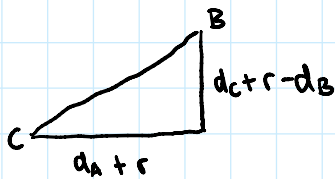
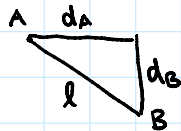
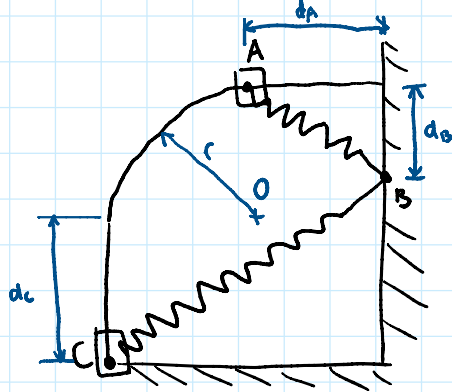


20-R-WE-DK-17

Beginner



Potential Energy

Inspiration: None

Find the potential energy at point A and at point C. Determine which location has greater potential energy. The collar has a mass $m = 0.8 \text{ kg}$ and the spring has a constant $k = 600 \text{ N/m}$. Point A is located a horizontal distance of $d_A = 0.6 \text{ m}$ away from the wall while point C is located a vertical distance of $d_C = 1.3 \text{ m}$ below point O on the diagram. Point B is located a vertical distance $d_B = 0.9 \text{ m}$ below point A and the track has a radius $r = 0.2 \text{ m}$. The unstretched length of the spring is $l_0 = 0.12 \text{ m}$.

$$l^2 = d_A^2 + d_B^2 \quad l = \sqrt{d_A^2 + d_B^2}$$

$$\begin{aligned} V_A &= mgh_A + \frac{1}{2} k s_A^2 = mg(d_C + r) + \frac{1}{2} k (\sqrt{d_A^2 + d_B^2} - l_0)^2 \\ &= (0.8)(9.81)(1.3 + 0.2) + \frac{1}{2} (600) (\sqrt{0.6^2 + 0.9^2} - 0.12)^2 \\ &= \boxed{289.212 \text{ J}} \end{aligned}$$

$$\begin{aligned} V_C &= mgh_C + \frac{1}{2} k s_C^2 = 0 + \frac{1}{2} k ((d_A + r)^2 + (d_C + r - d_B)^2 - l_0)^2 \\ &= \frac{1}{2} (600) (\sqrt{(0.6 + 0.2)^2 + (1.3 + 0.2 - 0.9)^2} - 0.12)^2 \\ &= \boxed{232.32 \text{ J}} \end{aligned}$$

$$\boxed{V_A > V_C}$$