From HW (pp 270-271)

49. $m = 125g$

$F_a = 85.0N$ ($F_{\parallel}$)

$\Delta d = 78.0cm$

$v = 9.84 m/s$

a) $W = ?$

b) $E_k = ?$

c) fraction of energy lost?

a) $W = F_{\parallel}\Delta d$

$W = (85.0N)(0.780m)$

$W = 66.3 J$

b) $E_k = \frac{1}{2}mv^2$

$E_k = \frac{1}{2}(0.125kg)(9.84m/s)^2$

$E_k = 6.05 J$

c) energy "lost" $= 66.3 - 6.05 J$

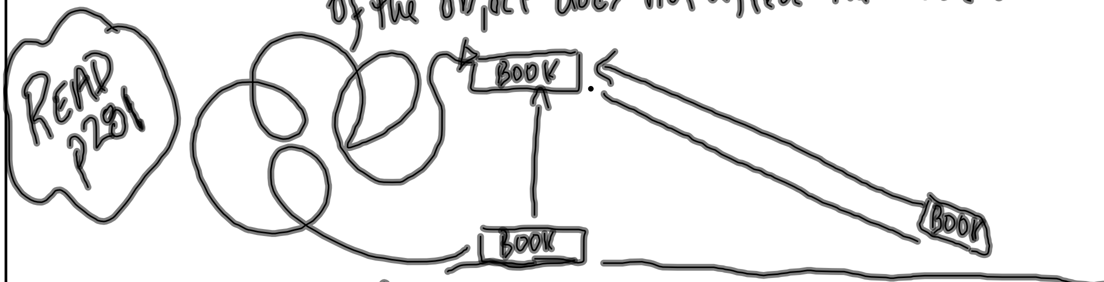
$= 60.2 J$

fraction lost $= \frac{60.2 J}{66.3 J}$

$= 0.909$ or 90.9% lost.

§7.1 Energy Transformation

conservative force - a force like gravity where the path of the object does not affect the work done.



non-conservative force - a force like friction or air resistance where the path affects the amount of work done by the force

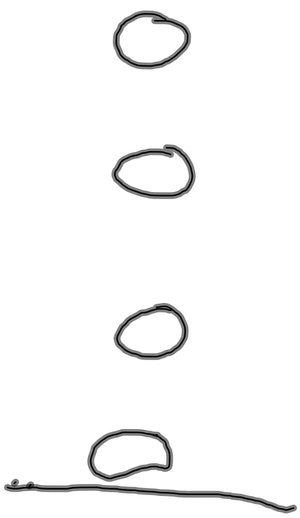
Law of Conservation of Mechanical Energy.

$$E_{total} = E'_{total}$$

(before) (after)

$$E_g + E_e + E_k = E_g' + E_e' + E_k'$$

(neglecting friction / air resistance)



$E_g = 100\,J$, $E_k = 0\,J$, $E_{total} = 100\,J$

$E_g = 70\,J$, $E_k = 30\,J$, $E_{total} = 100\,J$

$E_g = 30\,J$, $E_k = 70\,J$, $E_{total} = 100\,J$

$E_g = 0\,J$, $E_k = 100\,J$, $E_{total} = 100\,J$

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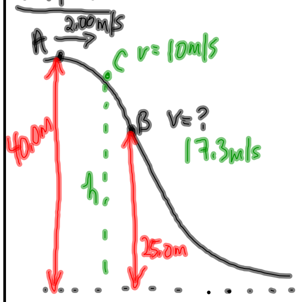


Law of Conservation of Mechanical Energy

$$E_{total} = E'_{total}$$
(A) (B)

$$E_{g_A} + E_{k_A} = E_{g_B} + E_{k_B}$$

$$mgh_A + \frac{1}{2}mv_A^2 = mgh_B + \frac{1}{2}mv_B^2$$

$$gh_A + \frac{v_A^2}{2} = gh_B + \frac{v_B^2}{2}$$

$$(9.81\,m/s^2)(40.0\,m) + \frac{(2.00\,m/s)^2}{2} = (9.81\,m/s^2)(25.0\,m) + \frac{v_B^2}{2}$$

$$392.4\frac{m^2}{s^2} + 2.00\frac{m^2}{s^2} = 245.25\frac{m^2}{s^2} + \frac{v_B^2}{2}$$

$$394.4\frac{m^2}{s^2} = 245.2\frac{m^2}{s^2} + \frac{v_B^2}{2}$$

$$149.15\frac{m^2}{s^2} = \frac{v_B^2}{2}$$

$$v_B^2 = 2\left(149.15\frac{m^2}{s^2}\right)$$

$$\boxed{v_B \doteq 17.3\,m/s}$$

$$E_{total} = E'_{total}$$
(A) (C)

$$E_{g_A} + E_{k_A} = E_{g_C} + E_{k_C}$$

$$mgh_A + \frac{1}{2}mv_A^2 = mgh_C + \frac{1}{2}mv_C^2$$

$$gh_A + \frac{v_A^2}{2} = gh_C + \frac{v_C^2}{2}$$

from Part (a) ⟶

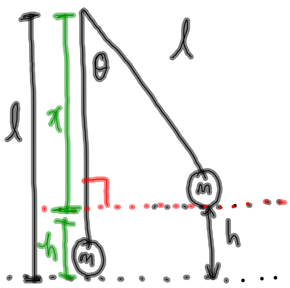
$$394.4\frac{m^2}{s^2} = (9.81\,m/s^2)h_C + \frac{(10.0\,m/s)^2}{2}$$

$$394.4\frac{m^2}{s^2} = (9.81\,m/s^2)h_C + 50.0\frac{m^2}{s^2}$$

$$344.4\frac{m^2}{s^2} = (9.81\,m/s^2)h_C$$

$$\boxed{h_C \doteq 35.1\,m}$$

Consider a pendulum:



To Do

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(at least 1-5)