

# 13 Energy

## Worksheet D: Energy Calculations

Name \_\_\_\_\_ Inquiry Physics

1. A 200 kg iceboat is supported by the smooth surface of a frozen lake (neglect friction). The wind exerts a constant force of 400 N on the boat while the boat moves 900 m. The boat starts from rest.
  - a) Find the work done on the boat by the wind.
  
  
  
  
  
  
  
  
  
  
  - b) When something does work, energy is being converted from one form to another. The wind energy is being converted into the boat's \_\_\_\_\_ energy.
  
  
  
  
  
  
  
  
  
  
  - c) Work equals the change in energy. Use this fact and your answers to parts **a** and **b** to find the boat's final speed.
  
  
  
  
  
  
  
  
  
  
2. A 0.00200 kilogram bullet is shot into a tree stump. It enters at a speed of 300 m/s and comes to rest after having penetrated 0.0500 m in a straight line.
  - a) Find the *change* in the bullet's kinetic energy ( $\Delta K$ ). (Since it loses kinetic energy, your calculation should yield a negative answer.)
  
  
  
  
  
  
  
  
  
  
  - b) Consider your answer to part **a**. How much *work* must the tree have done on the bullet? (Don't forget what you learned from problem 1!)
  
  
  
  
  
  
  
  
  
  
  - c) Use your answer to part **b** to find the average force during impact.

3. Use the ideas outlined on the first page to solve this problem:  
How much work is done in changing the velocity of a 5000 N car from 20.0 m/s to 30.0 m/s?
4. A 50.0 kg rock falls off a 20.0 m cliff.
- a) What is its gravitational potential energy before it falls?
  
  
  
  
  
  
  
  
  
  
  - b) Consider your answer to part **a**. What must its kinetic energy be just before it lands?  
SHOW WORK OR EXPLAIN YOUR ANSWER
  
  
  
  
  
  
  
  
  
  
  - c) Use your answer to part **b** to find its speed just before it lands.
  
  
  
  
  
  
  
  
  
  
  - d) Let's back up and consider the rock when it is halfway down toward the ground. Having fallen 10.0 m, what is its gravitational potential energy halfway down?  
SHOW WORK OR EXPLAIN YOUR ANSWER
  
  
  
  
  
  
  
  
  
  
  - e) Use your understanding of energy conservation to predict its kinetic energy at the halfway point.  
SHOW WORK OR EXPLAIN YOUR ANSWER
5. A 20.0 kg rock is thrown upward with 980 J of kinetic energy. Use your understanding of energy conservation to solve for how high that rock will rise above the ground before it stops.