ISP209 Spring 2002 **Homework 9** Name: _____
Due: Thurs., Mar. 28, 2:40 pm, in Rm 118PA. ID:_____

1. The work done on a mass as it moves is negative. Does the kinetic energy of the mass increase or decrease during this motion? _____
2. When a mass is slowly raised from the floor to a table by a human being what are the two forces acting on the mass during the motion? _____ and _____. Are the signs of the work done by the two forces the same or opposite? _____
3. What is stored in a spring that is stretched or compressed, force or energy? _____
4. What happens to the kinetic energy of a mass that comes to rest by compressing a spring? _____

A mass sliding on a table with an initial kinetic energy, KE_0 = 100 J is observed to have a kinetic energy, KE = 50 J at a later time.

5. The kinetic energy of the mass changes by, $\Delta KE = KE - KE_0$ = _____
6. There is no spring to store *PE*. What happened to the missing energy? _____
7. What is the name of the non-conservative force that has affected the speed? _____
8. How much energy is transferred to heat energy during this motion? _____
9. Assuming the work done by the average force is equal to the change in kinetic energy, what was the average force on the mass if it traveled a total of 10m ? _____
10. Which force(s), electromagnetic(E), gravitational(G), weak nuclear(WN) or strong nuclear(SN), is(are) primarily responsible for the following (100% correct for credit):

color of a green leaf. ____
scatter of neutrons off a nucleus. _____
period of Haley's comet (76 years). _____
beta decay producing a 3.5 MeV electron _____
boiling of water _____
shape of a salt crystal. _____
screech of a tire on a road. _____
hardness of a diamond. _____
smell of brie cheese. _____
sound of a beating heart. _____
decay of the Roman Empire. _____
fall of a thrown baseball. ____

A spring, with spring constant *k*, is attached to a wall and has been compressed by a distance *x*. It then expands horizontally against a small mass, *m*, that slides on a frictionless table (as shown in figure 9.1) Answer questions, 11-14 , based on these conditions (in your answers, use *k*, *m*, and/or *x*).

11. What is the initial force acting on the small mass in the horizontal direction? _____
12. What is the *net* force in the vertical direction acting on the small mass? _____
13. What is the initial potential energy in the spring _____
14. What is the speed of the mass when it leaves the spring? _____

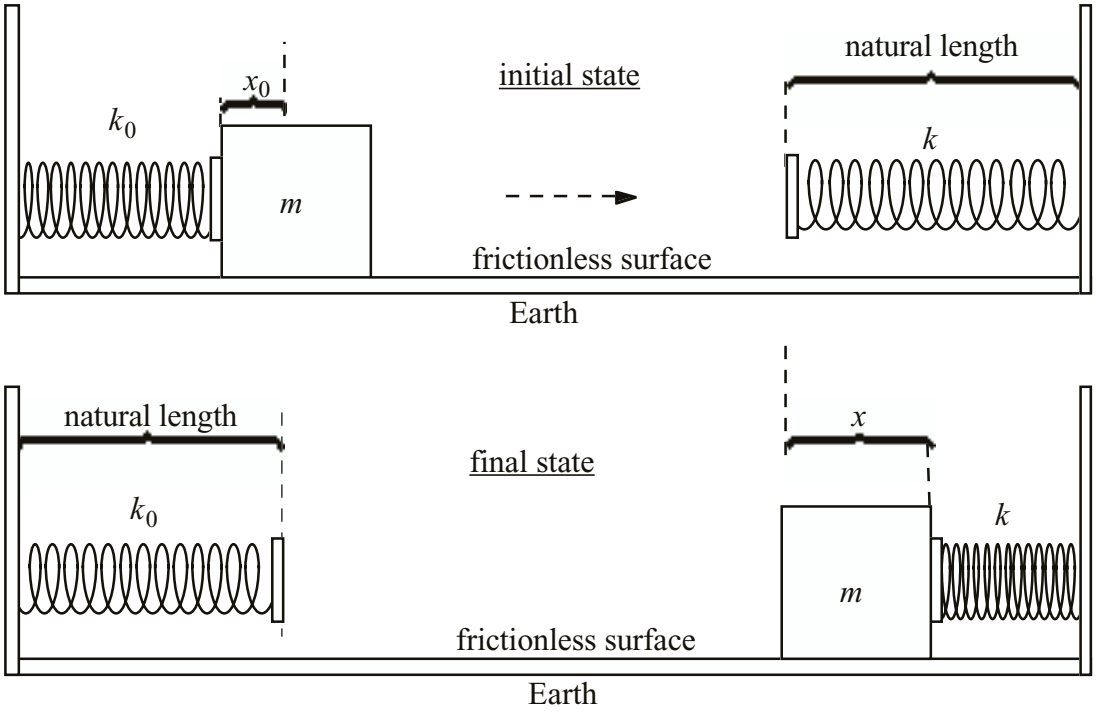

Figure for problem 15

15. A compressed spring with spring constant, k_0, transfers all of its stored energy to a mass that slides on a frictionless table attached to the earth, as shown above. The mass then hits and compresses a second spring with spring constant, k, (k_0 has a different value) again without losing energy. What is the ratio of the compression, x, of the second spring to the compression, x_0, of the first spring, i.e., what is the ratio of the compressions x/x_0 = _____ . ? (Hint: follow the energy.)

Problems 16 -18True or False (ignoring air friction):

16. Without changing direction, the work done to raise a mass sitting on the floor to one sitting on a table does not depend on how fast it is done. _____
17. Work is a vector because it can be either positive or negative. _____
18. A mass thrown upward has no forces acting on it at the highest point. _____
19. Which pair, below, are both considered non-conservative forces?
    (a) gravitational and ideal spring forces
    (b) gravitational and human forces
    (c) ideal spring and human forces
    (d) frictional and human forces
    (e) elastic and frictional forces