Individual

- Chapter 1, Problems: 6, 11, 18, 19, 20, 24, 28, 34
- Chapter 2, Problems: 2, 6, 9, 21, 27, 32, 40

Team

- Chapter 1, Problems: 29, 42, 49, 52
- Chapter 2, Problems: 33, 37

Chapter 1 - Individual

6. $100 \text{ yds}\left[\frac{3 \text{ ft}}{1 \text{ yd}}\right]\left[\frac{1 \text{ mi}}{5{,}280 \text{ ft}}\right] = 0.0568 \text{ mi}$

$\frac{60 \text{ mi}}{\text{hr}}\left[\frac{1 \text{ hr}}{60 \text{ min}}\right]\left[\frac{1 \text{ min}}{60 \text{ s}}\right] = 0.0167 \text{ mi/s}$

$t = \frac{d}{v} = \frac{0.0568 \text{ mi}}{0.0167 \text{ mi/s}} = \mathbf{3.40 \text{ s}}$

11. MKS, CGS, $°C = \frac{5}{9}(°F - 32) = \frac{5}{9}(68 - 32) = \frac{5}{9}(36) = \mathbf{20°}$

SI: $K = 273.15 + °C = 273.15 + 20 = \mathbf{293.15}$

18. a. $\mathbf{10^4}$ b. $\mathbf{10^6}$ c. $\mathbf{10^3}$ d. $\mathbf{10^{-3}}$

e. $\mathbf{10^0}$ f. $\mathbf{10^{-1}}$

19. a. $\mathbf{15 \times 10^3}$ b. $\mathbf{5 \times 10^{-3}}$ c. $\mathbf{2.4 \times 10^6}$ d. $\mathbf{60 \times 10^3}$

e. $\mathbf{4.02 \times 10^{-4}}$ f. $\mathbf{2 \times 10^{-10}}$

20. a. $4.2 \times 10^3 + 48.0 \times 10^3 = 52.2 \times 10^3 = \mathbf{5.22 \times 10^4}$
b. $90 \times 10^3 + 360 \times 10^3 = 450 \times 10^3 = \mathbf{4.50 \times 10^5}$
c. $50 \times 10^{-5} - 6 \times 10^{-5} = 44 \times 10^{-5} = \mathbf{4.40 \times 10^{-4}}$
d. $1.2 \times 10^3 + 0.05 \times 10^3 - 0.4 \times 10^3 = 0.85 \times 10^3 = \mathbf{850}$

24. a. $(2 \times 10^3)/(8 \times 10^{-5}) = 0.25 \times 10^8 = \mathbf{2.50 \times 10^7}$
b. $(4 \times 10^{-3})/(4 \times 10^6) = 4/4 \times 10^{-9} = \mathbf{1 \times 10^{-9}}$
c. $(22 \times 10^{-5})/(5 \times 10^{-5}) = 22/5 \times 10^0 = \mathbf{4.40}$
d. $(78 \times 10^{18})/(4 \times 10^{-6}) = \mathbf{1.95 \times 10^{25}}$

28. Scientific:
   a. 2.05×10^{1}
   b. 5.04×10^{4}
   c. 6.74×10^{-4}
   d. 4.60×10^{-2}

   Engineering:
   a. 20.46×10^{0}
   b. 50.42×10^{3}
   c. 674.00×10^{-6}
   d. 46.00×10^{-3}

34. a. $80 \times 10^{-3}\ \text{m} \left[\frac{100\ \text{cm}}{1\ \text{m}}\right] = 8000 \times 10^{-3}\ \text{cm} = \mathbf{8\ cm}$

   b. $60\ \text{cm} \left[\frac{1\ \text{m}}{100\ \text{cm}}\right] \left[\frac{1\ \text{km}}{1000\ \text{m}}\right] = \mathbf{60 \times 10^{-5}\ km}$

   c. $12 \times 10^{-3}\ \text{m} \left[\frac{1\ \mu\text{m}}{10^{-6}\ \text{m}}\right] = 12 \times 10^{-3} \times 10^{+6}\ \mu\text{m} = \mathbf{12 \times 10^{3}\ \mu m}$

   d. $60\ \text{cm}^2 \left[\frac{1\ \text{m}}{100\ \text{cm}}\right] \left[\frac{1\ \text{m}}{100\ \text{cm}}\right] = \mathbf{60 \times 10^{-4}\ m^2}$

Chapter 2 – Individual

2. a. $F = k\frac{Q_1Q_2}{r^2} = \frac{(9\times10^9)(1\,\text{C})(2\,\text{C})}{(1\,\text{m})^2} = \mathbf{18\times10^9\ N}$

b. $F = k\frac{Q_1Q_2}{r^2} = \frac{(9\times10^9)(1\,\text{C})(2\,\text{C})}{(3\,\text{m})^2} = \mathbf{2\times10^9\ N}$

c. $F = k\frac{Q_1Q_2}{r^2} = \frac{(9\times10^9)(1\,\text{C})(2\,\text{C})}{(10\,\text{m})^2} = \mathbf{0.18\times10^9\ N}$

d. Exponentially, $\frac{r_3}{r_1} = \frac{10\text{ m}}{1\text{ m}} = 10$ while $\frac{F_1}{F_2} = \frac{18\times10^9\text{ N}}{0.18\times10^9\text{ N}} = \mathbf{100}$

6. $F = \frac{kQ_1Q_2}{r^2} \Rightarrow r = \sqrt{\frac{kQ_1Q_2}{F}} = \sqrt{\frac{(9\times10^9)(20\times10^{-6})^2}{3.6\times10^4}} = \mathbf{10\text{ mm}}$

9. $W = VQ = (60\text{ V})(8\text{ mC}) = \mathbf{0.48\ J}$

21. $0.84\times10^{16}\ \text{electrons}\left[\frac{1\,\text{C}}{6.242\times10^{18}\ \text{electrons}}\right] = 1.346\text{ mC}$

$I = \frac{Q}{t} = \frac{1.346\text{ mC}}{60\text{ ms}} = \mathbf{22.43\text{ mA}}$

27. $\text{Ah} = (0.8\text{ A})(75\text{ h}) = \mathbf{60.0\text{ Ah}}$

32. At 100 mA, discharge time ≅ 120 H; At 25 mA, discharge time ≅ 425 h;
≅ 300 h more at 25 mA

40. Ammeters are connected in series with the load (the circuit must be broken and the current being measured flows though the meter) while voltmeters are connected in parallel (the meter is connected across the load).

Chapter 1 – Team

29. Scientific

a. 5.0×10^{-2}

b. 4.5×10^{1}

c. $1/32 = 0.03125 = \mathbf{3.125 \times 10^{-2}}$

d. $3.14159 = \mathbf{3.142 \times 10^{0}}$

Engineering:

a. $\mathbf{50.0 \times 10^{-3}}$

b. $\mathbf{0.045 \times 10^{3}}$

c. $\mathbf{31.25 \times 10^{-3}}$

d. $\mathbf{3.142 \times 10^{0}}$

42. $d = 86 \text{ stories}\left[\frac{14 \text{ ft}}{\text{story}}\right]\left[\frac{1 \text{ step}}{\frac{9}{12}\text{ ft}}\right] = 1605 \text{ steps}$

$$v = \frac{d}{t} \Rightarrow t = \frac{d}{v} = \frac{1605 \text{ steps}}{\frac{2 \text{ steps}}{\text{second}}} = 802.5 \text{ seconds}\left[\frac{1 \text{ minute}}{60 \text{ seconds}}\right] = \mathbf{13.38 \text{ minutes}}$$

49. MODE = DEGREES: $\cos 21.87° = \mathbf{0.928}$

52. $\mathbf{205 \times 10^{-6}}$

Chapter 2 – Team

33. $I = \dfrac{3\text{ Ah}}{6.0\text{ h}} = 500\text{ mA}$

$$Q = It = (500\text{ mA})(6\text{ h})\left[\frac{60\text{ min}}{1\text{ h}}\right]\left[\frac{60\text{ s}}{1\text{ min}}\right] = 10.80\text{ kC}$$

$$W = QV = (10.8\text{ kC})(12\text{ V}) \cong \mathbf{129.6\text{ kJ}}$$

37. a. $0.5\text{ in}\left[\dfrac{2.54\text{ cm}}{1\text{ in}}\right] = 1.27\text{ cm}$

$$1.27\text{ cm}\left[\frac{30\text{ kV}}{\text{cm}}\right] = \mathbf{38.1\text{ kV}}$$

b. $1.27\text{ cm}\left[\dfrac{270\text{ kV}}{\text{cm}}\right] = \mathbf{342.9\text{ kV}}$

c. $342.9\text{ kV}:38.1\text{ kV} = \mathbf{9:1}$