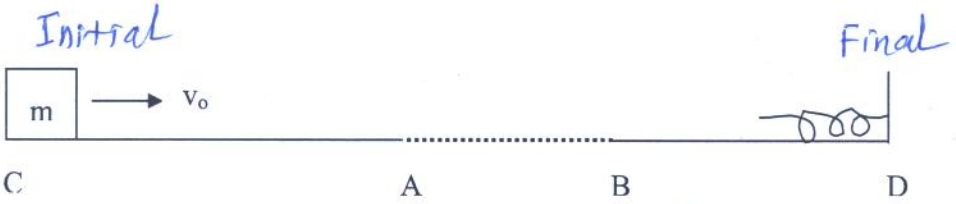
Physics 101- Chapter 8
Quiz No. 5

Name: Key	ID:	Sec: 28

As shown in figure a block of mass m = 4 Kg and initial speed v_o = 8.5 m/s at point C moves towards a spring (K = 2400 N/m). The track CD is frictionless except for the portion AB, of length 7 m. The coefficient of kinetic friction between the surface AB and the block is 0.35. Calculate the maximum compression of the spring when the block hits the spring.



The total energy of the system is conserved.

$$\Delta E_{sys.} = 0 \Rightarrow \Delta K + \Delta U_g + \Delta U_s + \Delta E_{Th.} + \Delta E_{int.} = 0$$

Notice that: $\Delta U_g = 0$ (No vertical movement), $\Delta E_{int.} = 0$ (No other energy)

The main formula becomes:

$$(K_f - K_i) + (U_{s_f} - U_{s_i}) + F_R d = 0$$

$$\frac{1}{2} m (\overset{0}{v_f^2} - v_i^2) + (U_{s_f} - 0) + F_R d = 0$$

$$\frac{1}{2} \times 4 [0 - (8.5)^2] + (\tfrac{1}{2} \times 2400 \times x_f^2 - 0) + \mu_K N d = 0$$

$$-144.5 + 1200 x_f^2 + (0.35 \times 4 \times 9.8 \times 7) = 0$$

$$-144.5 + 1200 x_f^2 + 96.04 = 0$$

$$1200 x_f^2 = 48.46$$

$$x_f^2 = \frac{48.46}{1200} = 0.04038$$

$$x_f = 0.20 \text{ m}$$

The maximam compression of the spring is 0.20 m.