

## Errata for “Waves and Oscillations: A Prelude to Quantum Mechanics”, by Walter Fox Smith

**It will only take about ten minutes to make these changes. Please do now. Thanks!**

- p. 10: (Two changes needed, as shown in red.) Change the end of the fourth sentence of section 1.5 to, “...it might have a charge + 1.2 nC on the **bottom** plate and -1.2 nC on the **top** plate.”
- p. 10: In fig. 1.5.1, the top capacitor plate should be labeled “- $q$ ”, and the bottom plate “+ $q$ ”.
- p. 11: Please print out this page; you’ll be cutting and pasting three things from this one printout: one for p. 11, and two for p. 168 (see below). Cut out the paragraph below, and paste it onto the top of p. 11, so that it covers all the text from the top of the page to the line above equation (1.5.6), so that equation (1.5.6) itself is still visible:

The emf is produced by a battery or a coil (through Faraday’s law) is defined with a sign opposite to the change in voltage. For example, when the positive end of a battery is connected to one side of a resistor, and the negative end to the other side, then current flows from the positive end, through the resistor, to the negative end of the battery, and is then pumped up through the battery to the positive end by the chemical action of the battery. However, if we only considered the voltage difference, we would expect the current to flow in the opposite direction through the battery, from the positive end to the negative end. Since emf is opposite in sign to voltage change, we have

$$V_L = -\varepsilon, \quad (1.5.4)$$

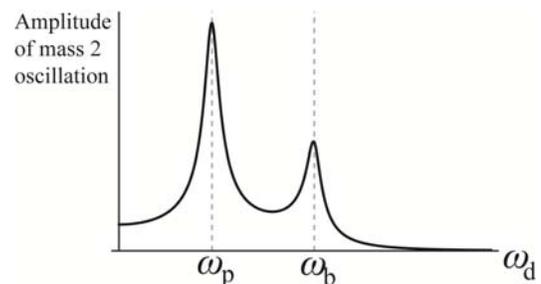
where  $V_L$  is the voltage across the inductor.

Recall that the current is defined to be a time rate of change of charge. We define positive current to be clockwise, as shown in figure 1.5.1. Therefore,

$$I = +\dot{q}. \quad (1.5.5)$$

Combining (1.5.3), (1.5.4), and (1.5.5) then gives

- p. 12: Just after the second “=” sign in (1.62), insert “ $f(x_0) +$ ”.
- p. 68: In fig. 3.2.1, the top capacitor plate should be labeled “- $q$ ”, and the bottom plate “+ $q$ ”.
- p. 69: In the top line, change “ $V_R = -IR$ ” to “ $V_R = +IR$ ”.
- p. 69: In the second line, change “...positive  $I$  decreases...” to “...positive  $I$  increases...”.
- p. 69: In the second line, change “ $I = -\dot{q}$ ” to “ $I = +\dot{q}$ ”.
- p. 69: In the third line, change “ $V_R = -IR = \dot{q}R$ ” to “ $V_R = +IR = \dot{q}R$ ”.
- p. 105: In both figures, the top capacitor plate should be labeled “- $q$ ”, and the bottom plate “+ $q$ ”.
- p. 141: About half way down the page, change “discussed in chapter 3” to “discussed in chapter 2”.
- p. 167: About a third of the way down the page, change “ $\frac{(5.9.1)}{\sqrt{2}} - \frac{(5.9.2)}{\sqrt{2}}$ ” to “ $\frac{(5.9.1)}{\sqrt{2}} + \frac{(5.9.2)}{\sqrt{2}}$ ”.
- p. 167: About two thirds of the way down the page, change “ $\frac{(5.9.1)}{\sqrt{2}} + \frac{(5.9.2)}{\sqrt{2}}$ ” to “ $\frac{(5.9.1)}{\sqrt{2}} - \frac{(5.9.2)}{\sqrt{2}}$ ”.
- p. 167: Near the bottom of the page, eliminate the subscript “ $s$ ” at the end of the definition of  $s_b$ .
- p. 168: Cross out the self test and the answer at the bottom of the page.
- p. 168: Replace fig. 5.9.1 with the figure shown here. (From your printout of this page, cut out the figure, and paste it in.)
- p. 168 From this same printout, cut out the paragraph below, and paste it in on top of the self-test box:



Again, for the coupled pendula, the response of each normal mode is that of a driven oscillator (though the effective drive force is reduced by  $1/\sqrt{2}$ ). So, most equations in chapter 4 can be used to determine the response of  $s_p$  or  $s_b$  by substituting either  $\omega_p$  or  $\omega_b$  for  $\omega_0$ . The only exceptions are equations (4.2.1), (4.2.2), (4.2.4), (4.2.5), and (4.3.3), because they are derived assuming  $\omega_0 = \sqrt{k/m}$ .

- p. 176: In problem 5.21 part b, change “...the response of the pendulum mode is negligible...” to “...the response of the breathing mode is negligible...”.
- p. 178: Cross out the last line in the page, and the word “a” on the next-to-last line, and write in “essentially zero.”
- p. 196: The equation above the line marked (6.5.3) should read

$$|\dot{x}_0\rangle \equiv \begin{pmatrix} \dot{x}_{10} \\ \dot{x}_{20} \\ \vdots \end{pmatrix} = \left[ \frac{d}{dt} |x(t)\rangle \right]_{t=0} = \left[ \frac{d}{dt} \operatorname{Re} \left[ \sum_{n=1}^N C_n e^{i\omega_n t} |e_n\rangle \right] \right]_{t=0}$$

Note that two changes are needed: the  $\frac{d}{dt}$  should be inside the  $[ ]_{t=0}$  brackets for the last two entries.

- p. 207: Change the first subscript in equation (6.7.16) from  $n$  to  $m$ , so that it reads

$$\langle e_m | \hat{\mathbf{M}} | e_n \rangle = \delta_{mn}$$

- p. 214: In problem 6.13, the eigenvector given is wrong. The correct eigenvector is

$$|e_a\rangle = \begin{pmatrix} 0.688 \\ -0.162 \\ 0.688 \\ -0.162 \end{pmatrix}$$

- p. 239: (Character to be deleted shown in red.) In problem 7.7, change, “If the guitarist pushes down behind the first fret (the one closest to the nut), and then plucks the string, it instead produces an F#.” to “If the guitarist pushes down behind the first fret (the one closest to the nut), and then plucks the string, it instead produces an F.”
- p. 243: (Character to be changed shown in red.) About halfway down the page change, “The notation  $\frac{\partial \Psi}{\partial t}$  means ‘partial derivative of  $\Psi$  with respect to  $x$ .’” to , “The notation  $\frac{\partial \Psi}{\partial t}$  means ‘partial derivative of  $\Psi$  with respect to  $t$ .’”

- p. 254: In equation (8.4.4), the upper limit on both integrals should be  $T$ , not  $\lambda$ .

- p. 263: In equation (8.6.14), insert “ $\frac{1}{N}$ ” immediately after the “=” and just before the “ $\sum_{n=0}^{N-1}$ ”.

- p. 278: In part b of problem 8.18, the first integral should be with respect to  $k$ , not  $x$ . In other words, the

$$\text{first equation should read } \psi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} Y(k) e^{ikx} dk.$$

- p. 330: The start of the last paragraph should read “In appendix A, ...”.

- p. 357: In the bottom equation, the “R2” that appears in the denominator on the right side should be a subscript, so that the right side should be  $\frac{F_{L,R2}}{\dot{y}_{R2}}$ .