PHYS 1401
General Physics I
Summer 2010

HOMEWORK ANSWERS

Giambattista - 2nd Edition

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CHAPTER 1

6. 10%

10. 56%

11. 36%

48. A ON THE VERTICAL SCALE AND B3 ON THE HORIZONTAL SCALE

69. $2.2 \times 10^{2}\ m^3$

72. $\xi = 1/2$; $\tau = 1/2$

78 $T_{MARS} = 2^{3/2} T_{VENUS}$

$= 2.8\, T_{VENUS}$

86. $10^{16}\ m^3$ (CLOSER TO $10^{17}\ m^3$)

CHAPTER 2

2. 1.2 m TO THE RIGHT OF THE STARTING POINT

8. 0.408 s

10. 325.

15. 27 m/s WEST

23. 1.05 m/s TO THE NORTH

27. $28\ m/s^2$ TOWARD THE PADDLE

37. (a.) 4.0 m/s

(b.) 5.0 m/s

48. 13 m

54. 10th FLOOR

60. 68 s.

CHAPTER 3

5. GRAPH

10. 2.0 km AT 20° EAST OF SOUTH

14. 8.7 UNITS

20. (a.) 31.0 m/s

(b.) 58.1° WITH THE +x AXIS AND 31.9° WITH THE −y AXIS

31. (a) GRAPH

(b.) 59.9 km AT 85° North OF EAST

(c.) 80 km/h AT 85° NORTH OF EAST

35. (a.) 102 km/h

(b.) 90.8 km/h AT 16.6° SOUTH OF WEST

39. 13 m/s^2 UP

50. (a.) $V_x = 10.0$ m/s

$V_y = -12.0$ m/s

(b.) $\Delta x = 30$ m

$\Delta y = 8$ m

57. (a.) $\Delta t = \frac{2 v_i \sin\theta}{g}$

(b.) $R = \frac{v_i^2 \sin 2\theta}{g}$

(c.) $R_{max} = \frac{v_i^2}{g}$

CHAPTER 4

21. 4.0 kg

26. 23 N

33. (a.) 50.0 N UPWARD

(b.) 650.0 N UPWARD

(c.) TWO FORCES:
1. UPWARD FORCE DUE TO FLOOR
2. DOWNWARD FORCE DUE TO GRAVITY

39. (a.) 670 N

(b.) 2.5 N

(c.) A STICK OF BUTTER WEIGHTS ABOUT 1.0 N.

42. THE ROCK WILL FALL TOWARD THE MOON'S SURFACE

48. 4 km

54. $\vec{N}$ $\vec{f}$

(a.) ⊥ TO AND AWAY FROM; ALONG RAMP UPWARD

(b.) " " " " " ; ALONG RAMP DOWNWARD

(c.) " " " " " ; ALONG RAMP UPWARD

63. $\mu_s = 0.41$; $F = 40.2$ N

67. 17°

73. $T_{lower} = 8.3$ N
$T_{upper} = 12.4$ N

78. (a.) 34 N

(b.) 39 N

80. $T = W/2\sin\theta$

83. $\frac{T_1}{T_2} = \frac{m_1}{m_1 + m_2}$

87. (a.) $a_1 = 3.9\ m/s^2$ TO THE RIGHT
$a_2 = 3.9\ m/s^2$ DOWNWARD

(b.) 4.7 m/s TO THE RIGHT

(c.) 2.8 m

(d.) $\Delta\vec{r}_1 = 0.31$ m TO THE RIGHT
$\Delta\vec{r}_2 = 0.31$ m DOWN

91. 0.81 s

92. (a.) $\vec{a} = 0.34\ m/s^2$ WATERMELON MOVES UP + TO THE LEFT

(b.) 1.5 cm

(c.) $6.8\ m/s^2$

130. FIG a. BREAKS THE TWINE
FIG b. WORKS

137. (a.) $T = 110.0$ N

(b.) $T_A = 115.0$ N
$T_B = 110.0$ N

CHAPTER 5

6. (a.) $|\omega| = 0.56$ rad/s
   (b.) 1.1 REV.

12. (a.) STATIC FRICTION
    (b.) $|\omega| = 3.1$ rad/s

22. $\vec{F} = 3900$ N AT 53° ABOVE THE HORIZONTAL

34. ~~3.6×10^{22} d~~ $h = 10.3 \times 10^6$ m; $a_c = 1.41$ m/s^2

35. $r = 2.04 \times 10^7$ m

42. 0.39 rad/s^2

50. (a.) 270°
    (b.) 405°

65. 150 m/s

74. 3.8 N

78. 2.935

84. (a.) 14 m/s^2
    (b.) 1.4
    (c.) 33 m/s

CHAPTER 6

5. 210 kJ

13. (a.) 0.70 J
    (b.) 0.37 m/s

25. (a.) 2
    (b.) 1.88 kJ
    (c.) 1.88 kJ
    (d.) 8.00 m

34. 2.9 m/s

38. 60.0 km/s

48. 1.6 J

52. (a.) 6.0×10^{10} N/m
    (b.) 8.0 mm

58. 4h

66. 4.08 min

71. 60 kW

84. (a.) 19.8 m/s
    (b.) 29.0 kN
    (c.) 25.0 m

88. (a.) 3.45 kJ
    (b.) 4.96 kJ
    (c.) −1.52 kJ
    (d.) 187 N

97. (a.) $h = L(1-\cos\theta)$
    (b.) $v_f = 4.9$ m/s

CHAPTER 7

6. (a.) 3.00
   (b.) 9.00

12. (a.) 3.8 kg·m/s AT 37° ABOVE THE HORIZONTAL DIRECTION OPPOSITE $\vec{v}_i$

    (b.) 75 N IN THE SAME DIRECTION AS $\Delta\vec{p}$

19. (a.) 33 m/s
    (b.) 0.94 N DOWN

22. 100 m/s (224 mph)
    DASH WILL NOT SUCCEED

24. 4.8 m

40. $-0.15\ m/s$

45. 2.0 kg·m/s TO THE RIGHT

48. 2.50 m/s IN THE +x DIRECTION

    100g BALL MOVES 2.50 m/s IN THE −x DIRECTION

57. 170 m/s

63. $P_{2f} = 8.7$ kg·m/s

67. 1.7 m/s AT 30° BELOW THE +x-AXIS

82. $V_{2f} = 2.8$ m/s

CHAPTER 8

5. (a.) $1.5\ kg \cdot m^2$
   (b.) $0.75\ kg \cdot m^2$
   (c.) $1.5\ kg \cdot m^2$

12. $4.5\ N \cdot m$

20. $5.83\ m$

24. (a.) $3.14\ m$
   (b.) $15.7\ J$
   (c.) $2.50\ N \cdot m$
   (d.) $6.28\ rad$
   (e.) $15.7\ J$

28. $200\ N$

35. $T = 350\ N$
   $F_x = 290\ N$; $F_y = -2\ N$
   THE MAGNITUDE OF F_y IS SMALL

51. $4.3\ N \cdot m$

52. $1.5\ N \cdot m$

61. $1.79\ m$

77. $0.125\ rad/s$

91. $0.792\ m$

100. $a = \dfrac{m_2}{m_1 + m_2 + \dfrac{I}{R^2}} \cdot g$

CHAPTER 9

6. (a.) 420 N
   (b.) NO FORCE IS NEEDED

9. 1.0 m

10. (a.) $F_1 = 625$ N
    (b.) $d_1 = 6.25$ mm
    (c.) 16.0

15. 0.126

24. 390 Pa

34. (a.) 0.910
    (b.) 1.28 cm
    (c.) 0.13 cm

36. 0.17 cm^3

79. 230 kg

81. 23.0 m

96. 270 m/s

CHAPTER 10

7. 5.0 mm

10. 1.7 mm

17. (a.) STRESS $= 2.8 \times 10^{7}$ Pa
(b.) STRAIN $= 4.7 \times 10^{-4}$
(c.) $\Delta L = 9.3 \times 10^{-4}$ m
(d.) $F = 5.0 \times 10^{5}$ N

24. $\Delta V = -6.71\ cm^3$

28. $v_m = 7.0$ cm/s

34. $v_m^2 = a_m A$

37. $f_{HORSE} = 2.5$ Hz

46. (a.) $T = 0.90$ s
(b.) $v_m = 0.56$ m/s

56. $A = 3.0$ cm

63. $v_m = 3.14$ cm/s

66. $f_H = \frac{1}{2\pi}\sqrt{\frac{g}{D}}$

$f_p = \frac{1}{2\pi}\sqrt{\frac{g}{L}}$

$f_H = f_p$ IF $D = L$

82. $f \propto \sqrt{\frac{k}{m}}$

CHAPTER 11

5. $P = 4.0 \times 10^{26}$ W

11. $\Delta t = 16$ ms

16. 4.3×10^{14} Hz $\leq f \leq 7.5 \times 10^{14}$ Hz

33. (a.) 6.9 cm
(b.) $A' = 5.7$ cm

36. $\lambda_w = 375$ nm

43. (a.) $I_2 = 0.25$ W/m^2
(b.) $I_2 = 0.010$ W/m^2
(c.) $I = 0.130$ W/m^2

48. (a.) $v = 1350$ m/s
(b.) $T = 45.6$ N
(c.) $\lambda = 0.76$ m
$f = 450$ Hz

50. $f_1 = 616$ Hz

54. $F = \frac{1.0}{n^2}$ N, WHERE $n = 1, 2, 3, \ldots$

63. 1ST FRET $\Delta L = 3.64$ cm
2ND FRET $\Delta L = 7.07$ cm
3RD FRET $\Delta L = 10.32$ cm

65 (a)

(a) Since $f_n = \frac{nv}{2L}$ and $f_1 = \frac{v}{2L}$, $f_n = nf_1 = n(300.0 \text{ Hz})$.

n	nf_1
2	600.0 Hz
3	900.0 Hz
4	1.200 kHz

65 (b.)

(b) The lowest frequency is now f_2.

n	nf_1
2	600.0 Hz
4	1.200 kHz
6	1.800 kHz
8	2.400 kHz

(c) The effective length

$f_n = \frac{nv}{2L}$, so $f_n' = \frac{nv}{2(L/2)} = \frac{nv}{L} = 2f_n$.

n	$f_n' = 2f_n$
1	600.0 Hz
2	1.200 kHz
3	1.800 kHz
4	2.400 kHz

CHAPTER 12

9. (a.) $v = \frac{m}{s}$

(b.) TRY COM

$$\frac{\rho}{B}, \quad \rho B, \quad \frac{1}{\rho B}, \quad \frac{B}{\rho}$$

ONLY $\sqrt{\frac{B}{\rho}}$ WILL GIVE DIMENSIONS OF SPEED

12. $P = 0.099\ W$

18. (a.) $\frac{\Delta I}{I_0} \times 100\% = 125.0\%$

(b.) $\Delta\beta = 3.522\ dB$

24. (a.) PIPE IS CLOSED AT ONE END SINCE THE NUMBERS IN THE RATIOS ARE ALL ODD

(b.) $f_0 = 78.0\ Hz$

(c) $L = 1.10\ m$

26. (a.) $\lambda_1 = 1.20\ m$

(b.) $L = 90.0\ cm$

(c.) $v = 338\ m/s$

27. RATIO IS $3/4$

31. $f_1 = 290.0\ Hz$

53. (a.) $f_1 = 3400\ Hz$

$f_2 = 10,200\ Hz$

$f_3 = 17,000\ Hz$

CHAPTER 13

5. $T_J = \left(\frac{0.750\ ^\circ J}{^\circ C}\right) T_C + 85.5\ ^\circ J$

7. $\Delta L_{Cu} + \Delta L_{Al} = 2.0\ mm$

10. $T_{glass} = 113^\circ C$

14. $15.8\ cm^3$

20. $T = 26.8^\circ C$

25. $\frac{\Delta S}{S_0} = \alpha \Delta T$

31. $N = 1.7 \times 10^{27}$

37. $N = 2.5 \times 10^{19}$ MOLECULES

41. $T_f = 400^\circ C$

45. $P_f = 135\ kPa$

92. $V_{EXTRA} = 80\ cm^3$

CHAPTER 14

1. a) $U = 34\,J$; b.) INCREASE OF INTERNAL ENERGY INCREASES THE AVG KE OF THE WATER MOLECULES ∴ TEMP IS SLIGHTLY INCREASED

6. $U_{AIR} = 560\,kJ$

12. $T_f = 82°C$

18. (a.) $C = 0.38\,kJ/K$

(b.) $C = 32\,kJ/K$

23. $\Delta U = 0.090\,J$

25. $\Delta U = 57\,kJ$

28. $N = 4.83 \times 10^{21}$ MOLECULES

32. $m_N = 10.4\,g$

48. $K = 66.6\ W/(m \cdot K)$

TIN

51. $P = 6.67\ W/m^2$

60. CONSTANT $= 2.9 \times 10^{-3}\ m \cdot K$

67. $P_{NET} = 2.24\,kW$

CHAPTER 15

1. $\Delta U = 2.9\,J$

4. $\Delta U = 95\,J$

6. $W = 101.3\,J$

9. (a.) $Q = 436\,J$

   (b.) $\Delta V = 1.23\,L$

   (c.) $W = 125\,J$

48. $\Delta S = 1.22\,\frac{J}{K}$

50. $\Delta S = -60\,\frac{J}{K}$

ENTROPY INCREASES

$> 60\,\frac{J}{K}$

65. $T = 24^{\circ}C$

68. (a.) $\Delta S = 22.0\,\frac{J}{K}$

(b.) $\Delta S = 0.777\,\frac{J}{K}$