Unit B: Physics Review Questions

1. A skateboarder travels 50.0 m in 12.0 s. What is the average speed of the skateboarder?

2. A baseball player throws a ball a distance of 45.0 m at a speed of 30.0 m/s. How long is the ball in flight?

3. An airplane flies at a speed of 990 km/h for 4.10 h. How far does the airplane travel?

4. A bird is flying 6.00 km/h in a straight line at a constant rate. How long will it take the bird to travel 30.0 km?

5. A person walks 15.0 m in 5.00 s, and then walks 12.0 m in 10.00 s. What is the average speed of the person?

6. A person walks at a speed of 2.00 m/s for 10.00 s, and then walks at a speed of 1.50 m/s for 8.00 s. What is the average speed of the person?

7. A ball rolls 10.0 m [S] in a time of 6.00 s, hits a wall, and rolls back a distance of 15.0 m [N] in a time of 10.00 s. Determine:
   a. The distance traveled by the ball
   b. The displacement of the ball
   c. The average speed of the ball
   d. The average velocity of the ball

8. Identify the following motions as positive or negative accelerations:
   a. An object changes its velocity from 10 m/s [E] to 20 m/s [E] in 4.0 s.
   b. An object changes its velocity from 20 m/s [E] to 10 m/s [E] in 4.0 s.
   c. An object changes its velocity from 10 m/s [W] to 20 m/s [W] in 4.0 s.
   d. An object changes its velocity from 20 m/s [W] to 10 m/s [W] in 4.0 s.

9. A transit bus traveling at 15 m/s [N] applies its brakes and stops in 3.0 s. What is the acceleration of the bus?

10. A race car driver accelerates his car from 25.0 m/s [W] to 40.0 m/s [W] in 4.00 s. What is the acceleration of the car?

11. A golf ball rolling on a green slows down from 2.00 m/s to 1.50 m/s in 2.00 s. What is the magnitude of the acceleration of the ball?

12. An object starts from rest and accelerates at 1.30 m/s² [N] for 6.00 s. What is the final velocity of the object?
13. An object, initially at rest, is dropped off a building and accelerates to Earth at \(-9.81 \text{ m/s}^2\) [downward]. How long will it take for the object to reach a final velocity of \(-49.1 \text{ m/s}\) [downward]?

14. A tugboat is towing a tanker through a canal using a towrope. Calculate the work done by the tugboat if it applies an average horizontal force of \(6.50 \times 10^3 \text{ N}\) on the towrope while towing the tanker through a horizontal distance of 150 m.

15. A large crane did \(2.2 \times 10^4 \text{ J}\) of work in lifting a demolition ball a vertical distance of 9.5 m. Calculate the average force exerted by the chain of the crane on the demolition ball.

16. A worker does \(43.0 \text{ J}\) of work in moving an object 3.20 m horizontally across a floor. How much force did the worker exert in doing the work on the object?

17. A machine does \(2.00 \times 10^4 \text{ J}\) of work in lifting an object. If the force exerted by the machine was \(1.20 \times 10^3 \text{ N}\), how high did the machine lift the object?

18. A person applies a force of 30.0 N in sliding an object 1.30 m up a ramp? What is the work done by the person along the ramp?

19. An object gains 155 J of gravitational potential energy when it is lifted 1.20 m above the surface of Earth. Calculate the force exerted on the object.

20. Standing on level ground, a person with a mass of 55.0 kg jumps straight up into the air to a position where the person has gained 800 J of gravitational potential energy. How high did the person leap?

21. A person jumping on a trampoline exerts an average force of 500 N in stretching the trampoline a distance of 0.750 m. Calculate the elastic potential energy stored in the trampoline.

22. An elastic that is stretched 10.0 cm has 320 J of stored elastic potential energy. Calculate the force required to stretch the elastic.

23. A 60.0 kg person climbs up a ladder to the roof of a building that is 3.50 m above the surface of Earth. Calculate the gravitational potential energy of the person.

24. Determine the kinetic energy of each of the following:
   a. A 0.500 kg ball is thrown horizontally at 12.0 m/s.
   b. A 75.0 kg person is in free-fall and reaches a terminal velocity of 40 m/s.
   c. A 4.00 g bullet is traveling at 140 m/s.
25. A curling rock, sliding down the ice at a speed of 2.40 m/s, is determined to have a kinetic energy of 57.6 J. What is the mass of the curling rock?

26. A 40.0 kg object has an initial kinetic energy of 320 J.
   a. What is the initial speed of the object?
   b. An unbalanced force is applied to accelerate the object to a final kinetic energy of 400 J. What is the change in speed of the object?

27. Calculate the percent efficiency of an engine that consumes 3.50 x 10^3 J of energy in doing 2.30 x 10^3 J of work?

28. The percent efficiency of a machine is 35.0%. What is the useful work done if the machine consumes 1.20 x 10^4 J of energy?

29. The percent efficiency of a machine is 35.0%. What is the input energy required if a 2.00 x 10^3 kg object is to be lifted 5.00 m?