Ch.1

1-1

a) 3 c) 3 e) 2 g) 2
b) 4 d) 1 f) 4

1-3

a) 86900 d) 476
b) 9100 e) 0.0000362
c) 0.88

1-5

$$\left(\frac{0.25}{5.48}\right)100 = 4.56 = \boxed{4.6\%}$$

1-6

a) $\frac{0.2}{5.5} \times 100 = 3.63 = \boxed{4\%}$

b) $\frac{0.2}{55} \times 100 = 0.363 = \boxed{0.4\%}$

c) $5.5\,\text{min} \cdot \frac{60\,\text{sec}}{1\,\text{min}} = 330\,\text{sec}$

$$\frac{0.2}{330} \times 100 = 0.06\% = \boxed{0.1\%}$$

1-7

$100200 \approx \boxed{1.0 \times 10^5\,\text{sec}}$

1-8

$2.093 \approx \boxed{2.1\,\text{m}^3}$

1-12

a) 0.2066 mm
b) 0.000085 V
c) 0.7609

1-15 $93{,}000{,}000 \text{ miles} \cdot \frac{1609.34 \text{ m}}{1 \text{ mile}} = 1.49 \times 10^{11} \text{ m}$

a) $1.49 \approx 1.5 \times 10^{11} \text{ m}$

b) $1.5 \times 10^{11} \text{ m} \cdot \frac{1 \text{ km}}{1000 \text{ m}} = 1.5 \times 10^{8} \text{ km}$

1-18 a) $\frac{1 \text{ mi}}{1 \text{ hr}} = \frac{1.60934 \text{ km}}{1 \text{ hr}}$

b) $\frac{1 \text{ ft}}{\text{s}} = 0.3048 \frac{\text{m}}{\text{s}}$

c) $\frac{1 \text{ m}}{\text{s}} \cdot \frac{3600 \text{ s}}{1 \text{ hr}} \cdot \frac{1 \text{ km}}{1000 \text{ m}}$

$\frac{1 \text{ m}}{\text{s}} = 3.6 \frac{\text{km}}{\text{hr}}$

1-23 a) $\frac{10^{-15} \text{ kg}}{1.67 \times 10^{-27} \text{ kg}} = 10^{12}$ bacterium in

b) $\frac{10^{-17} \text{ kg}}{1.67 \times 10^{-27} \text{ kg}} = 10^{10}$ DNA molecules in

c) $\frac{10^{2} \text{ kg}}{1.67 \times 10^{-27} \text{ kg}} = 10^{25}$ in human body

d) $\frac{10^{41} \text{ kg}}{1.67 \times 10^{-27} \text{ kg}} = 10^{68}$ in galaxy

Extra credit:

1-30 people in us $= 3 \times 10^{8}$

↳ half (1.5×10^{8} drive cars)

1 car drives 12,000 mi/yr

1 gal for 20 mi

$1.5 \times 10^{8} \text{ people} \cdot \frac{1 \text{ person}}{1 \text{ car}} \cdot \frac{1 \text{ car}}{12{,}000 \text{ miles}} \cdot \frac{20 \text{ miles}}{1 \text{ gal}} = \boxed{10^{11} \text{ gal/yr}}$

Ch·2

2-4 $v_{avg} = \frac{-4.2 - 8.4\,cm}{6.1 - 3\,s} = \frac{-12.6}{-4.1} = -4.06 \approx -4\,cm/sec$

2-11 $\Delta v = \frac{\Delta d}{\Delta t}$ $\Delta t = \frac{\Delta d}{\Delta v} = \frac{210\,m}{\frac{20\,km}{1\,hr}\left|\frac{1000\,m}{1\,km}\right|\frac{1\,hr}{3600\,s}} = 37.76 \approx \boxed{38\,sec}$

2-12

$t_{out} = \frac{250\,km}{95\,km/hr} = 2.63\,hr$ $t_{return} = \frac{250\,km}{55\,km/hr} = 4.54\,h$

$speed_{avg} = \frac{500}{2.63 + 1 + 4.54} = 61.15 \approx \boxed{61\,km/hr}$

$v_{avg} = 0$ since displacement is 0

2-18 a) $a = \frac{\Delta v}{\Delta t} = \frac{9 - 0}{1.38} = 6.52 \approx \boxed{7\,m/s^2}$

b) $\frac{7\,m}{s^2}\left|\frac{1\,km}{1000\,m}\right|\frac{3600^2\,s}{1\,h^2} = 8.45 \times 10^4\,\frac{km}{hr^2} \approx 8\,\frac{km}{hr^2}$

2-19 $v = \frac{\Delta d}{\Delta t} = \frac{120}{5} = 24\,m/s$

$a = \frac{\Delta v}{\Delta t} = \frac{24 - 0}{4} = \boxed{-6\,m/s^2} = \boxed{0.61g}$

$\boxed{|a| = 6\,m/s^2}$ ↑ actual answer

$-6\,\frac{m}{s^2} \div \frac{9\,m}{s^2}$

$= \boxed{0.61g}$

2-24 $\Delta x = \frac{\Delta v^2}{2a}$

$\Delta x = \frac{35^2 - 0^2}{2(3.0)} = 204.2 \approx \boxed{2.0 \times 10^2 \text{ m}}$

2-29 $\frac{95 \text{ km}}{\text{hr}} = 26.39 \text{ m/s}$

$\Delta x = \frac{\Delta v^2}{2a} = \frac{\Delta v^2}{2\Delta x} = a = \frac{0 - 26.39^2}{2 \cdot 0.80} =$

$-435.27 \text{ m/s}^2 \approx \boxed{400 \text{ m/s}^2} \cdot \frac{g}{9.8 \text{ m/s}} = \boxed{44g}$

2-38 $\Delta x = v_0 \Delta t$

$\Delta x = (18)(0.350) = 6.3 \text{ m}$

$\Delta v = 2a\Delta x$

$\Delta x = \frac{v^2 - v_0^2}{2a} = \frac{0 - 18^2}{2(-3.65)} = 44.4 \text{ m}$

$\Delta x = 6.3 + 44.4 = 50.7$

- she will not stop in time and will be 30.7 m from the intersection in the (+x) direction

2-33 $a = \frac{\Delta v}{2\Delta x} = \frac{18^2 - 0^2}{180.2} = 0.9 \text{ m/s}^2$

total distance of train = 180 m + 75 = 255 m

$v_f^2 = v_0^2 + 2a\Delta x$

$v_f = \sqrt{(0) + 2(0.9)(255)} = 21.42 = \boxed{21 \text{ m/s}}$

$\cdots \times 28 = \boxed{142 \text{ m/s}}$

2-53 $y = y_0 + v_0 t - \frac{1}{2} g t^2$

$0 = h + v_0 t - \frac{1}{2} g t^2$

$v_0 = \frac{1/2(9.8)(0.31)^2 - 2.2}{0.31} = -5.576 \text{ m/s}$

$v^2 = v_0^2 - 2g\Delta y$

$\Delta y = \frac{v^2 - v_0^2}{2g} = \frac{0 - (5.578)^2}{2(9.8)} = 1.587 \approx \boxed{1.6 \text{m}}$

2-48 a) $v_f^2 = v_0^2 + 2a\Delta x$

$v_f^2 = \sqrt{2(3.20)(775)} = 70.43 \approx \boxed{70 \text{ m/s}}$

b) $t = \frac{\Delta v}{a} = \frac{70.43 - 0}{3.2} = \boxed{22 \text{ s}}$

c) $v = v_0^2 - 2gh$

$h = \frac{v^2}{2g} = \frac{70.43}{2(9.8)} = \boxed{253 \text{ m}}$

← ans for c

775 m + 253 m = $\boxed{1028 \text{ m}}$

d) $t = \frac{70.43 - 0}{9.80} = 7.19 \text{ s}$

$T = 22 + 7.19 = \boxed{29.2 \text{ s}}$

e) $v'' = \sqrt{v_0^2 - 2gH}$

$\sqrt{(0) - (2)(9.8)(-1028}} = \boxed{142 \text{ m/s}}$

f) $t_{fall} = \frac{0 - 142}{-9.8} = 14.48\,s$

$t'' = 29.080 + 14.48 = \boxed{43.560\,s}$

Ch.2 Classwork

2-9 $\Delta d = 0$

$d_{total} = 3200\,m$

$|v|_{avg} = \frac{3200\,m}{(14.5\,min)(60\,s)} = 3.67 \approx \boxed{3.7\,m/s}$

$v_{avg} = \frac{0}{14.6.60} = \boxed{0\,m/s}$

2-17. $a = \frac{95-0\,km}{4.3\,s}\frac{(1000\,m)}{3600\,s} = 6.13 = \boxed{6.1\,m/s^2}$

2-21 a) $\vec{v} = \frac{385-25}{20-3} = \boxed{21.2\,m/s}$

b) $a = \frac{45-11}{20-3} = 2\,m/s \approx \boxed{2.00\,m/s}$

2-30 $v_0 = 75\,\frac{km}{hr}\cdot\frac{1000\,m}{1\,km}\frac{1\,hr}{3600\,s} = 20.83\,m/s$

a) $v_f^2 = v_i^2 + 2a\Delta x$

$x_f = \frac{v_f^2 - v_i^2}{2a} + x_0 = \frac{0^2 - 20.83^2}{2(-0.50)} + 0 = \boxed{434\,m}$

b) $v_f = v_0 + at$

$t = \frac{v_f - v_0}{a} = \frac{0-20.83}{-0.5} = 41.66 \approx \boxed{42\,s}$

c) $x = v_0 t + 1/2 a t^2 + x_0$

$x(1) = 20.83(1) + 1/2(-0.5)(1)^2 = 20.58$

$x(0) = 0$

$\Delta x = 20.58 \approx \boxed{21\,m}$

$x(5) = 20.83(5) - 1/2(-0.5)^2 = 97.9$

$x(5) - x(4) = 97.9 - 79.32 = \boxed{18.58\,m}$

2-43 $V^2 = v_0^2 - 2g\Delta y \Rightarrow v_0 = \sqrt{2(9.8)(1.45)} = 5.33\,m/s$

$V = v_0 - 2gt$

$t = \frac{v_0}{g} = \frac{5.33}{9.80}(2) = \boxed{1.09\,s}$

2-49 $y = y_0 + v_0 t - 1/2 g t^2$

$4.90t^2 - 5.40t - 105 = 0$

$t = 5.21$ or $-4.11 \approx \boxed{5.21\,s}$

2-50 $y = y_0 + v_0 t - 1/2 g t^2$

$v_0 = \frac{y - y_0 - 1/2 g t^2}{t} = \frac{15 - 1/2(9.8)(0.3)^2}{0.83} = \boxed{14\,m/s}$

b) $v^2 = v_0^2 + 2g\Delta y$

$\Delta y = \frac{v^2}{2g} = \frac{14^2}{2(9.8)} = \frac{10\,m}{5} = 2$ floors

It was dropped from the 5th floor

2-71 a) $y = y_0 + v_0 t + 1/2 a t^2$

$4.9t^2 - 15.5t - 75 = 0$

$t = 5.802, -2.638 \approx \boxed{5.802\,s}$

b) $v = v_0 + at$

$v = 15.5 + (-9.8)(5.802) = \boxed{-41.4\,m/s}$

c) $v^2 = v_0^2 + 2a\Delta y$

$y_i = -15.5^2 + 2(9.80) = 12.25\,m$

$y_{tot} = 2(12.25) + 75 = \boxed{99.5\,m}$