Introduction to Quantum Mechanics, 3rd edition
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New Errata, May 31, 2019

- Page 145, near bottom, displayed equation after "Inserting these into Equation 4.61,": in the second sum, $j(j+1) \to (j+1)$.
- Page 147, Equation 4.69, middle term: $m \to m_e$.
- Page 169, line after unnumbered displayed equation after (4.150): "but it gratifying" → "but it's gratifying".
- Page 196, Problem 4.74(b), first displayed equation: $\tilde{\Psi}(\mathbf{r}, t) \to \tilde{\Psi}_{\pm}(\mathbf{r}, t)$.
- Page 254, first equation under Problem 6.19(a): $\hat{V}_{+} \to \hat{V}_{\pm}$ (on the right).
- Page 259, Equations 6.59, 6.60, and 6.61: on the right, put a prime on the first n: $\langle n\ell' || V || n\ell \rangle \to \langle n'\ell' || V || n\ell \rangle$ (three times).
- Page 316, Problem 7.30(a): erase "*Hint:* Use Equation 7.9".
- Page 362, Equation 9.30: 1.07 → 1.25.
- Page 387, Problem 10.5: modify to read

  Problem 10.5 A particle of mass m and energy E is incident from the left on the potential

  $$V(x) = \begin{cases} 0, & (x < -a), \\ V_0, & (-a \le x \le 0), \\ \infty, & (x > 0), \end{cases}$$

  where V_0 is a (positive) constant.

  (a) If the incoming wave is Ae^{ikx} (where $k = \sqrt{2mE}/\hbar$ and $E < V_0$), find the reflected wave. *Answer:*

  $$Ae^{-2ika}\left[\frac{k - i\kappa\coth(\kappa a)}{k + i\kappa\coth(\kappa a)}\right]e^{-ikx}, \text{ where } \kappa \equiv \sqrt{2m(V_0 - E)}/\hbar.$$

  (b) Confirm that the reflected wave has the same amplitude as the incident wave.

  (c) Find the phase shift δ (Equation 10.40) for a very high barrier ($E \ll V_0$). *Answer:* $\delta = -ka$.

- Page 398, after "**nuclear scattering length** b," add the following footnote [this becomes footnote 17, and augments each of the current footnotes 17-20 (none of which is cited elsewhere) by 1]:

The delta-function potential in three dimensions is problematic [K. Huang, *Int. J. Mod. Phys. A* **4**, 1037 (1989)], as you can see from the fact that the next term in the Born series diverges. In the case of neutron scattering it is known as the **Fermi pseudopotential**; it gives the desired result *when treated in the first Born approximation* but is only valid in that limited sense. See Gordon Squires, *Introduction to the Theory of Thermal Neutron Scattering*, Cambridge University Press, Cambridge (1978), Chapter 2.

- Page 401, add

  Problem 10.24 Repeat Problem 10.5, but this time for a *well* instead of a barrier ($V_0 \to -V_0$). In place of part (c), plot the exact phase shift, as a function of ka (from 0 to 20), using $\sqrt{2mV_0}a/\hbar = 10$.

- Page 407, Equation 11.25: $H \to H'$ (three times).

- Page 425, replace footnote 30 with the following:

  Even at high energies—where one would *expect* the plane wave approximation to be valid—this result is too large by a factor of four; see J. G. Cordes and M. G. Calkin, *Am. J. Phys.* **51**, 665 (1983). An expression with the correct high-energy limit is obtained by using the form of the perturbation given in Problem 11.30.

- Page 487: add “circular well 188”.

- Page 488: add “finite circular well 188”.

- Page 493: add “self-adjoint extension 130”.