Errata for *Matter & Interactions I: Modern Mechanics*

Second Edition (Wiley 2007)

How to tell which printing you have:

Look at the bottom of the copyright page.
If the numbers say 10 9 8 7 6 5 4 3 2 1 it is the first printing.
If the numbers say 10 9 8 7 6 5 4 3 2 it is the second printing.
If the numbers say 10 9 8 7 6 5 4 3 it is the third printing.

Significant errors in all printings

26, example of fast proton: The denominator should be $\sqrt{1+(\frac{|\vec{p}|}{mc})^2}$, the speed is 1.4×10^8 m/s, and the distance traveled in 2 ns is 28 cm.

26, example of ice skater: The ice skater's momentum is $< 400, 0, 300 >$ kg $\cdot$ m/s.

37, 1.P.84: The bottom vector, $\vec{t}$, should point to the right.

40, 2nd answer for 1.X.50: Direction is "toward the Sun."

54, 2.X.8: Questions (c) through (f) should be these:
(c) How much time does it take for the ball to reach its maximum height?
(d) What is the maximum height?
(e) At what time does the ball hit the ground?
(f) What is the location of the ball when it hits the ground?
The correct answers on p. 72 are (c) 1.33 s; (d) 8.6 m; (e) 2.65 s; (f) $\langle -17.5, 0, -18.3 \rangle$ m

57: Calculation of the force is correct (21000 N), but the denominator should be 0.017 s, not 0.01 s.

72, 2.X.2(b): Units are N.

85-86, errors in the Earth and Sun example: In the first time step, $\vec{F}_{\text{on E by S}} = \langle -3.6 \times 10^{22}, 0, 0 \rangle$ N, and $\vec{p}_f = \langle -9.3 \times 10^{28}, 1.8 \times 10^{29}, 0 \rangle$ kg $\cdot$ m/s. In the momentum update of the second time step, the initial momentum is shown incorrectly (it should be the final momentum from the first step, though the result for the new final momentum is displayed correctly), and the position update gives $\vec{r}_f = \langle 2.9 \times 10^{10}, 1.3 \times 10^{11}, 0 \rangle$ m.

89, answer to 3.X.15(c): 0.5 cm

143, 4.X.29 and 4.X.30: as written, needed information was missing. Here are new exercises:

> 4.X.29: A certain metal with atomic mass 2×10^{-25} kg has an interatomic bond with length 2.1×10^{-10} m and stiffness 40 N/m. What is the speed of sound in a rod made of this metal?
>
> 4.X.30: A rod made of this metal is 3 m long. If you hit one end of the rod, when would a microphone at the other end first detect a disturbance?

158, 4.P.82 Weight on a bathroom scale; here is a clearer statement of the problem:

> You put a 10 kg object on a bathroom scale at the North Pole, and the scale reads exactly 10 kg (actually, it measures the force F_N that the scale exerts on the object, but displays a reading in kg). At the North Pole you are 6357 km from the center of the Earth. At the equator, the scale reads a different value due to two effects: (1) The Earth bulges out at the equator (due to its rotation), and you are 6378 km from the center of the Earth. (2) You are moving in a circular

path due to the rotation of the Earth (one rotation every 24 hours). Taking into account ***both*** of these effects, what does the scale read at the equator?

163, answers to the new 4.X.29 and 4.X.30 are 2970 m/s and 1.01 milliseconds later.

173, 5.X.14: The question should ask for work, not final speed.

221, 5.X.14: -600 J

257, 6.P.53: Angular speed ω is measured in radians/s and is equal to v/r.

300, 8.P.26: The last two sentences should read, "Initially the speed of each mass relative to the axle was $v_{m,i}$. In terms of the given quantities, what is the final speed of each mass relative to the axle, $v_{m,f}$?"

389, next to last paragraph: Should refer to Figure 11.30, not 11.29.

390, first sentence: The table of numerical data is on page 407.

410, under answer to 11.X.5: The answer starting with "Liquid" goes with 11.X.6 (page 388).

419, first section: In two places, $1/T$ should be equal to $\partial S/\partial E$, not $\partial E/\partial S$.

Significant errors in first and second printings

End-of-chapter problems should all be numbered like "4.P.74", not "4.HW.74".

40, 1.X.16: $\langle 0.04, -3.4, 60.0\rangle$

40, 1.X.49: Last answer is -0.114 kg $\cdot$ m/s.

72: 2.X.8 (c) 2.66 s, (d) $\langle -17.5, 0, -18.3\rangle$ m. There should be no (e) or (f).

74, first line: Delete the "p".

103, 3.X.11: (a) $\langle 2.8\times10^8, 0, -2.8\times10^8\rangle$ m; (b) 3.96×10^8 m; (c) $\langle -0.707, 0, 0.707\rangle$; (d) $\langle -1.3\times10^{20}, 0, 1.3\times10^{20}\rangle$ N.

103, 3.X.13: 3.7 N/kg

103, 3.X.23: 2.02×10^{-9} N, 2.02×10^{-9} N

118, 4.X.14: ... changes from $\langle 5, -3, 0\rangle$ m/s to $\langle 5.02, -3.04, 0\rangle$ m/s ...

147-148, circular pendulum example: $F_{\rm T}$ should be $F_{\rm String}$ everywhere.

163, 4.X.14: $\langle 2, -4, 0\rangle$m/s^2; $\langle 0.16, -0.32, 0\rangle$ (kg $\cdot$ m/s)/s; $\langle 0.16, -0.32, 0\rangle$ N

163, 4.X.23: Second answer is $|\vec{p}\,|\,(d\hat{p}/dt) = \dfrac{mv^2}{R}\hat{n}$

168, low-speed approximation: All the signs in the binomial expansion should be +'s.

180, Figure 5.15 caption: ... and a nearly massless antineutrino.

188, last main paragraph: ... headed upward at a speed of 8 m/s.

199, Figure 5.47: $E_{\rm tot}$ should be replaced everywhere by $K+U$.

208, Figure in left margin: Caption should read "A U-235 nucleus in the process of fissioning."

214, approximation for kinetic energy: In the expansion of $(1-\epsilon)^{-1/2}$, the second and third occurrences of ϵ should be $(-\epsilon)$. All the signs in the next to the last equation on the page should be +'s.

221: The answers for 5.X.5, 5.X.6, and 5.X.7 are out of order near the bottom of the first column. The missing answer for 5.X.8 is 1.40 J.

221, 5.X.41: 103 m

226, end of example: $\frac{1}{2}mv_f^2 = 0.03$ J (not v_i^2)

238-239: Last equation on p. 238 and third equation on p. 239, $\frac{1}{2}mv_i^2$ (not v_f^2)

264, middle of page: The notation $\exp(-E/kT)$ means $e^{-E/kT}$.

270, Figure 7.22: The energy levels are very faint but are marked by E_0, E_1, etc.

293, Figure 8.32: Delete the arrow labeled d at the lower left of the figure.

295: Just before the title "Lubricated friction", add this sentence: (If the blocks are not made of the same material, d_{eff} need not be equal to $d/2$.)

295-297: To be consistent with the notation used in Section 8.2, the vectors from the center of mass to the particles should be labeled $\vec{r}_{1,\text{cm}}$, $\vec{r}_{2,\text{cm}}$, and $\vec{r}_{3,\text{cm}}$, there should be vectors from an origin to the particles, labeled $\vec{r}_1$, $\vec{r}_2$, and $\vec{r}_3$, and a vector $\vec{r}_{\text{cm}}$ from the origin to the center of mass. With these definitions, $\vec{r}_1 = \vec{r}_{\text{cm}} + \vec{r}_{1,\text{cm}}$.

299, 8.P.24: Fourth line of part (b) should read . . . insufficient time for there to be. . .

300, 8.P.27: Delete the phrase "whose stiffness is 100 N/m". Part (d) should read "What is the vibrational energy (kinetic plus potenital) of the two-block system?"

300, 8.P.28: Delete the phrase "whose stiffness is k_s" and the sentence "The initial stretch of the spring is s_i (equal to Mg/k_s)." At the end of the first paragraph delete "to s_f". Delete k_s, s_i, and s_f from the diagram. Part (b) should read "What is the vibrational kinetic plus potential energy of the two blocks. . . "

307, example of two carts: In the Energy Principle, K_{2i} is zero. Also note that $p_{1xi}^2 = (p_{1xf} + p_{2xf})^2$.

337: As on pages 295-297, to be consistent with related derivations, the vectors from the center of mass to the particles should be labeled $\vec{r}_{1,\text{cm}}$, $\vec{r}_{2,\text{cm}}$, and $\vec{r}_{3,\text{cm}}$, and the vectors from location A to the particles should be labeled $\vec{r}_1$, $\vec{r}_2$, and $\vec{r}_3$. With these definitions, $\vec{r}_1 = \vec{r}_{\text{cm}} + \vec{r}_{1,\text{cm}}$. In the equations on page 337 all examples of $\vec{r}_1$ should be changed to $\vec{r}_{1,\text{cm}}$, including in the last equation on the page.

352, in section on alternative analysis: Reference to Figure 10.41 should be to Figure 10.40.

364, near bottom of left column and at top of right column: Replace $\vec{r}_1$ with $\vec{r}_{1,\text{cm}}$, etc.