

## PRACTICE D

### Potential Energy

1. A spring with a force constant of  $5.2 \text{ N/m}$  has a relaxed length of  $2.45 \text{ m}$ . When a mass is attached to the end of the spring and allowed to come to rest, the vertical length of the spring is  $3.57 \text{ m}$ . Calculate the elastic potential energy stored in the spring.
2. The staples inside a stapler are kept in place by a spring with a relaxed length of  $0.115 \text{ m}$ . If the spring constant is  $51.0 \text{ N/m}$ , how much elastic potential energy is stored in the spring when its length is  $0.150 \text{ m}$ ?
3. A  $40.0 \text{ kg}$  child is in a swing that is attached to ropes  $2.00 \text{ m}$  long. Find the gravitational potential energy associated with the child relative to the child's lowest position under the following conditions:
  - a. when the ropes are horizontal
  - b. when the ropes make a  $30.0^\circ$  angle with the vertical
  - c. at the bottom of the circular arc

## SECTION REVIEW

1. A pinball bangs against a bumper, giving the ball a speed of  $42 \text{ cm/s}$ . If the ball has a mass of  $50.0 \text{ g}$ , what is the ball's kinetic energy in joules?
2. A student slides a  $0.75 \text{ kg}$  textbook across a table, and it comes to rest after traveling  $1.2 \text{ m}$ . Given that the coefficient of kinetic friction between the book and the table is  $0.34$ , use the work–kinetic energy theorem to find the book's initial speed.
3. A spoon is raised  $21.0 \text{ cm}$  above a table. If the spoon and its contents have a mass of  $30.0 \text{ g}$ , what is the gravitational potential energy associated with the spoon at that height relative to the surface of the table?
4. **Critical Thinking** What forms of energy are involved in the following situations?
  - a. a bicycle coasting along a level road
  - b. heating water
  - c. throwing a football
  - d. winding the mainspring of a clock
5. **Critical Thinking** How do the forms of energy in item 4 differ from one another? Be sure to discuss mechanical versus nonmechanical energy, kinetic versus potential energy, and gravitational versus elastic potential energy.