.19, the formula for resistance should be $R = l/A\sigma$.

p. 278

In the line after Equation (5.116), the assumed form of the density should read $n(\vec{x}) = n_0 e^{\mu(\vec{x})/k_B T}$. (No minus sign.)

p. 282

In Exercise 5.22, the field should be given as 5 V over a distance of 1 cm, not 1 micron.

p. 286

The last line of (5.136) should read

$$= -(\vec{b} \cdot \vec{\sigma}) \cdot (d\vec{l} \times d\vec{r}).$$

p. 300

In Exercise 6.3, the third line from the end should say, “show that $\alpha_{ij}^* = \alpha_{ij}^{-1}$ and therefore ...”.

p. 309

Before the large matrix equation, the text should say that A is a 3×3 representation and B is a 2×2 representation.

p. 311

In Table 6.8, in the last column of the second row, the product of Γ_2 and Γ_8 should be Γ_8 .

p. 318

In (6.16), E_{12} should have a factor $1/\sqrt{3}$, not $1/3$.

Also in (6.16), the second term in E_{22} should have $(k_x^2 + k_y^2)$.

In the subsequent equation, the right-hand side of the equation for p_{cv}^2 should have m^2 in the denominator.

In (6.17), the standard definition uses B^2 instead of just B .

In Exercise 6.10, it should be noted that the form (6.15) will give $C = 0$ (light and heavy hole splitting, but no warping). Nonzero C is obtained only when coupling to higher p -like bands is included.

p. 322

In Table 6.12, the second half of the first row (D_0^\pm) should have all characters equal to ± 1 .

p. 326

The last sentence of the text before Exercise 6.13 should read, "... but polarization along $\theta = 90^\circ$ will not."

p. 328

In the first sentence of the last paragraph, the words "per unit cell" should be deleted.

p. 329

Exercise 6.16 should be deleted since the proof is given in the current version of the text on page 328.

p. 335

The curve for the imaginary part in Fig. 7.3 should be labeled $|\chi_I|$. The imaginary part is negative for all $\omega > 0$, for the definition (7.8).

The formula $n = \sqrt{1 + \chi_R + i\chi_I}$ in the second paragraph in the text is incorrect. See the comments for Exercise 7.3 on p. 342, below.

p. 339

The right-hand side of the second line of Equation (7.14) should be multiplied by an overall $-$ sign. Also, the plot of $P(t)$ in Figure 7.5 should start at $P(0) = 0$ and rise in time for the first half cycle, not start at a maximum value.

p. 342

In Exercise 7.3, the formula $n = \sqrt{1 + \chi_R + i\chi_I}$ is incorrect for this case. To deduce the relevant n for the Fresnel equations, one can use the general formula $B_0 = E_0(k_R + ik_I)/\omega$ in Equation (3.79) in the derivation of the Fresnel

equations. From Equations (7.9) on page 334, one obtains

$$\begin{aligned} k_I &= \frac{\omega}{\sqrt{2}c} \left(\sqrt{(1 + \chi_R)^2 + \chi_I^2} - (1 + \chi_R) \right)^{1/2} \\ k_R &= \frac{\omega}{\sqrt{2}c} \left(\sqrt{(1 + \chi_R)^2 + \chi_I^2} + (1 + \chi_R) \right)^{1/2}, \end{aligned}$$

and therefore in the Fresnel equations one should use

$$\begin{aligned} n_{\text{eff}} &= \frac{c(k_R + ik_I)}{\omega} \\ &= \left(\frac{\sqrt{(1 + \chi_R)^2 + \chi_I^2} + (1 + \chi_R)}{2} \right)^{1/2} \\ &\quad + i \left(\frac{\sqrt{(1 + \chi_R)^2 + \chi_I^2} - (1 + \chi_R)}{2} \right)^{1/2}. \end{aligned}$$

The phase velocity is given by $v = \omega/k_R$, which is not equal to c/n_{eff} .

In Exercise 7.4, the integral should be of $|\text{Im } \epsilon(\omega)|$ for the sum rule to give a positive value.

p. 348

Equation (7.38) and the one previous should have $\epsilon(\omega)/\epsilon_0$ in the denominator, not just $\epsilon(\omega)$.

p. 388

The Fröhlich matrix element in (8.29) should be $M_{\vec{p}}^{\text{Fr}}$, not $M_{\vec{k}}^{\text{Fr}}$.

p. 407

The second line of Equation (8.63) should read

$$\hbar \langle i | \frac{1}{\hbar\omega - H + i\epsilon} | i \rangle.$$

p. 408

The Green's function definition (8.67) should have an \hbar in the numerator, i.e.,

$$G_{\vec{k}}^-(t) = -(i/\hbar) e^{-i(E_{\vec{k}}' - i\Gamma_{\vec{k}})t/\hbar} \Theta(t).$$

p. 412

In the first term of the first line of Eq, (8.76), the denominator should be

$$\Delta E + E_{\vec{p}} - E_{\vec{p} + \Delta\vec{k}} + i\epsilon,$$

i.e., $E_{\vec{p}+\Delta\vec{k}}$ should appear in both terms.

p. 413

Equation (8.79) should read

$$\begin{aligned}\Pi_{\Delta\vec{k}} &= \sum_{\vec{p}} \left[\frac{\bar{N}_{\vec{p}}}{\Delta E - \hbar^2 \vec{p} \cdot \Delta\vec{k}/m - \hbar^2 |\Delta\vec{k}|^2/2m} + \frac{\bar{N}_{\vec{p}}}{-\Delta E + \hbar^2 \vec{p} \cdot \Delta\vec{k}/m - \hbar^2 |\Delta\vec{k}|^2/2m} \right] \\ &= \sum_{\vec{p}} \frac{\bar{N}_{\vec{p}} (\hbar^2 |\Delta\vec{k}|^2/m)}{-(\hbar^2 |\Delta\vec{k}|^2/2m)^2 + (\Delta E - \hbar^2 \vec{p} \cdot \Delta\vec{k}/m)^2}.\end{aligned}$$

The subsequent equation for the long-wavelength limit should be

$$\Pi_{\Delta\vec{k}} = \frac{N\hbar^2 |\Delta\vec{k}|^2}{m(\Delta E)^2}.$$

(No minus sign.)

p. 424

Exercise 8.22 should refer to Fig. 20 (no “(a)”).

p. 450

In the three equation lines before (9.53), there should be a factor $e^{i\omega_0\tau}$ instead of $e^{-i\omega_0\tau}$.

p. 486

The models in Figures 10.1 and 10.2 both assume a current of positively charged particles, and therefore the caption of Fig. 10.2 should read “Model of the orbit of a free charged particle leading to . . .”

p. 518 In the 3rd full paragraph, the 4th sentence should begin, “If they have the same spin, . . .”

p. 527

In next-to-last line, $U(\vec{r})$ should be $V(\vec{r})$.

p. 539

Equation (11.3) should have $-\beta\mu$ in the exponent in the denominator, i.e. the same $N_{\vec{k}}$ as in (11.2).

p. 544

(11.18) should read

$$E(\vec{k}) = \sqrt{E_k^2 + 2E_k L_{\vec{k}}}$$

p. 546

the last term in (11.23) should have V in the denominator.

p. 557

The first line of text after Equation (11.46) should read, “When $\vec{k} \rightarrow 0$, $E_k \rightarrow 0$ proportional to k^2”

p. 568

Two lines before Exercise 11.12, the absolute value should be used, i.e. $|\alpha| = \sqrt{N_0}$.

p. 592

Two lines before Eq. (11.115), the equation should read $\nabla^2 E = -k^2 E = -(\omega^2/c^2)E$. (Missing E .)

p. 594

Equation (11.119) for $P(t)$ should have \hbar in the denominator of the overall prefactor.

On the right-hand side of the equation after Eq. (120), the exponential factors should be $e^{-i\omega t}$.