

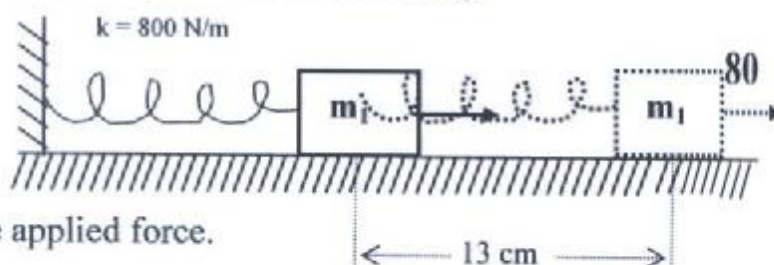
Name:

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A 12-kg block is resting on a horizontal a rough surface ($\mu_k=0.2$). The block is attached to an un-stretched spring ($k=800$ N/m). A force $F=80$ N parallel to the surface is applied to the block. After the block has moved 13 cm, answer the following:



a) Calculate the work done by the applied force.

$$W_F = \vec{F} \cdot \vec{d} = (80)(0.13) = \boxed{10.4 \text{ J}}$$

b) What is the work done by the frictional force?

$$W_f = -f_k d = -\mu_k N d = -\mu_k m g d = -(0.2)(12)(9.8)(0.13) = \boxed{-3 \text{ J}}$$

c) How much thermal energy is dissipated due to friction?

$$\Delta E_{th} = f_k d = \boxed{+3 \text{ J}}$$

d) What is the work done by the spring force?

$$W_s = \frac{1}{2} k (x_i^2 - x_f^2) = \frac{1}{2} (800) (0^2 - (0.13)^2) = \boxed{-6.8 \text{ J}}$$

e) What is the change of the elastic (spring) potential energy?

$$\Delta U_s = -W_s = \boxed{+6.8 \text{ J}}$$

f) What is the speed of the block when it is displaced by 13 cm from its initial position?

$$\Delta K + \Delta U_s + \Delta E_{th} = W_F$$

$$\frac{1}{2} m (v_f^2 - v_i^2) + 6.8 + 3 = 10.4$$

$$\frac{1}{2} (12) v_f^2 = 0.6$$

$$\boxed{v_f = 0.3 \text{ m/s}}$$