Significant Errata for Matter & Interactions II: Electric & Magnetic Interactions

P. 525, last two equations: Units of ε_0 in the denominator are inverted; the correct units are $C^2/(N \cdot m^2)$.

P. 599, evaluate cross product: Sign error in y component, should be $\langle 0, +zR\Delta\theta, R^2\Delta\theta \rangle$. See Fig. 17.29 on p. 598.

P. 740, Figure 20.46: The forces perpendicular to the plane of the loop are reversed (the perpendicular components of the magnetic forces are shown correctly in Figure 20.44).

P. 799, Prob. 21.4 (d): "Knowing E, determine q/A" (not Q).

(Following are errata for first printing, ISBN 0-471-44255-0, corrected in second printing, ISBN 0-471-66327-1)

P. 435, end of second paragraph: A more accurate value is $\varepsilon_0 = 8.85\times10^{-12} C^2/N \cdot m^2$.

P. 446, section "Dipole moment as a vector": ...along the axis of the dipole (outside the dipole) points....

P. 450: Add $\frac{1}{4\pi\varepsilon_0} = 9\times10^9 \frac{N \cdot m^2}{C^2}$ and this:

Electric field of a uniformly charged spherical shell

Outside a uniformly charged spherical shell the electric field is that of a point charge located at the center of the sphere, with a charge equal to the total charge on the shell. Inside the shell the electric field is zero.

P. 451: Equations at the bottom of the page should read like this:

$$\vec{E}_{ball} = \frac{1}{4\pi\varepsilon_0}\frac{(-Q)}{(b^2+a^2)}\frac{\langle -b, -a, 0\rangle}{\sqrt{b^2+a^2}} = \frac{1}{4\pi\varepsilon_0}Q\frac{\langle b, a, 0\rangle}{(b^2+a^2)^{3/2}}$$

$$\begin{aligned}\vec{E}_{net} &= \vec{E}_{dipole} + \vec{E}_{ball} \\ &= \langle 0, \frac{1}{4\pi\varepsilon_0}\frac{2qs}{a^3}, 0\rangle + \frac{1}{4\pi\varepsilon_0}Q\frac{\langle b, a, 0\rangle}{(b^2+a^2)^{3/2}} \\ &= \frac{1}{4\pi\varepsilon_0}\langle \frac{Qb}{(b^2+a^2)^{3/2}}, \frac{Qa}{(b^2+a^2)^{3/2}} + \frac{2qs}{a^3}, 0\rangle\end{aligned}$$

P. 453, Problem 13.2: 400 nm is about 4000 atomic diameters, not 40.

P. 454, Problem 13.3 (b): ...at a location marked ×, a distance 10^{-10} m from the helium nucleus.

P. 457, answer to Ex. 13.15: 5.8×10^{-15} N (also, this answer is listed out of order on the page).

P. 464, Experiment 14.4: ...at which you first see attraction (not repulsion).

P. 504: In Figures 14.75 and 14.76, the indicator of separation for the vertical dipole is misplaced and could be misinterpreted; the length of the vertical dipole is s, not $2s$. In Problem 14.18, units of polarizability should be $C \cdot m/(N/C)$.

P. 515: Just before 4th equation, should read "Plugging in the end values of y (not z)..."

P. 534: First sentence should say *positive* charge, not negative.

P. 539: Figure 15.52 Two plastic spheres (Problem 15.8).

P. 545: Solutions to Exercises 15.7, 15.8, and 15.9, using the accurate value $\varepsilon_0 = 8.85\times10^{-12} C^2/N \cdot m^2$:

15.7 (page 523) 2.684×10^6 N/C; 2.657×10^6 N/C

15.8 (page 523) 2.671×10^6 N/C; 2.671×10^6 N/C; 2.698×10^6 N/C

15.9 (page 524) 2.043×10^6 N/C; 2.023×10^6 N/C; 2.698×10^6 N/C

P. 554, second example: $\Delta V \approx -\vec{E} \bullet \Delta\vec{l} = -E\Delta l\cos\theta$ (missing minus sign)

P. 573, Figure 16.54: "...a distance h from..." *(**Continued on next page**)*

P. 575, Problem 16.7: Last two parts should be labeled (c) and (d). In the third part (c), show that the negative gradient is equal to the *x component* E_x (not the magnitude) of the electric field.

P. 577, Problem 16.16: Charge is $-q$, not $+Q$.

P. 578, Problem 16.21: Third bullet: The distances a and b shown in the diagram are much greater than *shown* ($a > b >> s$).

P. 581, answer to Ex. 16.6: Should be +1500 volts.

P. 598, Figure 17.28: The loop is in the xy plane, with x to the right and y up.

P. 600, below first equation: ...is just $2\pi R$, the circumference of the ring.

P. 602, Figure 17.37: Right edge of figure is cut off, should say "compass deflects to the east".

P. 619: Figure 17.73 should refer to Problem 17.13, and Figure 17.74 should refer to Problem 17.14.

P. 638, Figure 18.28: At the center of the bottom wire, $E \neq 0$.

P. 651, 4th line from bottom: Since $A_r > A_l$, $E_l > E_r$.

P. 660, Problem 18.2, Figure 18.67: North is to the right.

P. 666, answer to Ex. 18.12: $Q = \dfrac{A\varepsilon_0(\text{emf})}{s} = \pi(0.01\text{m})^2\left(8.85\times10^{-12}\dfrac{\text{C}^2}{\text{N}\cdot\text{m}^2}\right)\left(\dfrac{1.5\text{ volts}}{0.05\text{m}}\right) = 8.3\times10^{-14}C$

P. 685, Section 19.16: In the text and on the diagram, E_4 should be E_C.

P. 698, 2nd line from bottom: Capacitance $C = Q/|\Delta V|$ depends on the geometry of the capacitor (page 675; for a parallel-plate capacitor, $C = K\varepsilon_0 A/s$, where A is the area of one of the plates, s is the gap distance between the plates, and K is the dielectric constant of the material filling the gap).

P. 702, Problem 19.3, Figure 19.54: The "Gap" is in the wire to the left of the capacitor. (Of course there is also a nonconducting gap between the plates of the capacitor.)

P. 707, Problem 19.18, Figure 19.64: There should be 6 (not 8) locations marked × on the diagram. Add an × at the center of the capacitor, and at the center of the round bulb.

P. 709: At the bottom add a note that Problem 19.23 is continued on the next page.

P. 720 and 721: In Ex. 20.5, Ex. 20.6, and Fig. 20.9, the diagonal-pointing vectors are meant to indicate the $+z$ direction.

P. 747, Figure 20.57: The directions of the current and the horizontal magnetic forces were backwards. The corrected figure appears at right:

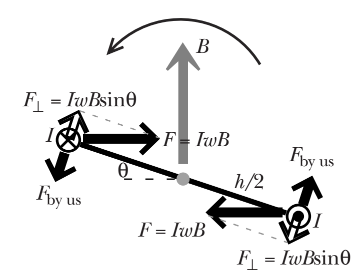


Figure 20.57 (corrected)

P. 759, Problem 20.14: In two places in the problem statement "L" should be "w".

(Continued on next page)

P. 780, Figure 21.30: The negative charge should be on the inner surface of the hole, not inside the metal. The corrected figure appears at right:

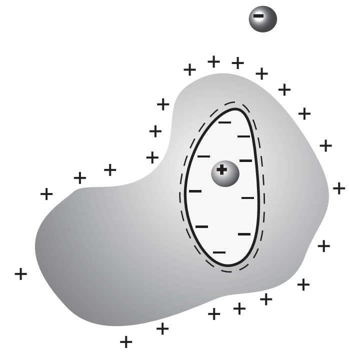


Figure 21.30 (corrected)

P. 798, Figure 21.63: The 20° should be positioned in the angle of the wedge.

P. 796, bottom of page: Result should be in terms of i, not E_1. Since $E = i/(nAu)$,

$$\sum q_{\text{inside}} = \varepsilon_0 i\left(\frac{1}{n_1 u_1} - \frac{1}{n_2 u_2}\right)$$, which is negative, since $n_1 > n_2$ and $u_1 > u_2$.

P. 799, Problem 21.5: In part (b), the force should be $F = \mu_{\text{loop}}|dB/dx|$, where μ_{loop} is the magnetic dipole moment of the current loop (μ is the magnetic dipole moment of the bar magnet). Also, Figure 21.67 should label the thickness of the dashed disk-shaped Gaussian surface as Δx.

P. 800, first sentence of Problem 21.6 (a): ...and is also polarized by other charges that are not on the metal.

P. 835, Figure 22.63 caption: A wire is wrapped around a toroid and connected to an ammeter (Problem 22.7).

P. 869, Problem 23.3: (c) What is the direction of the *radiative* electric field at location A at time t_3?

P. 888: Figures 24.26 and 24.27 and their captions should look like this:

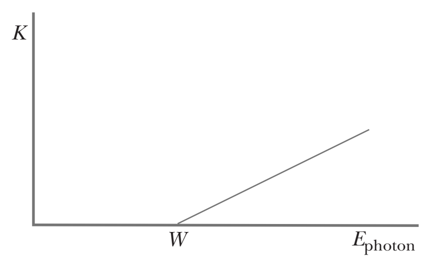


Figure 24.26 The particle model predicts that above a certain threshold energy W, the kinetic energy of an ejected electron should be proportional to $(E_{\text{photon}} - W)$.

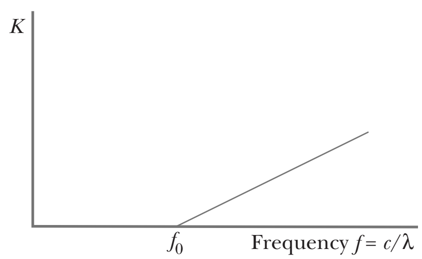


Figure 24.27 What is actually observed is that above a minimum frequency f_0, the kinetic energy of ejected electrons is proportional to $(f - f_0)$.

P. 889. Ex. 24.11: ...and the *maximum* kinetic energy of the electron is 0.9 eV.

The inside back cover contains the constants from Volume 1. The correct page is given next.

(Continued on next page)

Physical constants

$\frac{1}{4\pi\varepsilon_0} = 9\times10^9 \frac{N\cdot m^2}{C^2}$ $\varepsilon_0 = 8.85\times10^{-12} \frac{C^2}{N\cdot m^2}$ $\frac{\mu_0}{4\pi} = 10^{-7} \frac{T\cdot m}{A}$

$c = 3\times10^8$ m/s; speed of light

$e = 1.6\times10^{-19}$ coulomb; proton charge

$G = 6.7\times10^{-11}$ $N\cdot m^2/kg^2$; universal gravitational constant

$g = 9.8$ N/kg; gravitational field strength near Earth's surface

$h = 6.6\times10^{-34}$ joule·s; Planck's constant $\hbar = \frac{h}{2\pi} = 1.05\times10^{-34}$ joule·s

$k = 1.4\times10^{-23}$ J/K; Boltzmann constant

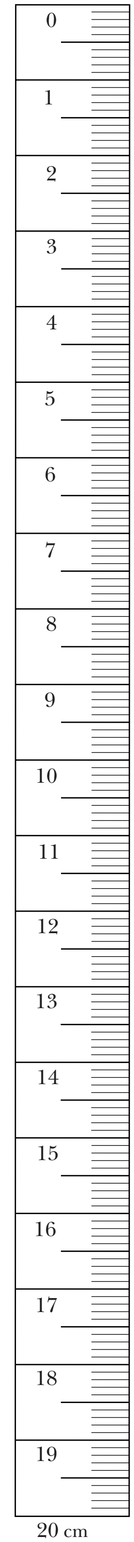
Avogadro's number = 6×10^{23} molecules/mole

$m_{electron} = 9\times10^{-31}$ kg

$m_{proton} \approx m_{neutron} \approx m_{hydrogen\ atom} \approx \frac{1\times10^{-3}\ kg}{6\times10^{23}\ atoms/mole} = 1.7\times10^{-27}$ kg

Radius of atom ≈ 10^{-10} m Breakdown strength of air ≈ 3×10^6 N/C

Horizontal component of Earth's magnetic field ≈ 2×10^{-5} T in much of the United States.



Units of measurement

C = coulomb	A = ampere	V = volt	T = tesla
kg = kilogram	m = meter	s = second	
N = newton ($kg\cdot m/s^2$)	J = joule (N·m)	W = watt (J/s)	

eV = electron volt = 1.6×10^{-19} J

Important prefixes

pico (p) = 10^{-12}	nano (n) = 10^{-9}	micro (m) = 10^{-6}	milli (m) = 10^{-3}
centi (c) = 10^{-2}	kilo (k) = 10^3	mega (M) = 10^6	giga (G) = 10^9