

① $m = 40 \text{ Kg}$
 $L = 6 \text{ m}$
 $\theta = 120$

a) $T = 2\pi\sqrt{\frac{L}{g}}$
 $T = 6.28\sqrt{\frac{6}{9.8}}$
 $\boxed{4.91 \text{ s}}$

b) 4.91^{-1}
 $\boxed{.203 \text{ Hz}}$

c) $h = L(1 - \cos\theta)$
 $h = 6(1 - \cos 12)$
 $h = .131 \text{ m}$

$PE = KE$
 $mgh = \frac{1}{2}mv^2$
 $9.8(.131) = \frac{1}{2}v^2$
 $\boxed{v = 1.41 \text{ m/s}}$

d) see part c
 $.131 \text{ m}$

e) From part c
 $PE = mgh$
 $PE = 40 \times 9.8(.131)$
 $\boxed{PE = 51.3 \text{ J}}$

f) $T = mg \cos \theta$
 $T = 40 \times 9.8 \cos 12$
 $\boxed{T = 383.4 \text{ N}}$

② $m_d = .02$
 $F = 285 \text{ N}$
 $x = .15 \text{ m}$

b) $U \text{ or } PE = \frac{1}{2}kx^2$
 $PE = \frac{1}{2}(1900)(.15)^2$
 $\boxed{PE = 21.37 \text{ J}}$

c) $PE = KE$
 $21.37 = \frac{1}{2} \cdot .02 v^2$
 $\boxed{v = 46.2 \text{ m/s}}$

a) $K = ?$
 $F = -Kx$
 $285 = K \cdot .15$
 $\boxed{1900 = K}$

d) From b: $m g h$
 $21.37 = .02 \times 9.8 h$
 $\boxed{109.03 \text{ m}}$

③ a) $T = 2\pi\sqrt{\frac{m}{K}}$
 $.285 = 6.28\sqrt{\frac{.25}{K}}$
 $\boxed{K = 12,138.6 \text{ N/m}}$

b) $35/10 = 3.5 \text{ Hz}$

c) $3.5^{-1} = .2855$

f) $PE = KE = \frac{1}{2}mv^2$
 $2.43 = \frac{1}{2} \cdot .25 v^2$

$\boxed{v = .44 \text{ m/s}}$

d) $F = -Kx$
 $F = 25 \cdot 9.8 = 245$
 $245 = 12,138.6 x$
 $\boxed{.02 \text{ m}}$

e) $U = \frac{1}{2}Kx^2$
 $U = \frac{1}{2}(12,138.6)(.02)^2$
 $\boxed{U = 2.43 \text{ J}}$

g) $T = 6.28\sqrt{\frac{.25}{12,138.6}}$
 $T = .522 \text{ s}$
 $\boxed{1.91 \text{ Hz}}$

7. $PE = KE$
 $mgh = \frac{1}{2}mv^2$
 $9.8(0.05) = \frac{1}{2}v^2$
 $v = \underline{0.989 \text{ m/s}}$
 $0.005 v = 1.005(0.989)$
 798.9
 198.9 m/s

(16) skip ...
same as 9

11. $\textcircled{3} \xrightarrow{4} \textcircled{4}$

$$v_1 - v_2 = v_2' - v_1' \quad m_1 v_1 = m_1 v_1' + m_2 v_2'$$

$$4 - 0 = v_2' - v_1' \quad 12 = 3v_1' + 4v_2'$$

$$4 = v_2' - v_1' \quad 12 = 3v_1' + 4(4 + v_1')$$

$$4 + v_1' = v_2' \quad 12 = 3v_1' + 16 + 4v_1'$$

$$-4 = 7v_1'$$

$$4 - .57 = v_2' \quad .57 \text{ m/s} = v_1'$$

$$3.42 \text{ m/s} = v_2'$$

$$d) P_1 = 25 - 10.4 = 14.6$$

$$P_{A_{avg}} = 0.6 = 6 \text{ dwn}$$

b) 8 kg ball $V_x = 1.5 \cos 30 = 1.29$
 $V_y = 1.5 \sin 30 = .75$

c) $P_8 = 8 \cdot 1.29 = 10.4$

$$P_{84y} = 8.75 = 6$$

$$\theta = \tan^{-1} \theta = \frac{6}{14.6}$$

$\rho = 5. V$
 $1570 \text{ } \cancel{212} \text{ } (11)$

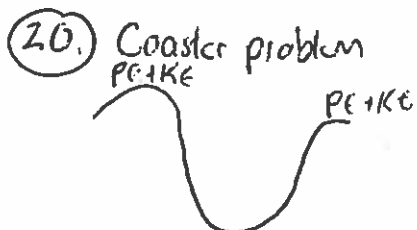
(13) $KE = \frac{1}{2}mv^2$
 $KE = .150 \cdot .5 \cdot 50^2$
 $KE = 187.5j$

(15) $W = PE = mgh$
 $900 \cdot 9.8 \cdot 150$
 $1,323,000j$

(17) $KE = PE$
 $\frac{1}{2}mv^2 = mgh$
 $\frac{1}{2}(100)^2 = 9.8h$
 $h = 510.2m$



$h = ?$
 $\sin 34 = \frac{h}{68}$
 $h = 38.03m$
 $PE_{Tip} = KE + heat$
 $(89 \cdot 9.8 \cdot 38.03) = \frac{1}{2}(89)s^2 + heat$
 $32057.2j$



$PE + KE = PE + KE$
 $(40 \cdot 9.8) + (\frac{1}{2}3^2) = (27 \cdot 9.8) + (\frac{1}{2}v^2)$
 $16.24ms$
 $PE + KE = KE$
 $= \frac{1}{2}v^2$
 $28.16m/s$

(14)

$\cos 55 = \frac{adj}{hyp} = \frac{154.8}{270}$

(16) $W = F \cdot x$ $154.8 \cdot 60 = 9291.9j$
 $P = \frac{W}{t}$ $1800 = \frac{100 \cdot 9.8 \cdot 78}{t}$
 $42.5s$

(18) $PE = mgh$
 $= 5 \cdot 9.8 \cdot 250$
 $12250j$

$KE_{\frac{1}{2}} = 2$
 $6125j$

$PE_{150m} = 5 \cdot 9.8 \cdot 150$
 7350
 $12250 - 7350$
 $4900 = \frac{1}{2}5v^2$
 $44.3m/s$

$PE_{Top} = KE_{bottom}$
 $12250 = \frac{1}{2} \cdot 5v^2$
 $v = 70m/s$
 $KE_{60m} = 9.8 \cdot 5 \cdot 60$
 2940
 $12250 - 2940$
 $9310j$

(21) Bullet question

$V = 4.43$
 $x = 2$
 $t = .451$
 $y = 4.41^2$
 $y = 1$
 $t = .451s$

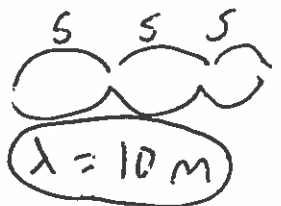
$m_1v_1 = (m_1 + m_2)v_N$
 $.006v = 2.006(4.43)$
 $1480m/s$

(22) wave generator

$f = 45/1 = 45Hz$

$T = 45^{-1} = 0.022s$

$v = 45 \cdot 10 = 450$



23) hummingbird

$$f' = 600 \frac{(360 + 0)}{(360 - 65)}$$

$$f' = 732.2 \text{ Hz}$$

7m cord

$$L = 7$$

$$m = .015 \text{ Kg}$$

$$\lambda = .55 \text{ m}$$

$$F = 240$$

skip and next

25) skip

26) Guitar problem

$$v = 450 \text{ m/s}$$

$$F = 370 \text{ Hz}$$

L

$$F = \frac{v n}{2L}$$

$$370 = \frac{450(1)}{2L}$$

$$L = .608 \text{ m}$$

next f

$$370 \cdot 2 = 740 \text{ Hz}$$

27) musician

open

$$v = 343$$

$$F = 440 \text{ Fundamental}$$

L = ?

$$F = \frac{v n}{2L} \quad 440 = \frac{343 \cdot 1}{2L}$$

$$L = .389$$



30)



$$\lambda = 10$$

$$f = \frac{23}{5} = 4.6 \text{ Hz}$$

$$T = 4.6^{-1} = .217 \text{ s}$$

$$v = 4.6 \cdot 10 = 46 \text{ m/s}$$

31)

$$f = \frac{23}{13} = 1.76 \text{ Hz}$$

$$T = 1.76^{-1} = .565 \text{ s}$$

$$v = \frac{40}{18} = 2.22 \text{ m/s}$$

$$\lambda = \frac{v}{f} = \frac{2.22}{1.76}$$

$$\lambda = 1.26 \text{ m}$$

32)



33)

2λ