Chapter 7 Problem 26 †

Given
See Figure 7-16
Height at A = 3.8 m
Height at B = 2.6 m
Height at C = 1.3 m

Solution
a) Find the speed at B.

Since the particle starts at rest at A it has potential energy of mgh_A and kinetic energy of 0. At B the particle has potential energy of mgh_B and kinetic energy of $\frac{1}{2}mv_B^2$. From conservation of mechanical energy

$$K_A + U_A = K_B + U_B$$

$$0 + mgh_A = \frac{1}{2}mv_B^2 + mgh_B$$

Solving for v_B gives

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

$$v_B^2 = \frac{2mg(h_A - h_B)}{m}$$

$$v_B = \sqrt{2g(h_A - h_B)} = \sqrt{2(9.80\ m/s^2)(3.8\ m - 2.6\ m)}$$

$$v_B = 4.85\ m/s$$

b) Find the speed at C.

Use the same procedure as above but now use the height at C instead of B.

$$v_C = \sqrt{2g(h_A - h_C)} = \sqrt{2(9.80\ m/s^2)(3.8\ m - 1.3\ m)}$$

$$v_C = 7.00\ m/s$$

c) Find the location of the right-hand turning point.

The turning point is when the height of the track matches the height at A. It appears that the track reaches a height of 3.8 m at $x = 11\ m$. This would be the right-hand turning point.

†Problem from Essential University Physics, Wolfson