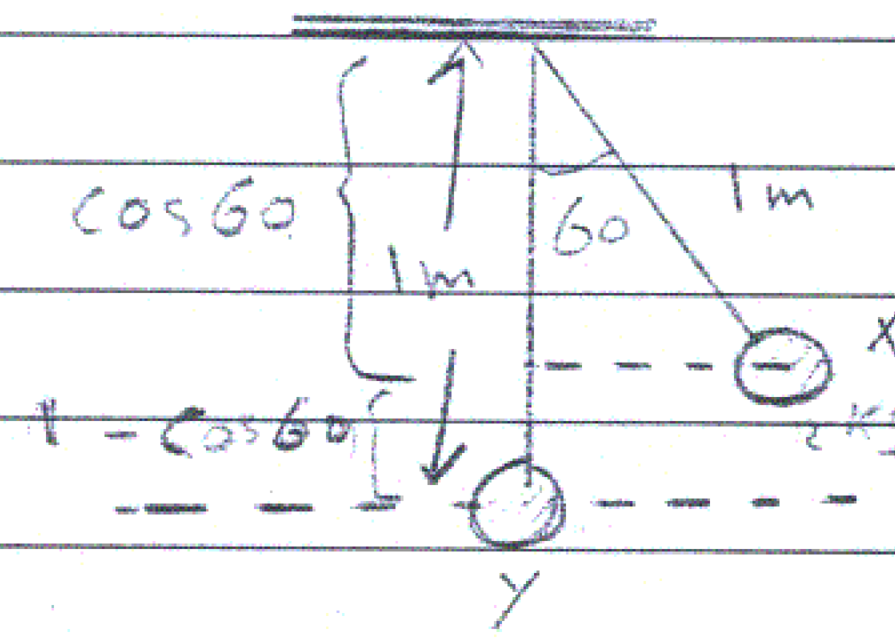
(CH #8)

Q.1



$$\Delta U_g + \Delta K = 0$$

$$\Rightarrow U_i(x) = K_f(y)$$

$$y_i = 1 - (1\cos 60)$$

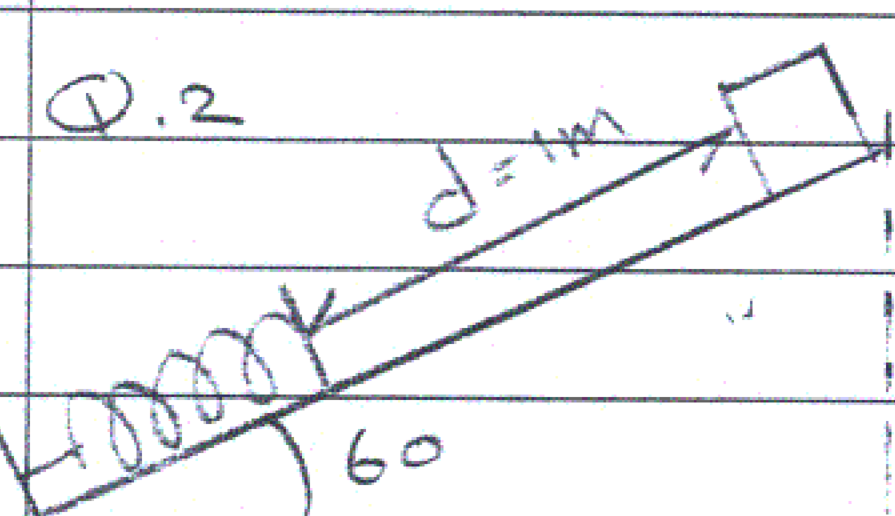
$$y_i = 0.5m$$

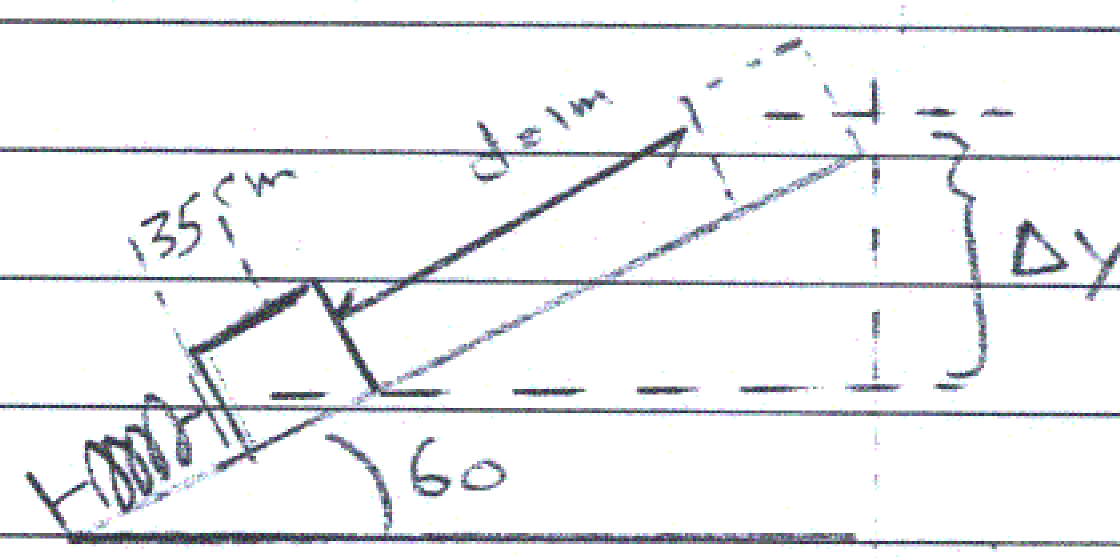
$$mgy_i = \frac{1}{2} m v_f^2$$

$$v_f = \sqrt{2gy_i} = \sqrt{2 \times 9.8 \times 0.5}$$

$$v_f = 3.1 \, m/s$$

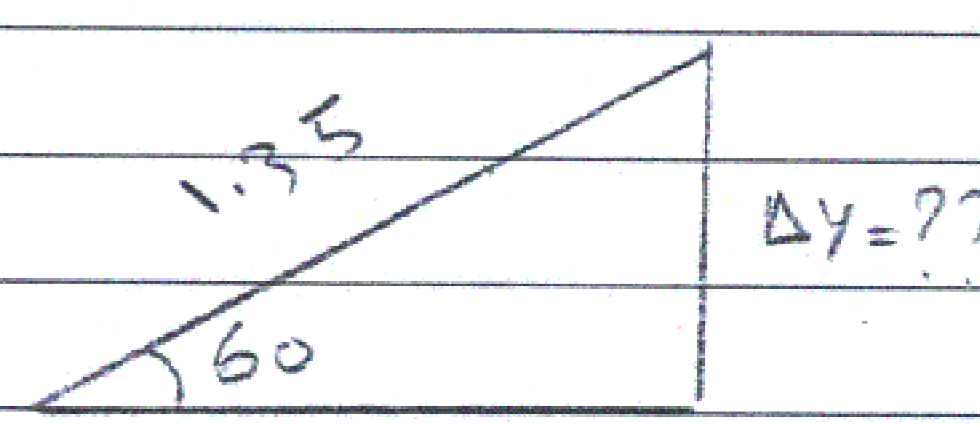
Q.2





$$\Delta y = 1.35 \sin 60$$

$$\Delta y = 1.17m$$



for moving down

$$\Rightarrow (\Delta y = -1.17m)$$

for spring $x_i = 0$ (relax)

$x_f = 0.35m$

$K_i = 0$ $K_f = 0$

$\Rightarrow$ Ch.8

Cont CH8

Cont (2)

$W = \Delta K + \Delta U_g + \Delta U_x + \Delta E_{th}$

$\Rightarrow$

$0 = \Delta U_g + \Delta U_x$

$0 = mg(\Delta y) + \frac{1}{2}k(x_f^2 - x_i^2)$

$0 = 3 \times 9.8(-1.17) + \frac{1}{2}(k)(0.35)^2$

$\Rightarrow \boxed{k = 561.6\ N/m}$

Q.3 $E_i = E_f$

$E_i = U_i + K_i$

$E_i = 0 + \frac{1}{2} m V_i^2$

$= \frac{1}{2} \times 0.5 \times 10^2$

$\boxed{E_i = 25 J = E_f}$

Q.4 for cycle under conservative force

$W = 0 \Rightarrow W_{A \to B} + W_{B \to C} + W_{C \to A} = 0$

$W_{AB} + 54 - 96 = 0$

$= W_{A \to B} = 42 J$

Now:

$W_{A \to B} + W_{B \to D} + W_{D \to A} = 0$

$W_{D \to A} = -42 - 136 = -178 J = -W_{A \to D}$

Ch8 →

$(W_{A \to D} = +178 J)$

Cont CH8 :-

Q.5

There is No displacement along the axis of (T) $\Rightarrow d = 0$

$\Rightarrow W_T = 0$

Q.6 Using Hook's Law to find "X"

$$f_a = kx \Rightarrow mg = kx$$

$2.5 \times 9.8 = 240\ x$

$\Rightarrow x = 0.1\,m$

$\Rightarrow \Delta U_x = \frac{1}{2} k (x_f^2 - x_i^2)$ ← $x_i = 0.1$, $x_f = 0$

$\Rightarrow \Delta U_x = 0 - \frac{1}{2} \times 240 \times (0.1)^2$

$(\Delta U_x = -1.2\,J)$

Q.7 $J = N.m = (Kg.m/s^2)\,m = Kg.\frac{m^2}{s^2}$

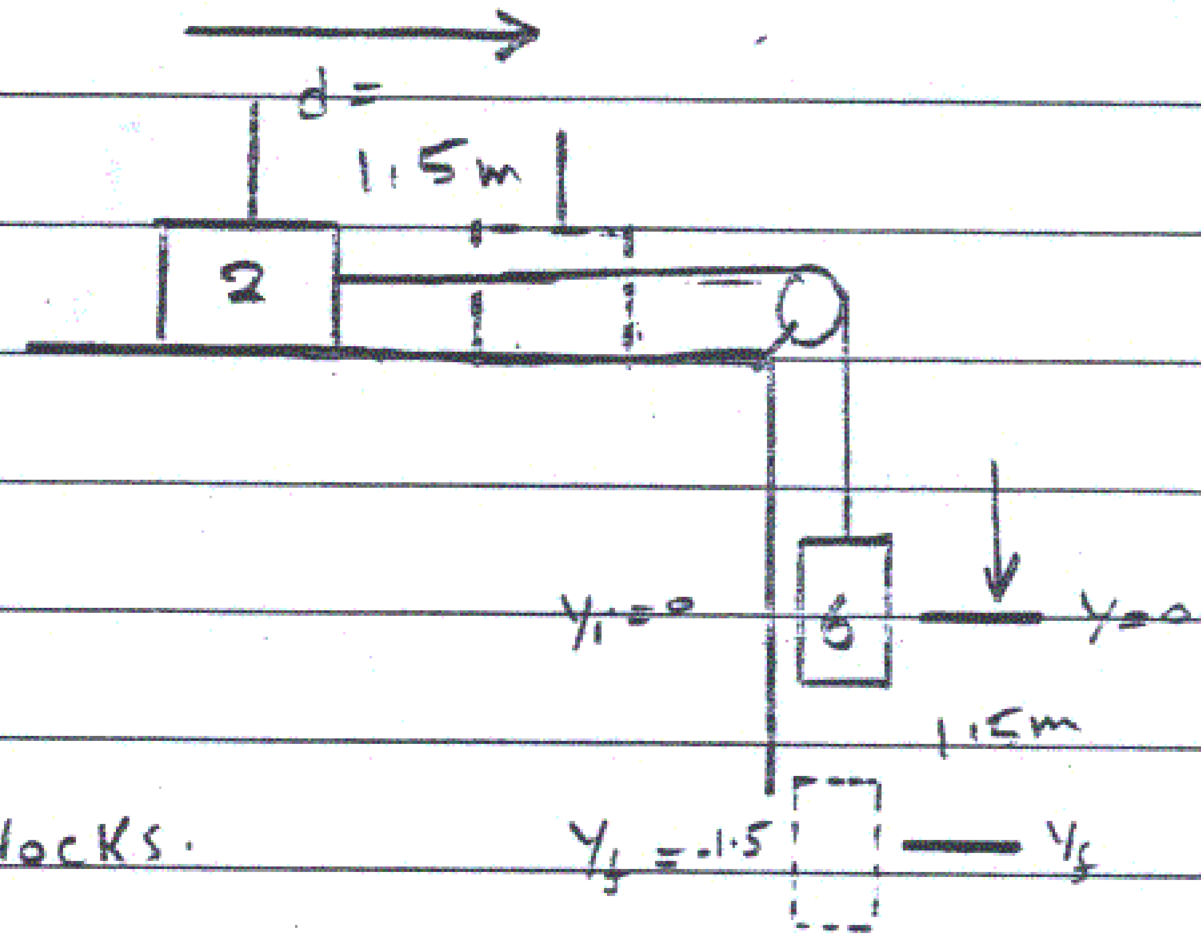
$= Watt.s$

so The only nonaccepted unit of Potential Energy is $Kg.m/s^2$.

Cont ch8 →

Cont CH 8

Q.8



$W = \Delta K + \Delta U_g + \Delta E_{th}$

But this time for two blocks.

$0 = (\Delta K_2 + \Delta U_{g2} + \Delta E_{th2}) + (\Delta K_6 + \Delta U_{g6} + \Delta E_{th6})$

$0 = K_f(2) + 0 + f_k d + K_f(6) + mg(y_f - y_i) + 0$

$0 = \frac{1}{2} \times 2 \times V_f^2 + \mu_k N d + \frac{1}{2} \times 6 \times V_f^2 + 6 \times 9.8(-1.5)$

$0 = V_f^2 + 0.4 \times 2 \times 9.8 \times 1.5 + 3 V_f^2 + (-88.2)$

$4 V_f^2 = 76.44$

$\boxed{V_f = 4.37 \text{ m/s}}$

Q.9 $\Delta K = 0$, const speed

$\Delta U_g = 0$, horizontal surface

$W_a = F d \cos 0 = 12 d$

$\Delta U_x = 0$ (No spring).

$\Rightarrow W_a = \overset{0}{\Delta K} + \overset{0}{\Delta U_g} + \overset{0}{\Delta U_x} + \Delta E_{th}$

$12 d = \Delta E_{th}$

$\Rightarrow \text{Power} = \frac{\Delta E_{th}}{t} = \frac{12 d}{t} = 12 (v) = 12 \times 1.5$

$\boxed{\text{Power} = 18 \text{ watt}}$

Cont (CH 8)

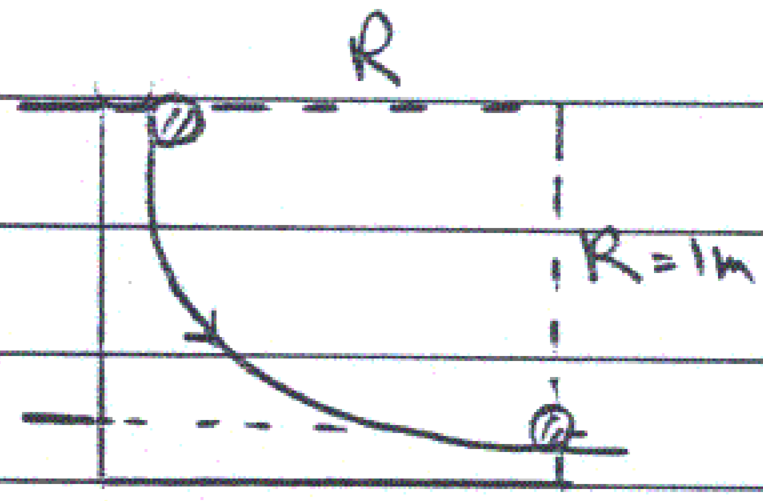
Q: 10

Use the K.E formula:

$$K = \frac{1}{2} m v^2$$

you will find that: mass 2M and speed 3V will give max K.E

Q. 11



$V_i = 0 \Rightarrow K_i = 0$

$V_f = 4 m/s \Rightarrow K_f = \frac{1}{2} m (4)^2 = \frac{1}{2} \times 2 \times 4^2 = 16 J$

$\therefore \Delta K = 16 - 0 = 16 J$

$\left. \begin{array}{l} y_i = 1m \\ y_f = 0 \end{array} \right\} \Delta y = -1 m$

$\Rightarrow \Delta U_g = mg \Delta y = 2 \times 9.8 (-1) = -19.6 J$

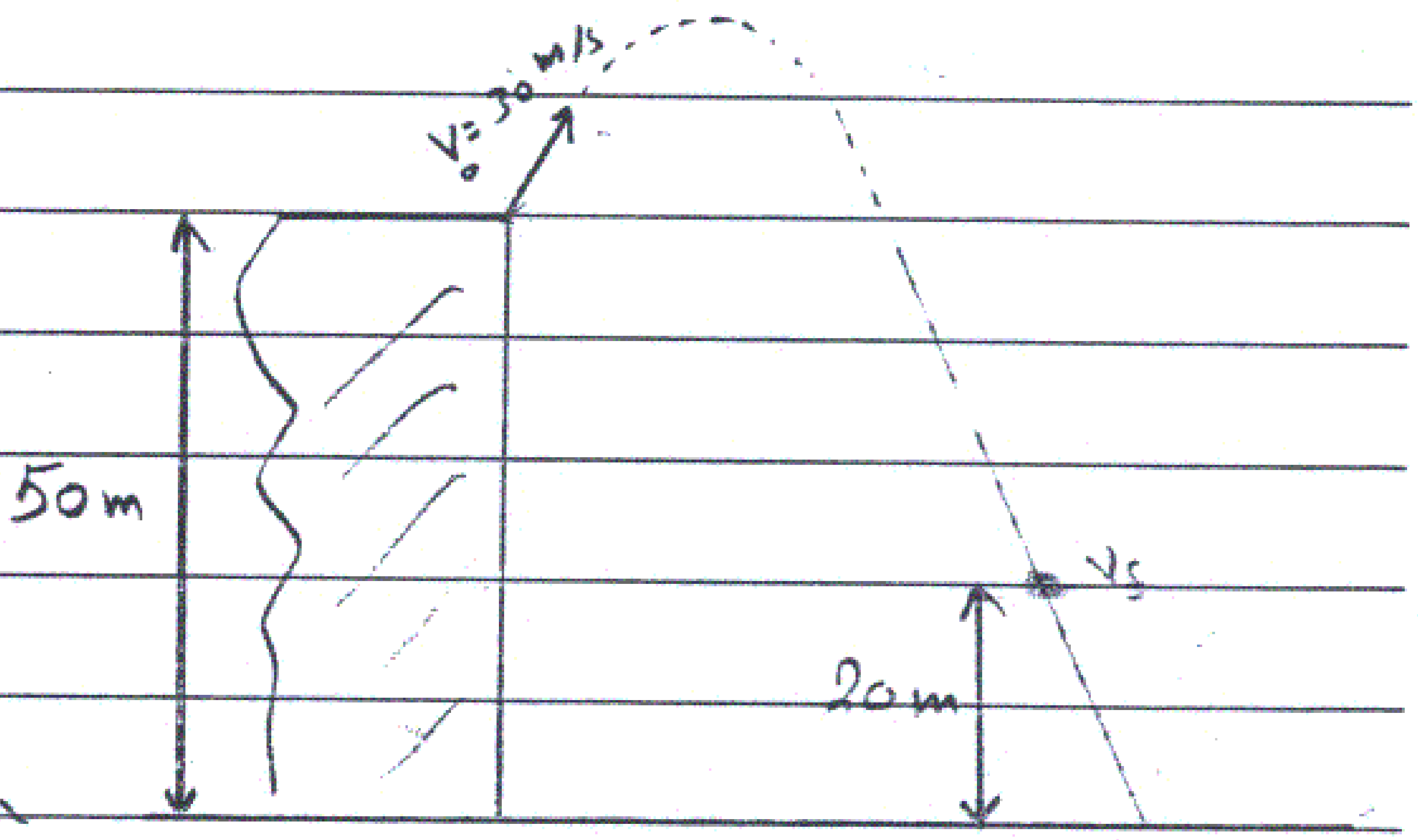
$\Delta E_{th} = ?$ $\quad \Delta U_x = 0$, $W_a = 0$

$$\Rightarrow \overset{\nearrow 0}{W_a} = \Delta K + \Delta U_g + \overset{\nearrow 0}{\Delta U_x} + \Delta E_{th}$$

$$0 = 16 + (-19.6) + \Delta E_{th}$$

$$\Rightarrow (\Delta E_{th} = 3.6 J)$$

Q. 12



From the Figure

$Y_i = 50 m$

$Y_f = 20 m$

$V_i = 30 m/s$

$V_f = ?$

This is an Isolated System with no Friction $\Rightarrow$

$\Delta E = 0 \Rightarrow \Delta K + \Delta U_g = 0 \Rightarrow \frac{1}{2} m (V_f^2 - V_i^2) + mg \Delta y = 0$

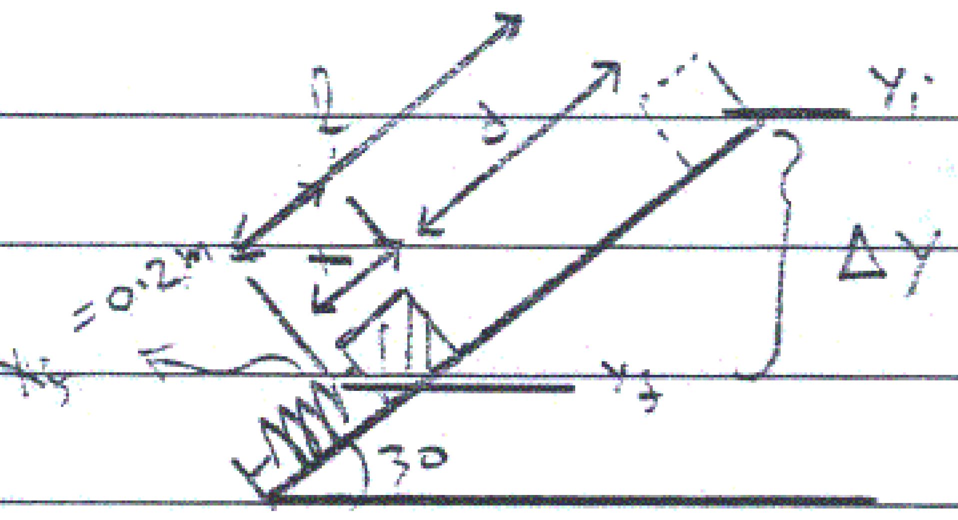
$(\div m) \Rightarrow \frac{1}{2} (V_f^2 - (30)^2) + 9.8 (20 - 50) = 0$

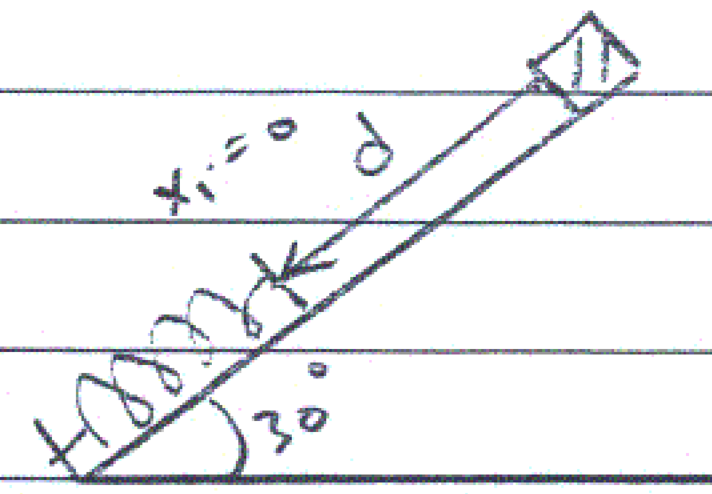
$$\Rightarrow \boxed{V_f = 38.6 \; m/s}$$

Ch8 $\rightarrow$ 5

Cont CH8

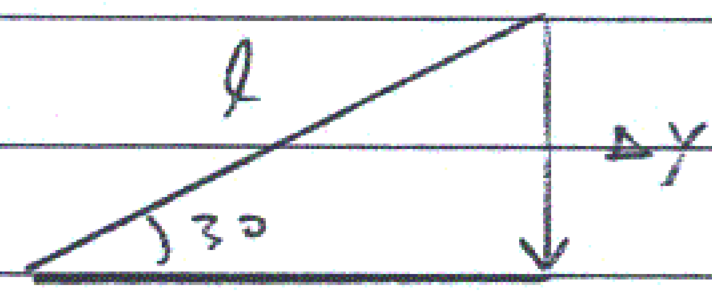
Q.13





where $(l = d + x)$

$(l = 0.2 + d)$



$\Delta y = -l \sin 30$ (Down)

$\Rightarrow \Delta U_g = mg\Delta y = 3 \times 9.8 \times (-l \sin 30) = (-14.7 l \ J)$

$\Delta K = 0$ (from rest to rest)

$\Delta E_{th} = 0$ (No Friction)

$\Delta U_x = \frac{1}{2} k (x_f^2 - x_i^2) = \frac{1}{2} \times 400 \times ((0.2)^2 - 0)$

$\Delta U_x = 8 J$

$W_a = 0$ (No applied Force)

$$\Rightarrow \overset{\nearrow 0}{W_a} = \overset{\nearrow 0}{\Delta K} + \Delta U_g + \Delta U_x + \overset{\nearrow 0}{\Delta E_{th}}$$

$\Rightarrow 0 = -14.7 l + 8$

$\Rightarrow l = 0.544 = 0.2 + d$

$\Rightarrow (d = 0.344 \text{ m})$

Q.14 To Find $Y_{max} = \frac{V_0^2 (\sin \theta_0)^2}{2g}$, we need $V_0 = ?$

V_0 is the final velocity after leaving the spring

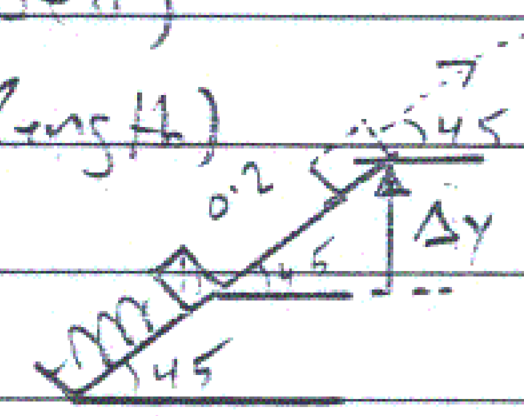
Now: spring - mass system:

$V_i = 0$, $V_f = ??$

$x_i = 0.2m$ (when it was compressed)

$x_f = 0$ (its back to relax length)

$\Delta y = 0.2 \sin 45 = 0.14 \text{ m}$ (up)



$\Delta E_{th} = 0$ (No friction)

$W_a = 0$ (No applied Force)

$$\Rightarrow \overset{\nearrow 0}{W_a} = \Delta K + \Delta U_g + \Delta U_x + \overset{\nearrow 0}{\Delta E_{th}}$$

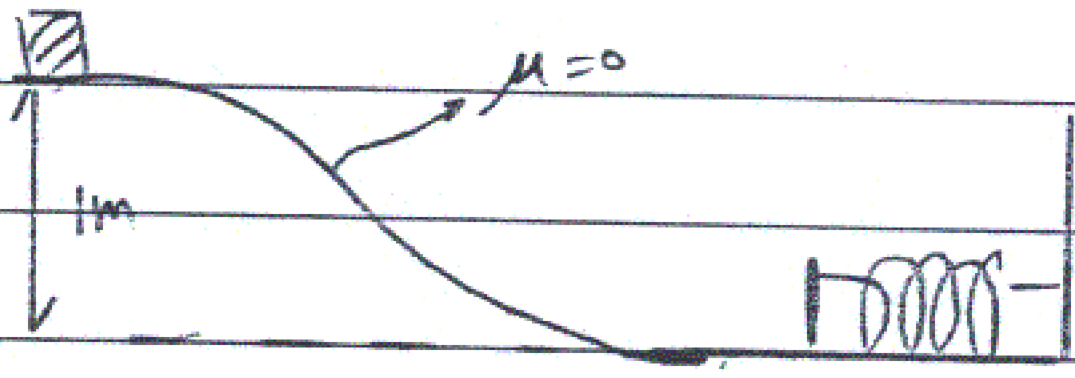
$0 = \frac{1}{2} \times 0.1 \times (V_f^2 - 0) + 0.1 \times 9.8 \times 0.14 + \frac{1}{2} \times 100 (0 - (0.2)^2) + 0$

$V_f = 6.1 \text{ m/s} = V_0$ in the projectile:

$\Rightarrow Y_{max} = (6.1)^2 (\sin 45)^2 / 2 \times 9.8 = 0.95 \text{ m}$

Cont CH 8

Q.15



$V_i = 0$
$V_f = 0$
$\Delta K = 0$

$\Delta Y = -1\,m$ (Down)

$\Rightarrow \Delta U_g = mg\Delta Y = -1 \times 9.8 \times 1 = -9.8\,J$

$\Delta E_{th} = 0$ (No friction)

$W_a = 0$ No applied Force

for spring:

$x_i = 0$ (relax)

$x_f = ?$ (max compressed distance)

$$\overset{0}{W_a} = \overset{0}{\Delta K} + \Delta U_g + \Delta U_x + \overset{0}{\Delta E_{th}}$$

$$\Rightarrow 0 = -9.8 + \frac{1}{2}(400)(x_f^2 - 0)$$

$$\boxed{x_f = 0.221}\ m$$

end