5 REVIEW

26. **a.** nonmechanical
b. mechanical
c. mechanical
d. mechanical
e. both

27. As the athlete runs faster, KE increases. As he is lifted above the ground, KE decreases as PE_g and $PE_{elastic}$ increase ($PE_{elastic}$ comes from the bent pole). At the highest point, $KE = 0$ and PE_g is at its maximum value. As the athlete falls, KE increases and PE_g decreases. When the athlete lands, KE is at its maximum value and $PE_g = 0$.

28. The ball will not hit the lecturer because, according to the principle of energy conservation, it would need an input of energy to reach a height greater than its initial height. If the ball were given a push, the lecturer would be in danger.

29. **a.** Athlete does work on the weight. PE_g increases.
b. No work done on the weight. PE_g is constant.
c. Athlete does negative work on the weight. PE_g decreases.

30. at the ball's lowest height; at its maximum height

31. no, because energy wouldn't be conserved

32. two, gravitational potential energy and elastic potential energy; yes, because total mechanical energy is conserved if there is no dissipation of energy

33. 12.0 m/s

34. **a.** 10.9 m/s
b. 11.6 m/s

35. 17.2 s

36. 5.9×10^8 W

CONSERVATION OF MECHANICAL ENERGY

Review Questions

26. Each of the following objects possesses energy. Which forms of energy are mechanical, which are nonmechanical, and which are a combination?

a. glowing embers in a campfire
b. a strong wind
c. a swinging pendulum
d. a person sitting on a mattress
e. a rocket being launched into space

27. Discuss the energy transformations that occur during the pole-vault event shown in the photograph below. Disregard rotational motion and air resistance.



28. A strong cord suspends a bowling ball from the center of a lecture hall's ceiling, forming a pendulum. The ball is pulled to the tip of a lecturer's nose at the front of the room and is then released. If the lecturer remains stationary, explain why the lecturer is not struck by the ball on its return swing. Would this person be safe if the ball were given a slight push from its starting position at the person's nose?

Conceptual Questions

29. Discuss the work done and change in mechanical energy as an athlete does the following:

a. lifts a weight
b. holds the weight up in a fixed position
c. lowers the weight slowly

30. A ball is thrown straight up. At what position is its kinetic energy at its maximum? At what position is gravitational potential energy at its maximum?

31. Advertisements for a toy ball once stated that it would rebound to a height greater than the height from which it was dropped. Is this possible?

32. A weight is connected to a spring that is suspended vertically from the ceiling. If the weight is displaced downward from its equilibrium position and released, it will oscillate up and down. How many forms of potential energy are involved? If air resistance and friction are disregarded, will the total mechanical energy be conserved? Explain.

Practice Problems

For problems 33–34, see Sample Problem E.

33. A child and sled with a combined mass of 50.0 kg slide down a frictionless hill that is 7.34 m high. If the sled starts from rest, what is its speed at the bottom of the hill?

34. Tarzan swings on a 30.0 m long vine initially inclined at an angle of 37.0° with the vertical. What is his speed at the bottom of the swing if he does the following?

a. starts from rest
b. starts with an initial speed of 4.00 m/s

POWER

Practice Problems

For problems 35–36, see Sample Problem F.

35. If an automobile engine delivers 50.0 hp of power, how much time will it take for the engine to do 6.40×10^5 J of work? (Hint: Note that one horsepower, 1 hp, is equal to 746 watts.)

36. Water flows over a section of Niagara Falls at the rate of 1.2×10^6 kg/s and falls 50.0 m. How much power is generated by the falling water?