Homework: Ch. 7

1. What does it mean to do negative work?

2. What does it mean for a quantity to be "path independent"?

3. For each quantity below, record the abbreviation, the SI unit, and the unit abbreviation.

Quantity	Quantity Abbreviation	SI unit	Unit Abbreviation
length			
time			
mass			
velocity			
acceleration			
force			
energy			
power			

4. Calculate the work done to lift a block of mass of 10.0 kg at the top of a 5.00 m long ramp which is inclined at an angle of 20.0° with the ground.

5. Calculate the kinetic energy of a 2.0 kg object that is travelling with a constant velocity of 36 km/h.

6. If a 50.0 kg object which was originally at rest achieves a velocity of 12 m/s due to application of an external force for 2.0 seconds. Calculate the magnitude of the external force and also calculate the kinetic energy of the object after 5 seconds.

7. Calculate the kinetic energy of a 6.0 kg object which was at rest before a 30.0 N force was applied on it for 10.0 seconds.

8. A loaded cab of an elevator has a mass of 3.0×10^4 kg and moves 210 m up the shaft in 23 s at a constant speed. At what average rate does the force from the cable do work on the cab?

9. If a Saturn V rocket with an Apollo spacecraft attached had a combined mass of 2.0×10^5 kg and, starting from rest, reached a speed of 11.2 km/s, how much kinetic energy would it then have? How much work would have to be applied in order to get the rocket and spacecraft to the final speed?

10. A 15 kg block is accelerated at 2.0 m/s^2 along a horizontal frictionless surface with the speed increasing from 10.0 m/s to 30.0 m/s. What is the change in the block's mechanical energy and the average rate which energy is transferred to the block?

11. A volcanic ash flow is moving across horizontal ground when it encounters a 10.0^o upslope. The front of the flow then travels 920 m up the slope before stopping. Assume that the frictional force from the ground is negligible and that the mechanical energy of the front of the flow is conserved. What is the initial speed of the front of the flow?

12. A 0.100 gram spider is suspended on a strand of silk. With a force of 25.0 mN, Garfield displaces the spider 0.100 m and lets go.

Assume that the strand acts like a spring and that all the potential energy is converted into kinetic energy. Ignoring the gravitational force, determine the following:

a. What is the spring constant of the strand?
b. What is the potential energy of the spider when displaced?
c. What is the speed of the spider when Garfield lets go?

13. A 250 kg block is dropped onto a relaxed spring that has a spring constant of k = 2.5 N/cm. The block becomes attached to the spring and compresses the spring 12 cm before momentarily stopping. While the spring is being compressed, what work is done on the block by the gravitational force and by the spring force?

14. A 50.0 kg skier with an initial speed of 10.0 m/s coasts up a 5.00 m high rise as shown in the figure. Neglecting the friction between her skis and the snow, determine her final speed at the top of the hill.