1. A 2.0 kg object moves at a velocity of 3.0 m/s. How much work is required to stop the object?
   a) 3.0 J
   b) 6.0 J
   c) 9.0 J
   d) 12.0 J
2. A 1000 W motor lifts a 50 kg object vertically at constant speed. How long will it take to raise the object 10.0 m?
   a) 2.5 s
   b) 4.9 s
   c) 5.0 s
   d) 10.0 s

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3. A 1.5 kg cart is moving with a speed of 4.0 m/s. Calculate its kinetic energy.
4. A 1.2 kg ball traveling at 3.0 m/s collides elastically with a stationary 0.8 kg ball. After the collision, the 1.2 kg ball moves at 1.0 m/s. Find the velocity of the 0.8 kg ball after the collision.

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5. A 5.0 kg box is pushed across a frictionless surface by a force of 20.0 N for a distance of 3.0 m. Calculate:
   a) The work done by the force.
   b) The final speed of the box if it started from rest.
6. Two carts collide elastically. Cart A (2.0 kg) moves at 3.0 m/s, while Cart B (3.0 kg) is at rest. After the collision, Cart A moves at -1.0 m/s. Find the final velocity of Cart B.

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7. Explain how energy conservation applies when a pendulum swings from its highest point to its lowest point.
8. A 0.5 kg soccer ball is kicked and accelerates from rest to 10 m/s in 0.2 seconds. Calculate:
   a) The impulse applied to the ball.
   b) The average force exerted by the kick.

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9. A roller coaster of mass 500 kg is at the top of a 30.0 m high hill.
   a) Calculate its potential energy relative to the ground.
   b) If it descends the hill, ignoring friction, find its speed at the bottom.
10. A hockey puck of mass 0.15 kg moving at 20 m/s strikes a stationary goalie pad of mass 3.0 kg. After the collision, the puck moves backward at 5.0 m/s. Calculate the velocity of the goalie pad after the collision.
1. A 1,200 kg car traveling at 20 m/s rear-ends a 900 kg stationary car. After the collision, the cars stick together and move as one mass.

a) Find their velocity immediately after the collision.
b) If the collision lasts for 0.5 seconds, calculate the average force exerted on the stationary car.

2. A 2.0 kg object is launched at a speed of 15 m/s at an angle of 30° to the horizontal. Ignore air resistance.
   a) Calculate the object's total energy at the point of launch.
   b) Determine its maximum height during flight.

3. A 1,500 kg elevator is lifted upward by a motor at a constant speed of 3.0 m/s.
   a) Calculate the tension in the elevator cable.
   b) How much work does the motor do in lifting the elevator a height of 20 m?

4. A 3,000 kg truck traveling at 25 m/s comes to a stop over a distance of 50 m.
   a) Calculate the work done to stop the truck.
   b) Find the magnitude of the average braking force.

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5. A roller coaster climbs a hill slowly and then descends quickly. Explain how the concepts of potential energy, kinetic energy, and energy conservation apply to this motion.

6. Two identical balls are dropped from different heights. Explain why they hit the ground with different speeds, assuming no air resistance.

7. Modern cars are equipped with crumple zones that collapse in a crash. Explain how crumple zones reduce the risk of injury in terms of momentum and impulse.

8. A skier is gliding down a frictionless slope inclined at 30° to the horizontal.
   a) Identify the forces acting on the skier.
   b) Explain why the skier accelerates down the slope even though there is no friction.

9. A pendulum is released from a certain height but does not return to the same height after a swing. Why does this happen, and which forces are responsible for the energy loss?