

Physics 101Rec
 Quiz#6-Sect 06
 Chapter 8

Name: Key Id: _____

Consider the track shown in the figure. The section AB is frictionless. The section B to C is 3.0 m long and rough with a coefficient of kinetic friction of 0.25. The section C to D is frictionless. A block of mass $m = 1.0$ kg is released from rest at point A. After sliding on the track, it is observed to compress the spring by 0.20 m before coming to rest. Determine the spring constant k of the spring.

$$\Delta K + \Delta U_g + \Delta U_s = W_f$$

$$\Delta K = 0 \quad (v_i = 0 \text{ and } v_f = 0)$$

$$\begin{aligned} \Delta U_g &= 0 - mgh \\ &= 0 - mgr = -1 \times 9.8 \times 2 = \\ &= -19.6 \text{ J} \end{aligned}$$

$$\Delta U_s = \frac{1}{2} k x_f^2 - 0 = \frac{1}{2} k (0.2)^2 = 0.02 k$$

$$\begin{aligned} W_f &= -\mu_k N d = -\mu_k mg d = -0.25 \times 1 \times 9.8 \times 3 \\ &= -7.35 \text{ J} \end{aligned}$$

$$\Rightarrow -19.6 + 0.02k = -7.35$$

$$\Rightarrow \boxed{k = 612.5 \text{ N/m}}$$

