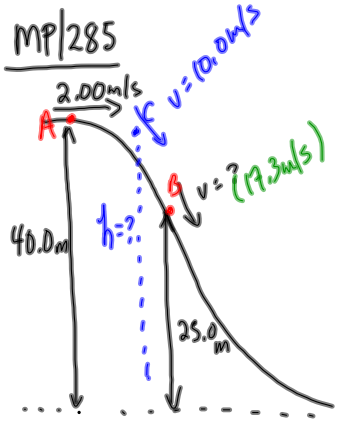
Conservation of Mechanical Energy

MP|285



According to the Law of Conservation of Mechanical Energy:

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

(A) (B)

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

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

$gh_A + \frac{1}{2}v_A^2 = gh_B + \frac{1}{2}v_B^2$

$(9.81 m/s^2)(40.0m) + \frac{1}{2}(2.00 m/s)^2 = (9.81 m/s^2)(25.0m) + \frac{1}{2}v_B^2$

$392.4 \frac{m^2}{s^2} + 2.00 \frac{m^2}{s^2} = 245.25 \frac{m^2}{s^2} + \frac{1}{2}v_B^2$

$394.4 \frac{m^2}{s^2} = 245.25 \frac{m^2}{s^2} + \frac{1}{2}v_B^2$

$149.15 \frac{m^2}{s^2} = \frac{1}{2}v_B^2$

$298.3 \frac{m^2}{s^2} = v_B^2$

$v_B = 17.3 m/s$

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

(A) (C)

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

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

$gh_A + \frac{1}{2}v_A^2 = gh_C + \frac{1}{2}v_C^2$

$(9.81 m/s^2)(40.0m) + \frac{1}{2}(2.00 \frac{m}{s})^2 = (9.81 m/s^2)h_C + \frac{1}{2}(10.0 m/s)^2$

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

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

$h_C = 35.1 m$

You could also have:

a ball toss

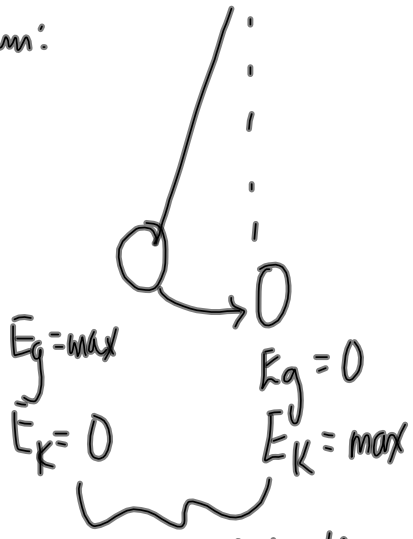
← E_g = max, E_K = 0

← E_g = 0, E_K = max

} total is the same.

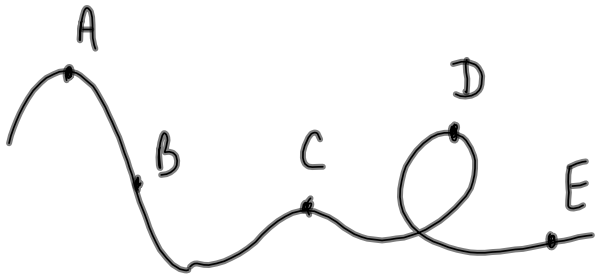
(neglecting air resistance)

a pendulum:



total is the same.

a roller coaster:



TO DO:

① Video Analysis + Ball Toss (due Mon)

② PP|287