# Phys 2010 (NSCC), Spring 2007
Problem Set #6

1. A 300-kg car moves down a level highway under the actions of two forces: a 1200-N forward force exerted on the drive wheels by the road and a 900-N resistive force. Use the work–energy theorem to find the speed of the car after it has moved a distance of 20 m.

2. A 60-kg pole vaulter running at $10.0\,\frac{\text{m}}{\text{s}}$ vaults over the bar. Her speed when she is above the bar is $1.2\,\frac{\text{m}}{\text{s}}$. Neglect air resistance as well as any energy absorbed by the pole and determine her altitude as she crosses the bar.

3. A 4.00-kg bead slides on a curved wire, starting from rest at point A. If the wire is frictionless, find the speed of the bead at B and at C.
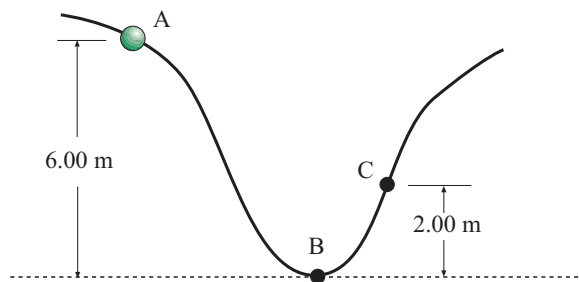
4. A 2.0-m long pendulum is released from rest when the support string is at an angle of 35° from the vertical. What is the speed of the bob at the bottom of the swing?

5. A 70-kg diver steps off a 10-m tower and drops from rest straight down into the water. If he comes to rest 5.0 m beneath the surface, determine: (a) The work done on him by the resistive force of the water, and (b) the average resistive force exerted on him by the water.

6. The electric motor of a model train accelerates the train from rest to $0.700 \frac{m}{s}$ in 20.0 ms. The total mass of the train is 875 g. Find the work done on the train in the given time.
   Find the average power delivered to the train during the acceleration.

7. On a one-dimensional track, a 500 g cart moves to the right with speed $1.5 \frac{m}{s}$ and a 400 g cart moves to the left with speed $2.5 \frac{m}{s}$. What is the total momentum of this system?

8. A pitcher throws a 0.15-kg baseball so that it crosses home plate horizontally with a speed of $20 \frac{m}{s}$. The ball is hit straight back at the pitcher with a final speed of $22 \frac{m}{s}$. (a) What is the impulse (magnitude of the momentum change) delivered to the ball? (b) Find the average force exerted by the bat on the ball if the two are in contact for 2.0×10^{-3} s.