Potential Energy

1. An elevator car has a mass of 750 kg. Three passengers of masses 65.0 kg, 30.0 kg, and 48.0 kg, ride from the 8th floor to the ground floor, 21.0 m below. Find the change in gravitational potential energy of the car and its passengers. [-1.84 x 105 J]
2. If an elevator and its passengers have a mass of 500 kg, what is their change in gravitational potential energy when they are lifted through a height of 48.0 m? [2.35 x 105 J]
3. A book with a mass of 1.45 kg gains 25.0 J of potential energy when it is lifted from the floor to a shelf. How high is the shelf above the floor? [1.76 m]
4. The Mars rover lifts a bucket of dirt from the surface of Mars into a compartment on the rover. The mass of the dirt is 0.148 kg and the compartment is 0.750 m above the surface of Mars. If this action requires 0.400 J of energy, what is the gravitational acceleration on Mars? [3.60 m/s2]
5. A pile driver drops a mass of 550 kg from a height of 12.5 m above the ground onto the top of a pile that is 2.30 m above the ground. Relative to ground level, what is the gravitational potential energy of the mass
   * 1. at its highest point? [6.74 x 104 J]
     2. at its lowest point? [1.24 x 104 J]
6. The elastic constant for a spring is750 N/m. How far must you stretch a spring from its equilibrium position in order to store 45.0 J of elastic potential energy in it? [0.346 m]
7. A spring has an elastic constant of 4.40 x 104 N/m. What is the change in elastic potential energy stored in the spring when its stretch is increased from 12.5 cm to 15.0 cm? [1.51 x 102 J]
8. A bow that has an elastic constant of 2500 N/m is stretched to a position of 0.540 m from its rest position.
   * 1. What is the elastic potential energy stored in the bow? [365 J]
     2. If all of the elastic potential energy of the bow were to be transformed into kinetic energy of a 95.0 g arrow, what would be the speed of the arrow? [87.6 m/s]