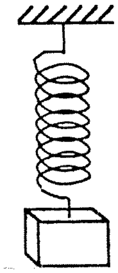
Name: ______________________

Aim: Springs

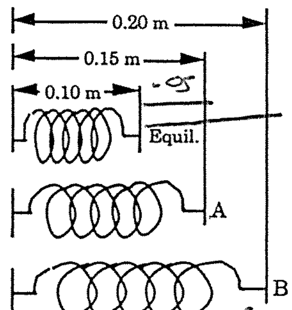
1. The diagram represents a block suspended from a spring. The spring is stretched 0.200 meter. If the spring constant is 200 newtons per meter, what is the weight of the block?



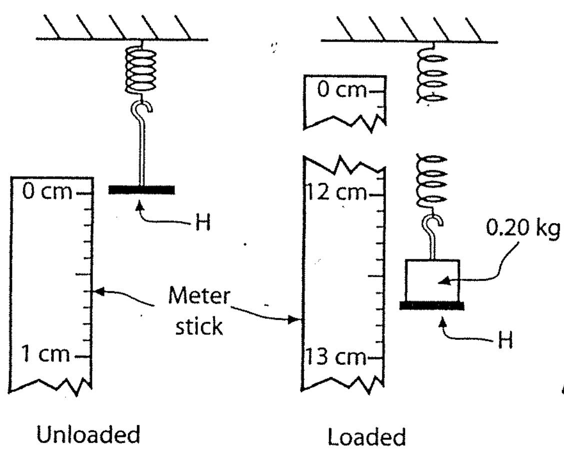
(1) 40.0 N
(2) 20.0 N
(3) 8.00 N
(4) 4.00 N

2. A 0.10 -meter spring is stretched from equilibrium to position A and then to position B as shown in the diagram below. Compared to the spring's potential energy at A, what is its potential energy at B ?

(1) the same
(2) twice as great
(3) half as great
(4) four times as great

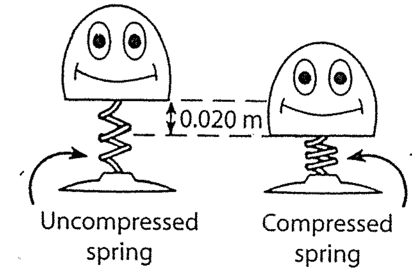


3. A mass hanger is attached to a spring, as shown in the following diagrams.



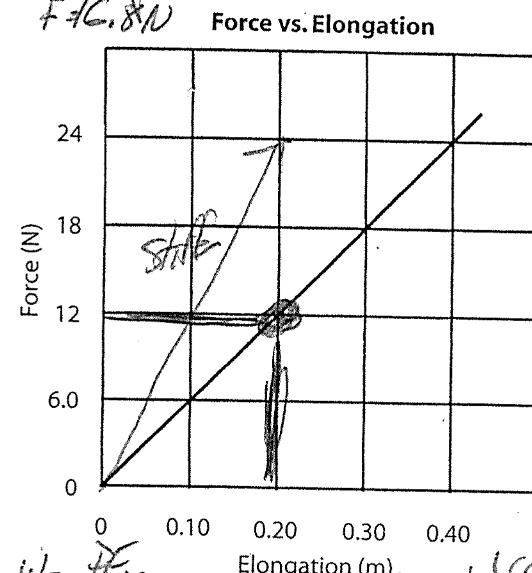
What is the magnitude of the displacement of the mass hanger H after a 0.20-kilogram mass is loaded on it? (Assume the hanger is at rest in both positions.)

4. In the diagram below, a child compresses the sp[ring] in a pop-up toy 0.020 meter.



If the spring has a spring constant of 340 newtons per meter, how much energy is being stored in the spring? (1) 0.068 J (2) 0.14 J (3) 3.4 J (4) 6.8 J

5.



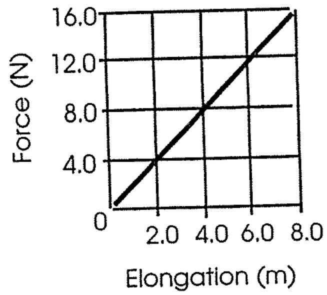
A. How much work must be done to stretch the spring 0.40 meter? (1) 4.8 J (2) 6.0 J (3) 9.8 J (4) 24 J

B. Determine the spring constant k for the spring.

C. On the grid, sketch a line that represents the relationship between applied force and elongation for a stiffer spring.

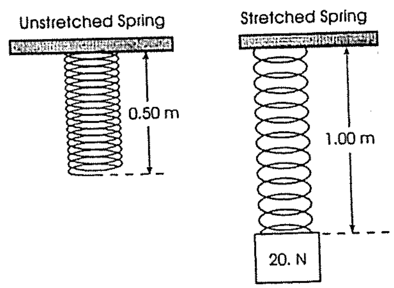
6. The graph at the right represents the relationship between the force applied to a spring and the elongation of the spring. What is the spring constant? [1]
__2__ N/m

$F = Kx \quad K = \frac{F}{x} = \frac{4N}{2m}$



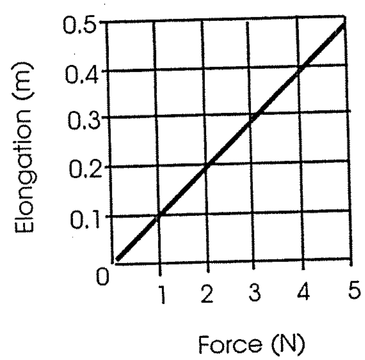
7. A 20.-newton weight is attached to a spring, causing it to stretch, as shown in the diagram at the right. What is the spring constant of this spring? [1] __40__ N/m

$F = Kx$
$20N = K .5m$



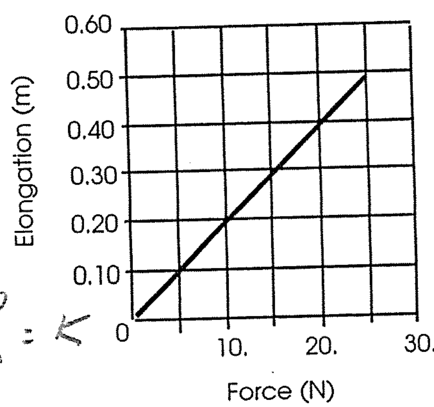
8. At the right is a graph representing the elongation of a spring as different forces are added to it. What is the value of the spring constant? [1]
__10__ N/m

$\frac{F}{x} = K \quad \frac{4N}{.4m} = K$



9. The graph at the right shows the relationship between the elongation of a spring and the force applied to the spring causing it to stretch. What is the spring constant for this spring? [1]
__50__ N/m

$\frac{F}{x} = K \quad \frac{10N}{.2m} = K$



200 N/m

10. A spring of negligible mass with a spring constant of 2.0×10^2 newtons per meter is stretched 0.20 meter. How much potential energy is stored in the spring?
(1) 8 J (2) 8.0 J (3) 4 J (4) 4.0 J

$PE_s = \frac{1}{2}Kx^2$
$\frac{1}{2}(200N/m)(.2m)^2$
$4.0J$

11. A force is applied to a spring causing it to stretch. If the applied force is halved, the potential energy stored in the spring will be (1) halved (2) doubled (3) quartered (4) quadrupled

Assume K=1

$PE_s = Kx^2$, $F = Kx$
$F = 2, \; F = 1(2) = F = 2$
$PE = \frac{1}{2}(1)(2)^2 = 2$
$F = 4 \quad F = Kx \quad x = 4m$
$F = 1\frac{N}{m}(4m)$
$PE = \frac{1}{2}Kx^2$
$PE = \frac{1}{2}(1)(4)^2$
$= 8$

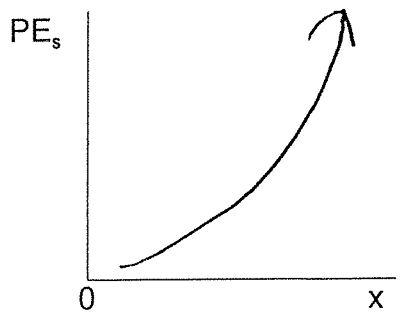
12. If the distance a spring is stretched is doubled and the elastic limit is not exceeded, the potential energy stored in the spring is (1) halved (2) doubled (3) quartered (4) quadrupled

Name:____________________ Date: ____________________

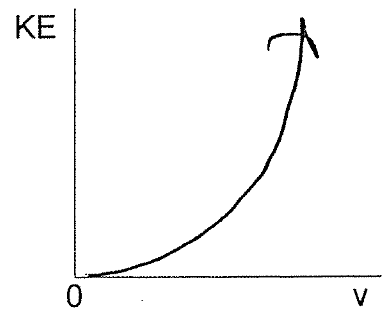
Physics *Do Now: Pendulum and Energy*

1. On the following axes, sketch the line to represent the relationship between:

PE_s and the change in length of the spring from the equilibrium position x.



KE of a moving object and its speed v.



TGPR3
56

2. a. 3

b. $PE_1 = KE_3 = \frac{1}{2} mv^2 = \frac{1}{2}(2.00\,kg)(6.00\,\frac{m}{s})^2 = 36.0\,J$

c. A

d. $a = \frac{v^2}{r} = \frac{6.00\,\frac{m}{s}}{10.0\,m} = 3.6\,\frac{m}{s^2}$

e. 3 (Sec)

Date key Period ______ Name ______

15 Transparency Worksheet

Use with Chapter 11, Sections 11.1, 11.2.

Energy Transfer

1. What two types of energy occur in this spring-block system?

PE_s KE

2. How are these two types of energy defined?

$PE_s = \frac{1}{2}kx^2$ $KE = \frac{1}{2}mv^2$

3. When is kinetic energy at a maximum? Why?

At $d = 0$ b/c $v = v_{max}$

4. When is elastic potential energy at a maximum? Why?

At $d = \pm d_{max}$ (x is squared)

5. As the elastic potential energy increases, how does the kinetic energy change? Is this an example of an open or a closed system?

PE_s ↑ then KE ↓ Closed system

6. How does the sum of the kinetic and elastic potential energy change? What principle does this demonstrate?

$PE_s + KE =$ constant Conservation of energy

7. How many times during one cycle are the elastic potential and kinetic energy equal?

4

8. In reality, this cycle would not repeat forever. What would happen to the energy?

Lost to heat, light, sound