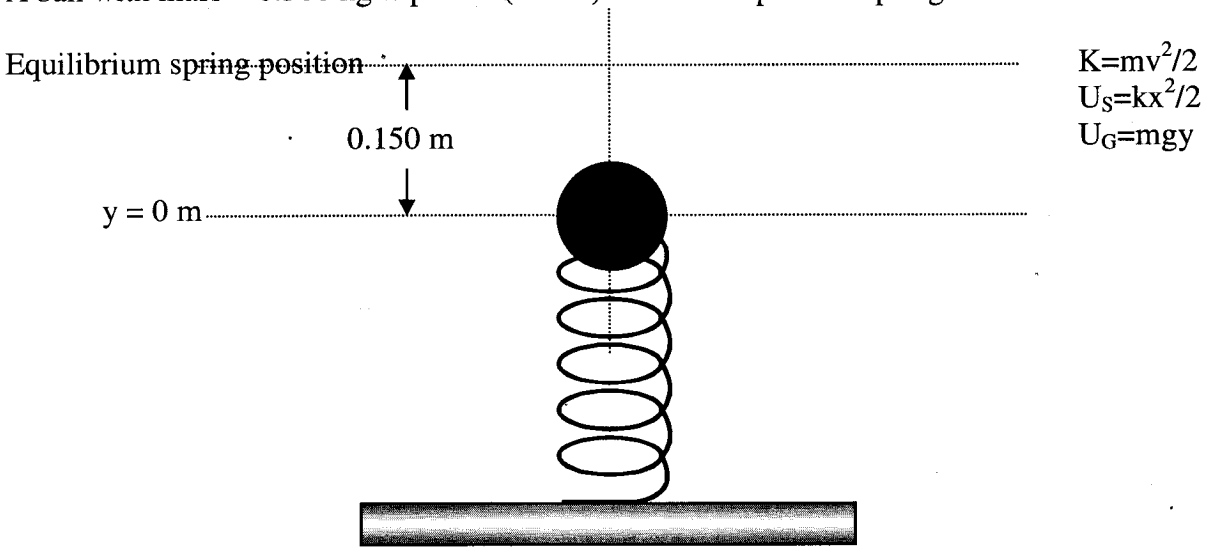
Name_____ SP211 Quiz 16 Oct 03

A vertical spring (k = 900. N/m) is attached to a table and is compressed down by 0.150 m. A ball with mass = 0.300 kg is placed (at rest) on the compressed spring.



1. What is the initial potential energy of the ball due to the spring? $U_s = \frac{1}{2}kx^2 = \frac{1}{2}(900\ N/m)(.15m)^2 = 10.1\ J$
2. What is the initial potential energy of the ball due to gravity? $U_G = 0$
3. What is the initial kinetic energy of the ball? $K = 0$
4. What is the total mechanical energy? $E = 10.1\ J$

The compressed spring is released and the ball travels up to the equilibrium spring position. At the equilibrium spring position:

5. What is the potential energy of the ball due to the spring? $U_s = 0$
6. What is the potential energy of the ball due to gravity? $U_G = mgy = (.3)(9.8\ m/s^2)(.15m) = .44\ J$
7. What is the kinetic energy of the ball? $K = 10.1\ J - .44\ J = 9.66\ J$
8. What is the ball's upward speed? $v = \sqrt{\frac{2K}{m}} = 8.02\ m/s$

The ball leaves the spring and continues to rise:

9. How high will the ball travel relative to its original compressed position (y = 0 m) before it stops and begins to fall? $10.1\ J = mgy \Rightarrow y = \frac{10.1\ J}{(3kg)(9.8\ m/s^2)} = 3.43m$
10. The ball falls back toward the spring. What is the ball's downward speed just before it touches the spring at the equilibrium position? $v = 8.02\ m/s$