that would be needed to lift the crate straight up into the truck. Does the inclined plane serve as a simple machine in this situation? Explain.

Q11. A boy pushes his friend across a skating rink. Since the frictional forces are very small, the force exerted by the boy on his friend’s back is the only significant force acting on the friend in the horizontal direction. Is the change in kinetic energy of the friend greater than, equal to, or less than the work done by the force exerted by the boy? Explain.

Q12. A child pulls a block across the floor with force applied by a horizontally held string. A smaller frictional force also acts upon the block, yielding a net force on the block that is smaller than the force applied by the string. Does the work done by the force applied by the string equal the change in kinetic energy in this situation? Explain.

Q13. If there is just one force acting on an object, does its work necessarily result in an increase in kinetic energy? Explain.

Q14. Two balls of the same mass are accelerated by different net forces such that one ball gains a velocity twice that of the other ball in the process. Is the work done by the net force acting on the faster-moving ball twice that done on the slower-moving ball? Explain.

Q15. A box is moved from the floor up to a tabletop but gains no speed in the process. Is there work done on the box, and if so, what has happened to the energy added to the system?

Q16. When work is done to increase the potential energy of an object without increasing its kinetic energy, is the net force acting on the object greater than zero? Explain.

Q17. Is it possible for a system to have energy if nothing is moving in the system? Explain.

Q18. Suppose that work is done on a large crate to tilt the crate so that it is balanced on one edge, as shown in the diagram, rather than sitting squarely on the floor as it was at first. Has the potential energy of the crate increased in this process? Explain.

Q19. Which has the greater potential energy: a ball that is 10 feet above the ground, or one with the same mass that is 20 feet above the bottom of a nearby 50-foot-deep well? Explain.

Q20. When a bow and arrow are cocked, a force is applied to the string in order to pull it back. Is the energy of the system increased? Explain.

Q21. Suppose that the physics instructor pictured in figure 6.15 gives the bowling ball a push as she releases it. Will the ball return to the same point or will her chin be in danger? Explain.

Q22. A pendulum is pulled back from its equilibrium (center) position and then released. 
   a. What form of energy is added to the system prior to its release? Explain.
   b. At what points in the motion of the pendulum after release is its kinetic energy the greatest? Explain.
   c. At what points is the potential energy the greatest? Explain.

Q23. For the pendulum in question 22—when the pendulum bob is halfway between the high point and the low point in its swing—is the total energy kinetic energy, potential energy, or both? Explain.

Q24. Is the total mechanical energy conserved in the motion of a pendulum? Will it keep swinging forever? Explain.

Q25. A sports car accelerates rapidly from a stop and “burns rubber.” (See everyday phenomenon box 6.1.)
   a. What energy transformations occur in this situation?
   b. Is energy conserved in this process? Explain.

Q26. A man commutes to work in a large sport utility vehicle (SUV). (See everyday phenomenon box 6.1.)
   a. What energy transformations occur in this situation?
   b. Is chemical energy conserved in this situation? Explain.
   c. Is energy of all forms conserved in this situation? Explain.

Q27. Suppose that we burn a barrel of oil just to warm our hands on a cold day. (See everyday phenomenon box 6.1.)
   a. From the standpoint of physics, is energy conserved in this process? Explain.
   b. Why is this a bad idea from an economic or environmental standpoint? Explain.

Q28. A bird grabs a clam, carries it in its beak to a considerable height, and then drops it on a rock below, breaking the clam shell. Describe the energy conversions that take place in this process.

Q29. Is the elastic potential energy stored in the pole the only type of potential energy involved in pole-vaulting? Explain. (See everyday phenomenon box 6.2.)

Q30. If one pole-vaulter can run faster than another, will the faster runner have an advantage in the pole vault? Explain. (See everyday phenomenon box 6.2.)

Q31. A mass attached to a spring, which in turn is attached to a wall, is free to move on a friction-free horizontal surface. The mass is pulled back and then released.
   a. What form of energy is added to the system prior to the release of the mass? Explain.
   b. At what points in the motion of the mass after its release is its potential energy the greatest? Explain.
   c. At what points is the kinetic energy the greatest? Explain.

Q32. Suppose that the mass in question 31 is halfway between one of the extreme points of its motion and the center point. In this position, is the energy of the system kinetic energy, potential energy, or a combination of these forms? Explain.