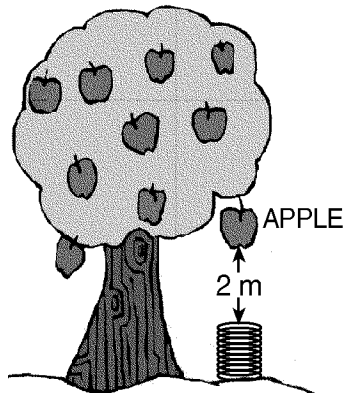Name: _____

Regents Physics: Springs Worksheet #2

1) The diagram below shows a 0.1-kilogram apple attached to a branch of a tree 2 meters above a spring on the ground below.

The apple falls and hits the spring, compressing it 0.1 meter from its rest position. If all of the gravitational potential energy of the apple on the tree is transferred to the spring when it is compressed, what is the spring constant of this spring?

A) 10 N/m   B) 40 N/m   C) 400 N/m   D) 100 N/m

2) The graph below shows elongation as a function of the applied force for two springs, *A* and *B*.
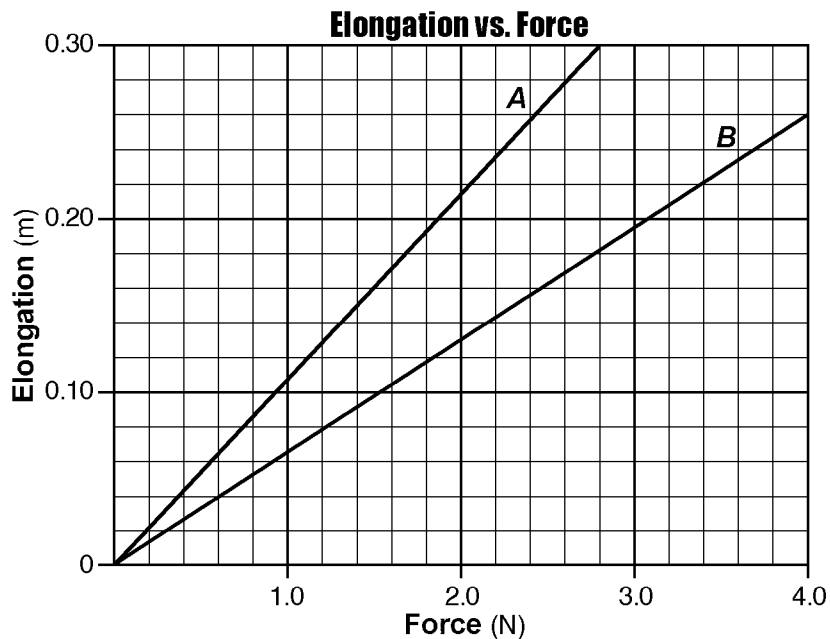
Compared to the spring constant for spring *A*, the spring constant for spring *B* is

A) larger   B) the same   C) smaller

3) The graph below represents the relationship between the force applied to a spring and spring elongation for four different springs.

Force vs. Elongation

Which spring has the *greatest* spring constant?

A) *A*   B) *B*   C) *C*   D) *D*

4) A 3.0-kilogram mass is attached to a spring having a spring constant of 30. newtons per meter. The mass is pulled 0.20 meter from the spring's equilibrium position and released. What is the maximum kinetic energy achieved by the mass-spring system?

A) 0.60 J   B) 2.4 J   C) 1.5 J   D) 1.2 J

5) A 10.-newton force is required to hold a stretched spring 0.20 meter from its rest position. What is the potential energy stored in the stretched spring?

A) 1.0 J   B) 5.0 J   C) 50. J   D) 2.0 J

6) A catapult with a spring constant of 1.0×10^4 newtons per meter is required to launch an airplane from the deck of an aircraft carrier. The plane is released when it has been displaced 0.50 meter from its equilibrium position by the catapult. The energy acquired by the airplane from the catapult during takeoff is approximately

A) 1.0×10^4 J   B) 2.5×10^3 J   C) 1.3×10^3 J   D) 2.0×10^4 J

7) The spring in a scale in the produce department of a supermarket stretches 0.025 meter when a watermelon weighing 1.0×10^2 newtons is placed on the scale. What is the spring constant for this spring?

A) 4.0×10^3 N/m   B) 3.1×10^{-2} N/m   C) 2.5 N/m   D) 3.2×10^5 N/m

8) As shown in the diagram below, a 0.50-meter-long spring is stretched from its equilibrium position to a length of 1.00 meter by a weight.

Unstretched spring   Stretched spring

0.50 m

1.00 m

Weight
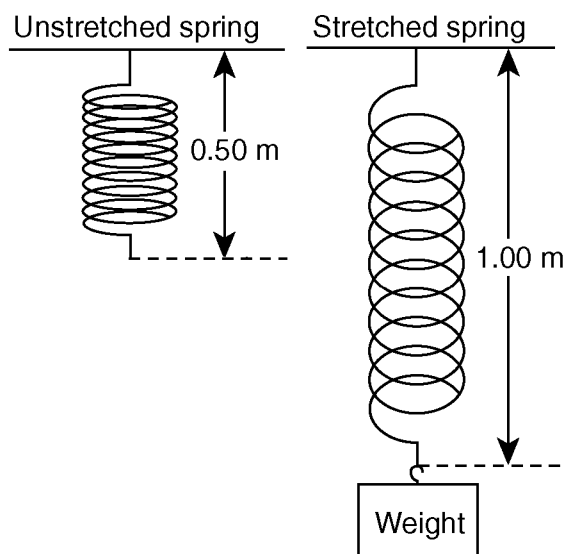
If 15 joules of energy are stored in the stretched spring, what is the value of the spring constant?

A) 60. N/m   B) 240 N/m   C) 120 N/m   D) 30. N/m

9) A pop-up toy has a mass of 0.020 kilogram and a spring constant of 150 newtons per meter. A force is applied to the toy to compress the spring 0.050 meter.

Force

Suction cup →

Spring that compresses

Base
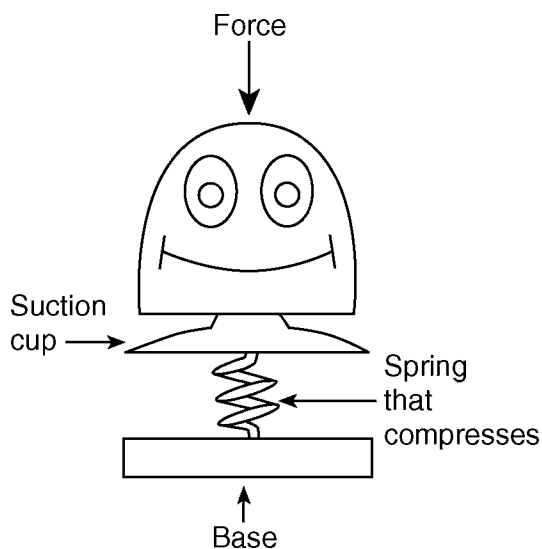
(a) Calculate the potential energy stored in the compressed spring described. [*Show all work, including the equation and substitution with units.*]

(b) The toy is activated and all the compressed spring's potential energy is converted to gravitational potential energy. Calculate the maximum vertical height to which the toy is propelled. [*Show all work, including the equation and substitution with units.*]

Questions 10 and 11 refer to the following:

A block of mass m starts from rest at height h on a frictionless incline. The block slides down the incline across a frictionless level surface and briefly comes to rest by compressing a spring through distance x, as shown in the diagram below.
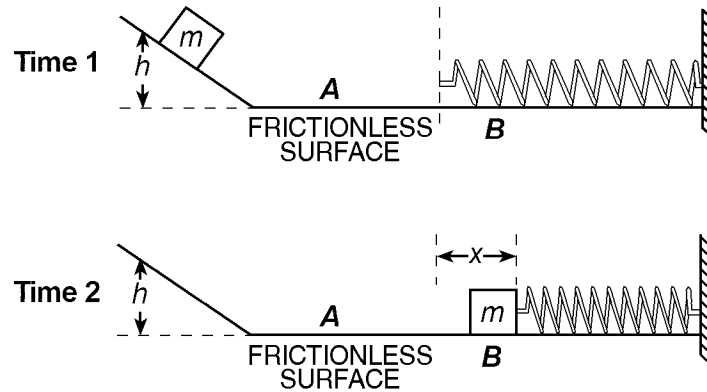
10) Name the forms of mechanical energy possessed by the system when the block shown is in position A and in position B.

11) For the spring shown, determine the spring constant, k, in terms of g, h, m, and x. [*Show all work including formulas and an algebraic solution for k.*]