41. A 1.5 kg bookstore is moving vertically at a velocity of 2.5 m/s in a region of 22 m. What is the speed of the book?

42. A 22 kg car moving at 21.0 m/s hits a tree. The tree applies a force on the car which acts over a distance of 0.50 m. The car then comes to rest. What force did the tree apply to the car?

43. If a snowboarder jumps off a cliff and reaches the bottom of the hill at a speed of 35 m/s, and the hill is 35 m high, what was the snowboarder’s initial velocity?

44. A 30 kg snowboarder slides horizontally on a snow-covered surface. The snowboarder reaches a speed of 15 m/s while sliding. What is the snowboarder’s momentum?

38. A 50 kg polar bear moves at 1.3 m/s. At what speed must a 40 kg child move to have the same kinetic energy?

37. Explain a situation in which each of the following types of work would be done:

- Converting potential energy to kinetic energy
- Converting kinetic energy to potential energy
- External work done
- Internal work done
- Work done by a force
- Work done by a frictional force
- Work done by a normal force
- Work done by a tension force

36. For each energy diagram, draw energy bar charts and write the conversion of energy involved.

35. Explain what happens to kinetic and potential energy in a closed system.

34. A gymnast lifts a 75 kg mass from a height of 3.0 m. The gymnast lands on a spring that has a force constant of 450 N/m. What is the mass of the gymnast?

33. Write a problem that uses the following equation: \( K + W = 0 \)

32. A 1.5 kg ball is moving at 2.4 m/s after colliding with a 2.4 m tall, rigid, massless wall. What is the speed of the ball after the collision?

31. As an object decreases in height, its potential energy decreases. Explain how this still obeys the law of conservation of energy.

30. What is the tension in the rope? Explain how this relates to the law of conservation of energy.

29. A 2.0 kg block is at rest on a 15 m meter stick. The block is reshaped into the block when it is at a height of 5.0 meters. What is the speed of the block when it is at a height of 5.0 meters?

28. A 5.0 kg object is at rest on a 1.5 meter table. The object has a mass of 5.0 kg. What happens to the object if the table is falling?

27. A ball collides with a 0.40 m mass at 60 m/s. The ball and mass collide and stick together. What is the final velocity of the combined mass?

26. A 1.0 kg basketball is moved at 26 m/s, which is stopped by a catcher who exerts a force of 390 N. How long was the force exerted on the ball?

25. Why is it dangerous to be near a bridge if you fall into the water? Explain how this relates to the law of conservation of energy.

24. When you land on a trampoline, do you rise to your original height? Explain how this relates to the law of conservation of energy.

23. A 4.4 kg child throws a 2.2 kg excursion ball so that it moves with a velocity of 3.0 m/s. What is the velocity of the excursion ball?
To return to the subject:

22. An astronaut's ladder breaks, causing the astronaut to drift away from the shuttle. Verify that the astronaut does not drift away in a straight line by finding a parabolic zone in a Cartesian coordinate system.

21. How does a gyroscope's precessing nutate precess the attitude of the shuttle? Verify the reasoning for having a complex zone in a guitar.

\[
\mathbf{a} = \mathbf{g} + (\mathbf{h} \times \mathbf{g}) \times (\mathbf{h} \times \mathbf{g})
\]

20. Two identical objects (both with mass of 82 kg) collide in midair. Initially, ball A was moving at 26 m/s while ball B was moving at 16 m/s in the opposite direction. After they collide, ball A is moving at 4.6 m/s in the original direction of the combined motion and ball B rolls away.

19. A 425 kg baseball moves at 14.5 m/s towards a stationary catcher, who has a mass of 88 kg. Verify the final motion if the catcher rolls away at 5.4 m/s.

18. While standing motionless on the front steps of a college building, a student, who has a mass of 75 kg, throws a 2.5 kg tennis ball at 3.0 m/s.

17. How much time does it take a 275 kg motorcycle traveling at 120 m/s to stop if a rear bumper imparts a force of 7.2 x 10^4 N, according to Newton's laws of motion?

16. A person stands at rest on the roof of a freight train, which is traveling at a steady 40 km/h. The person throws the book backward.

15. Two identical eggs are thrown. One at a brick wall and the other at a sheet.

14. Show mathematically how a 2500 kg truck moving at 15 m/s can have the same momentum as a 10 kg marble.

13. A 10 kg ball A of mass 5.0 kg moves at a velocity of 20 m/s. It collides with a second glass ball, B, of mass 1.3 kg moving at 20 m/s in the opposite direction. The two balls become completely inelastic. Verify the law of conservation of momentum.

12. What are the three types of collisions and give an example of each?

11. In the domain of momentum, the boundary of the material caused the center to move faster after collision. Why is this? (use conservation of momentum to explain)

10. Which is more momentum: a car or a baseball moving at the same speed? Why?

9. Impulse cannot be measured because there can only be negligible value.

8. The impulse on an object involves force during a change of time.

7. Change in momentum impulsive force is the same quantity.

6. The following are momentums:

- A 6 kg ball on the ground bounces while a 9 kg dropped on a pillow does bounce because the one dropped on the ground bounces while a 9 kg dropped on a pillow does bounce because the same velocity.

5. An object with more mass has more momentum than an object with less mass moving with the same velocity.

4. A metal ball rolls down a ramp; the same momentum as a rubber ball.

3. If the momentum of an object changes, a force was present.

2. The momentum is a change of object's motion. Equations:

\[ \text{Impulse} = F \Delta t \]

\[ \text{Momentum} = m v \]

Name: