4. A particle of mass $m = 5.00$ kg is released from point Ⓐ and slides on the frictionless track shown in Figure P8.4. Determine (a) the particle's speed at points Ⓑ and Ⓒ and ~~(b) the net work done by the gravitational force as the particle moves from Ⓐ to Ⓒ~~.

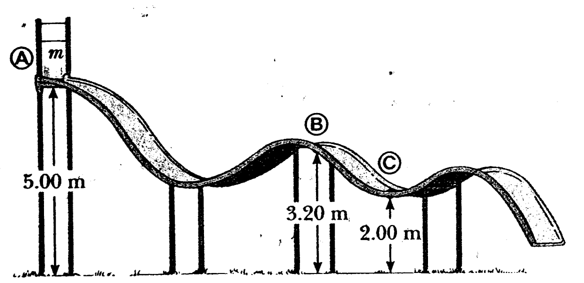
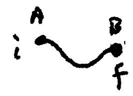



Figure P8.4

Comparing Ⓐ & Ⓑ



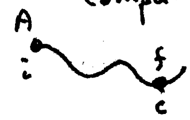

Total Init Energy = Total Final Energy

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

$9.8(5) = \frac{1}{2}v_B^2 + 9.8(3.2)$

$v_B = 5.9$ m/s

Comparing Ⓐ & Ⓒ




Total Init Energy = Total Final Energy

$mgh_A = \frac{1}{2}mv_c^2 + mgh_c$

$9.8(5) = \frac{1}{2}v_c^2 + 9.8(2)$

$v_c = 7.7$ m/s

7. Two objects are connected by a light string passing over a light, frictionless pulley as shown in Figure P8.7. The object of mass 5.00 kg is released from rest. Using the isolated system model, (a) determine the speed of the 3.00-kg object just as the 5.00-kg object hits the ground. ~~(b) Find the maximum height to which the 3.00-kg object rises.~~

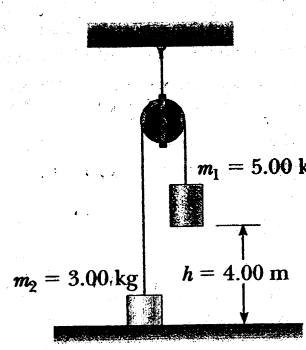
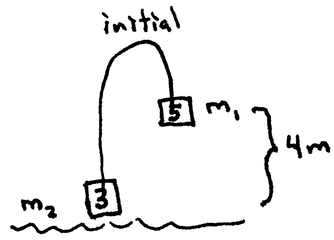
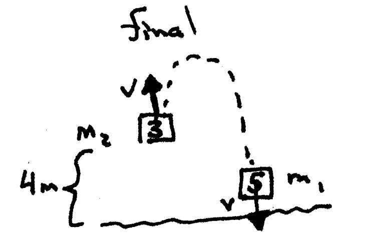



Figure P8.7 Problems 7 and 8.




both will be moving at same speed

Tot Init Energy = Total Final Energy

$m_1 g h_{1i} = \frac{1}{2}m_1 v^2 + \frac{1}{2}m_2 v^2 + m_2 g h_{2f}$

$5(9.8)4 = \frac{1}{2}5v^2 + \frac{1}{2}3v^2 + 3(9.8)4$

$2(9.8)4 = \frac{1}{2}8v^2$

$v = 4.4$ m/s

**3.** A bead slides without friction around a loop-the-loop (Fig. P8.3). The bead is released from a height $h = 3.50R$. (a) What is the bead's speed at point Ⓐ? (b) How large is the normal force on the bead if its mass is 5.00 g?

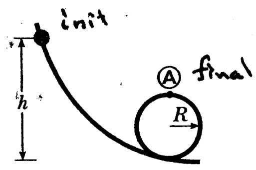


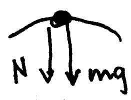

**Figure P8.3**

Total Init Energy = Total Final Energy

$mgh = \frac{1}{2} m v_A^2 + mg\,2R$

$v^2 = 2g(h-2R) = 2g(\frac{7}{2}-2)R$

$= 3gR$




(+ radial)

$m\vec{a} = \sum \vec{F}'s$

$m a_{rad} = \sum F_{rad}'s$ $\qquad$ $m a_{tang} = \sum F_{tang}$

$m \frac{v^2}{R} = N + mg$

→

$m \frac{3gR}{R} = N + mg$

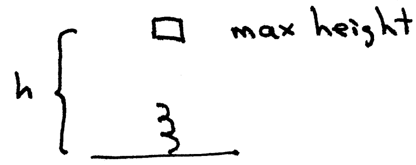
$N = 2mg$

$= 2(0.005\text{ kg})\,9.8$

$= 0.098$ Newtons

**5.** A block of mass 0.250 kg is placed on top of a light vertical spring of force constant 5 000 N/m and pushed downward so that the spring is compressed by 0.100 m. After the block is released from rest, it travels upward and then leaves the spring. To what maximum height above the point of release does it rise?

initial $\qquad$ final




Total Init Energy = Total Final Energy

— Assume the initial height of the mass is negligible compared to the final height h.

$\frac{1}{2} k x_{comp}^2 = mgh$

$\frac{1}{2}\,5000\,(0.1)^2 = 0.25\,(9.8)\,h$

~~h = 32.3 m~~

$h = 10.2$ m