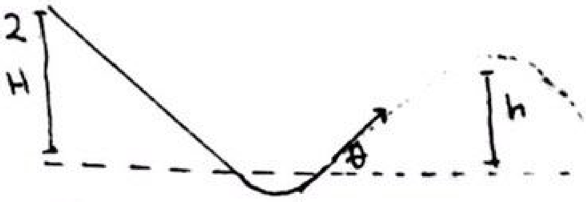
yohandi - assignment 7

22



$\Delta E_{mec} = \Delta K + \Delta U$

$0 = (\frac{1}{2}m v_f^2 - 0) + (0 - mgH)$

$v_f = \sqrt{2gH}$

$= 21 \, m/s$

$v_y = v_f \sin\theta$

h_{max} when $v_y = 0 \Rightarrow v_f \sin\theta - gt = 0$

$t = \frac{v_f \sin\theta}{g}$

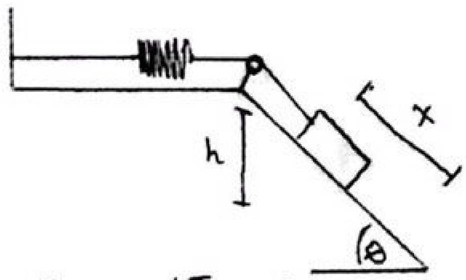
$= 1.0 s$

(a) $h_{max} = v_f \sin\theta . t - \frac{1}{2}gt^2$

$= 5.0 \, m$

(b) since the value of v_f, h_{max} don't have any relation with m, the value of h will be the same

30.



$\Delta E_{mec} + \Delta T_h = 0$

$-mgh + (\frac{1}{2}mv^2 - 0) + \frac{1}{2}kx^2 + 0 = 0$

(a) $v = \sqrt{\frac{2}{m}(mgh - \frac{1}{2}kx^2)}$

$= \sqrt{2gx \sin\theta - \frac{kx^2}{m}}$

$= 0.86 \, m/s$

(b) $-mgx \sin\theta + \frac{1}{2}kx^2 = 0$

$x = \frac{2mg \sin\theta}{k}$

$= 0.24 m$

(c) $\Sigma F = m.a$

$a = \frac{\Sigma F}{m} = \frac{m.g.\sin\theta - kx}{m}$

$= -6.3 \, m/s^2$

(d) direction up a plane (↖)

31. highest point when $v = 0$

$\Delta E_{mec} + \Delta T_h = 0$

$(mgh - 0) + (0 - \frac{1}{2}kx^2) + 0 = 0$

a. $k = \frac{2mgh}{x^2}$

$= 1600 \, N/m$ (2 s.f.)

b. $\frac{1}{2}mv^2 = \frac{1}{2}kx^2$

$v = \sqrt{\frac{kx^2}{m}}$

$= 9.9 \, m/s$ (2 s.f.)

c. $mgh_{max} = \frac{1}{2}kx^2$

$h_{max} = \frac{kx^2}{2mg}$

we can see that the value of h_{max} doesn't depend on θ

32. $W = \int F \, dx$

$= g \int m . dx$

$m(x) = \frac{M}{L} . x$

$W = g . \frac{M}{L} \int x . dx$

$= \frac{Mg}{L}\left[\frac{1}{2}x^2 + C\right]$

$W\Big|_{L/4}^{0} = \frac{Mg}{L}\left[\frac{1}{2}x^2 + C\right]_0^{L/4}$

$= \frac{MgL}{32}$

$= 1.2 \; 10^{-3} \, J$

43 a. ΔT_h = Work by friction

$= \mu_s . m . g . D$

$= 67 \, J$

b. $\Delta E_{mec} + \Delta T_h = 0$

$(K - 0) + (0 - \Delta T_h) = 0$

$K = \Delta T_h$

$= 67 \, J$

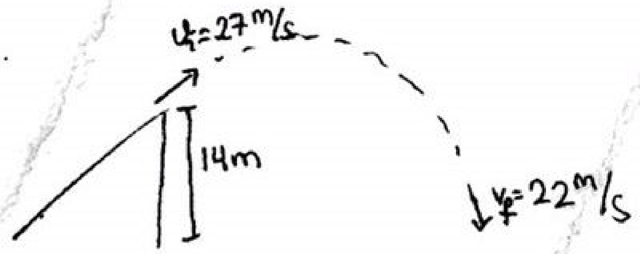
c. $\Delta E_{mec} = 0$

$(\frac{1}{2}kx^2 - 0) + (0 - K) = 0$

$x = \sqrt{\frac{2K}{k}}$

$= 0.46 \, m$

50.



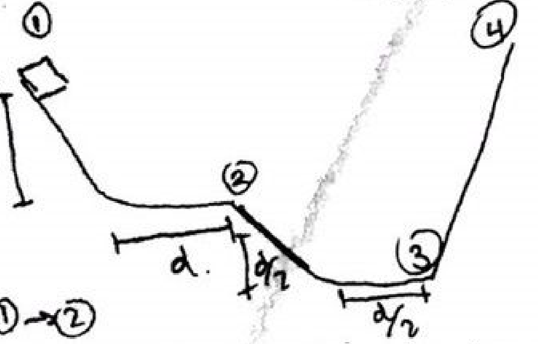
$\Delta E_{mec} + \Delta Th + \Delta E_{int} = 0$

$(\frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2) + (0 - mgh) + 0 + \Delta E_{int} = 0$

$\Delta E_{int} = mgh + \frac{1}{2} m (v_i^2 - v_f^2)$

$= 1.6 \cdot 10^4\ J$ (E_{mec} is reduced by $1.6\ 10^4\ J$)

64.



1 → 2

$\Delta E_{mec} + \Delta Th = (0 - mgd) + (mgd\mu)$

$= mgd(\mu - 1)$

< 0 (no need internal energy)

2 → 3

$\Delta E_{mec} + \Delta Th = (0 - mg\frac{d}{2}) + mgd(\mu - 1) + (mg\frac{d}{2}\mu)$

$= \frac{3mgd}{2}(\mu - 1)$

< 0 (no need internal energy)

3 → 4

$\Delta E_{mec} + \Delta Th = 0$

$(mgh - 0) + (\frac{3mgd}{2}(\mu - 1)) + 0 = 0$

$h = (1 - \mu)\frac{3d}{2}$

$= 0.3\,m$