

## PRACTICE F

### Power

1. A  $1.0 \times 10^3$  kg elevator carries a maximum load of 800.0 kg. A constant frictional force of  $4.0 \times 10^3$  N retards the elevator's motion upward. What minimum power, in kilowatts, must the motor deliver to lift the fully loaded elevator at a constant speed of 3.00 m/s?
2. A car with a mass of  $1.50 \times 10^3$  kg starts from rest and accelerates to a speed of 18.0 m/s in 12.0 s. Assume that the force of resistance remains constant at 400.0 N during this time. What is the average power developed by the car's engine?
3. A rain cloud contains  $2.66 \times 10^7$  kg of water vapor. How long would it take for a 2.00 kW pump to raise the same amount of water to the cloud's altitude, 2.00 km?
4. How long does it take a 19 kW steam engine to do  $6.8 \times 10^7$  J of work?
5. A  $1.50 \times 10^3$  kg car accelerates uniformly from rest to 10.0 m/s in 3.00 s.
  - a. What is the work done on the car in this time interval?
  - b. What is the power delivered by the engine in this time interval?

## SECTION REVIEW

1. A 50.0 kg student climbs 5.00 m up a rope at a constant speed. If the student's power output is 200.0 W, how long does it take the student to climb the rope? How much work does the student do?
2. A motor-driven winch pulls the 50.0 kg student in the previous item 5.00 m up the rope at a constant speed of 1.25 m/s. How much power does the motor use in raising the student? How much work does the motor do on the student?
3. **Critical Thinking** How are energy, time, and power related?
4. **Critical Thinking** People often use the word *powerful* to describe the engines in some automobiles. In this context, how does the word relate to the definition of *power*? How does this word relate to the alternative definition of *power*?