

Physics 101Rec  
 Quiz#5-Sect 05  
 Chapter 7

Name:

Key

Id:

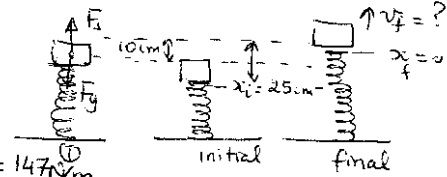
Consider a relaxed vertical spring. When a block of mass  $m = 1.50$  kg sits on the spring, it compresses it a vertical distance of 10 cm down. The spring with the block are compressed an additional distance of 15 cm down and then released.

(a) Find the spring constant  $k$ .

From figure ①

$$F_s = F_g \Rightarrow kx = mg$$

$$\Rightarrow k = \frac{mg}{x} = \frac{1.5 \times 9.8}{0.1} = 147 \text{ N/m}$$



(b) Find the work done by gravity on the block as it moves up from its compressed position to the position when the spring is relaxed.

$$W_g = -mgd = -1.5 \times 9.8 \times 0.25 = \boxed{-3.675 \text{ J}}$$

(c) Find the work done by the spring force during the same situation as in part (b).

$$W_s = \frac{1}{2} k (x_i^2 - x_f^2)$$

$$x_i = 0.25 \text{ m}$$

$$x_f = 0$$

$$\Rightarrow W_s = \frac{1}{2} \times 147 \times (0.25)^2 = \boxed{4.594 \text{ J}}$$

(d) What is the speed of the block just as it leaves the spring?

$$W_{\text{net}} = \Delta K = K_f - K_i = \frac{1}{2} m v_f^2$$

$$W_g + W_s = \frac{1}{2} m v_f^2$$

$$-3.675 + 4.594 = \frac{1}{2} \times 1.5 \times v_f^2 \Rightarrow \boxed{v_f = 1.1 \text{ m/s}}$$