

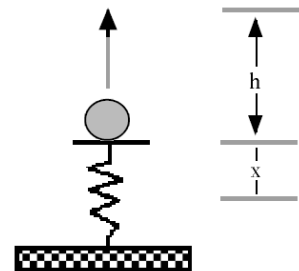
Elastic Potential Energy

Solve the following problems

1. A 50g mass extends a spring from its equilibrium 30 cm. If the spring constant is 35 N/m. What is the elastic potential energy stored in the spring?

Energy – the ability of a body or system of bodies to perform work.	
$W = Fx \cos \theta$	$KE = \frac{1}{2}mv^2$
$P = \frac{W}{t}$	$PE_G = mgh$
	$PE_E = \frac{1}{2}kx^2$

2. If a spring with a spring constant of 80N/m is stretch and is now storing 120J of energy, how far is it stretched?
3. If a spring is storing 100J of energy and has been stretched 50cm, what is its spring constant?
4. (Serway, p. 172, #1)A spring with a force constant of 5.2 N/m has a relaxed length of 2.45 m. When a mass is attached to the end of the spring and allowed to come to rest, the vertical length of the spring is 3.57 m. Calculate the elastic potential energy stored in the spring.
5. (Serway, p. 172, #2)The staples inside a stapler are kept in place by a spring with a relaxed length of 0.115 m. If the spring constant is 51.0 N/m, how much elastic potential energy is in the spring when the spring's length is 0.05m?
6. If a spring is stretched from its equilibrium position by a hanging mass and the spring constant was 40N/m. How much mass must be on the spring if the elastic potential energy is 4J?
7. A 20g ball rests on the top of a vertical spring gun whose spring constant is 20 N/m. The spring is compressed 10 cm and the gun is then fired. Determine how high the ball rises in its vertical trajectory. (assume no energy loss to air resistance)



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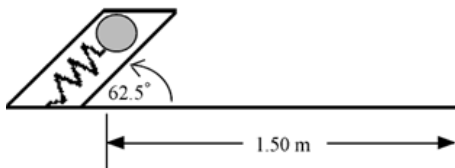
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Chapter 5: Work and Energy

8. 200 g of mass is hung on a spring, and it stretches 4 cm as a result. The spring constant of the spring is 14 N/m. What is the elastic potential energy at this point? How much will the spring be stretched if the PE_E quadruples? How much mass is on it if this happens?

9. A toy spring gun is used to fire a ball as a projectile. Find the value of the spring constant k , such that when the spring is compressed 10 cm, and the gun is fired at an angle of 62.5 degrees, the range of the projectile is 1.5 m. The mass of the ball is 25.2 g. [**think kinematics and projectile motion! Watch your units!**] (assume no energy loss to air resistance) (assume the spring is on the plane when completely compressed and at the end of the gun when at equilibrium)



10. *The Alpengeist*, a popular inverted roller coaster at Busch Gardens, Virginia, has a maximum height on its first drop of 195 feet. At the bottom of this drop, the car you are in is traveling at 67 mph. Assuming no energy loss (no friction), find *how high* the car you are in is at the bottom of this drop. The second highest hill, later on in the ride, is 170 feet off the ground. Again assuming no energy loss, *how fast* are you going at the top of this hill?

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Chapter 5: Work and Energy

11. A very large spring has a spring constant equal to 5.6 N/m . If the spring is compressed 1 meter, what is its elastic potential energy? If the spring is stretched 1 meter, what is its elastic potential energy? If the spring is stretched 30 cm, what is its elastic potential energy?
12. If a spring has an elastic potential energy of 42 J , and it is being stretched 50 cm, what is its spring constant?
13. If a spring has an elastic potential energy of $3,421 \text{ J}$, and it has a spring constant of 11 N/m , how much is it being stretched?
14. When a mass moves at the end of a spring, where is the force acting on it maximum? Where is it minimum?