Corrections to the Instructor's Solution Manual
Introduction to Quantum Mechanics, 2nd ed.
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Corrected in the current electronic version.
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- Page 60, Problem 3.5(a), third line: $-\langle x\, f|g\rangle \to -\langle \frac{df}{dx}|g\rangle$.
- Page 119, Problem 4.55(h): multiply all four terms by r^2.
- Page 124, Problem 4.60: at the end insert the following:

  A more elegant solution runs as follows: Let

  $$P \equiv \frac{1}{\sqrt{2}}\left[(p_x + p_y) - \frac{qB_0}{2}(x-y)\right], \quad Q \equiv \frac{1}{\sqrt{2}}\left[\frac{1}{qB_0}(p_x - p_y) + \frac{1}{2}(x+y)\right].$$

  Show (a) P and Q satisfy the canonical commutation relations (Eq. 2.51): $[Q,P] = i\hbar$, and (b) the Hamiltonian (square brackets in Eq. 4.205) can be written as

  $$H = \left(\frac{1}{2m}P^2 + \frac{1}{2}m\omega_1^2 Q^2\right) + \left(\frac{1}{2m}p_z^2 + \frac{1}{2}m\omega_2^2 z^2\right).$$

  The problem is therefore mathematically identical to two independent harmonic oscillators, with the same mass, and frequencies ω_1 and ω_2; the total energy is just the sum: $(n_1 + \frac{1}{2})\hbar\omega_1 + (n_2 + \frac{1}{2})\hbar\omega_2$.

- Page 174, Problem 6.31(end): "ArXiv: 1401.8144" → "Am J. Phys. **83**, 150 (2015)".
- Page 204, Problem 7.19: change to read as follows:

  The calculation is the same as before, but with $m_e \to m_r$, the reduced mass of the muon:

  $$m_r = \frac{m_\mu m_d}{m_\mu + m_d} = \frac{m_\mu 2m_p}{m_\mu + 2m_p} = \frac{m_\mu}{1 + m_\mu/2m_p}.$$

  From Problem 6.28, $m_\mu = 207 m_e$, so

  $$1 + \frac{m_\mu}{2m_p} = 1 + \frac{207}{2}\frac{(9.11\times 10^{-31})}{(1.67\times 10^{-27})} = 1.056; \quad m_r = \frac{207 m_e}{1.056} = 196 m_e.$$

  This shrinks the muonic "Bohr radius" down by a factor of nearly 200. Equation 7.49 is still valid, but now E_1 is the ground state energy of the muonic "atom." The potential energy associated with the deuteron-deuteron repulsion is the same as V_{pp} (Eq. 7.50), and since the product aE_1 is independent of mass, it doesn't matter whether we write it using the electron values or the muon values. Thus Eq. 7.51 still holds, and the entire molecule shrinks by that same factor of 196. The equilibrium separation for the electron case was $2.493a$ (Problem 7.10), so for muons

  $$R = \frac{2.493}{196}(0.529\times 10^{-10}\,\text{m}) = \boxed{6.73\times 10^{-13}\,\text{m}.}$$