1. Momentum = ***mass x velocity***.

   p = m x v.

2. A 1000 kg car is moving at 20 m/s. The momentum of the car is:

   20000 kg m/s

3. The momentum of a car is 3.0 x 10^4 kg m/s. The mass of the car is 1500 kg. What is the speed of the car?

   20 m/s

4. The momentum of a car is 5.0 x 10^4 kg m/s. The speed of the car is 25.0 m/s. What is the mass of the car?

   2000 kg

5. Compared to a car moving at 20 m/s, the same car moving at 80 m/s has
   a. the same momentum.
   b. twice as much momentum.
   c. four times as much momentum.
   d. eight times of the momentum.
   e. sixteen times of the momentum.

6. Compared to a 2-ton truck moving at 20 m/s, a 1-ton car moving at 80 m/s has
   a. the same momentum.
   b. twice as much momentum.
   c. four times as much momentum.
   d. eight times of the momentum.
   e. sixteen times of the momentum.

7. Impulse = ***Impact force x time.***

   $J = F_{net} \times t.$

8. A ball was hitting by a bat. The impact force is 250 N, and the contact time is 0.2 s. What is the impulse received by the ball?

   50 N s

9. A 1200 kg car was crashed into a wall. The impulse is 4000 N-s and the impact time is 0.5 s. What is the impact force on the car?

   8000 N

10. A 1000 kg car was crashed into a garden and stopped. The impulse is 4000 N-s and the impact force is 2000 N. How long it takes for the car to stop?

    2 s

11. A cannon is fired. Compared to the impulse on the cannon ball, the impulse on the cannon is
    a. twice.
    b. half.
    c. smaller.
    d. larger.
    e. the same.

12. A car stopped by a wall takes 0.2 s. the same car with the same speed stopped by a haystack takes 0.6 s. Compared to the impulse of the wall, the impulse of the haystack is
    a. one ninth.
    b. one third.
    c. the same.
    d. three times.
    e. nine times.

13. Change of Momentum = ***Impulse***

= ***Impact force x time.***

Δp = ***J***

= F_{net} ***x t.***

14. A 40 kg block with velocity 30 m/s was encountering a constant 60 N friction force until the block stopped.
(a) What is the initial momentum of the block?

1200 kg m/s

(b) What is the impulse exerted on the block?

1200 N s

(c) How long will it take for the block to stop?

20 s

15. Assume a 10.0 kg bowling ball moving at 4 m/s bounces off a spring at 1 m/s.
(a) What is its change in velocity of the bowling ball?

5 m/s

(b) What is its change of momentum of the ball?

50 kg m/s

(c) What is the impulse exerted on of the ball?

50 N s

(d) If the interaction with the spring occurs in 0.2 s, calculate the average force the spring exerts on the ball.

250 N

16. Momentum before collision= ***Momentum after collision***

p_{before} = p_{after}

(Elastic) $m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$,

(Inelastic) $m_1v_1 + m_2v_2 = (m_1 + m_2)\,v$.

17. A block with mass 60 kg and velocity 50 m/s moving along a frictionless surface collides with a stationary block with a mass 40 kg. After the elastic collision the first block has a speed 10 m/s.
(a) What is the total momentum of the blocks before the collision?

3000 kg m/s

(b) What is the total momentum of the blocks after the collision?

3000 kg m/s

(c) What is the velocity of the second block after the collision?

60 m/s

18. A toy cart with mass 4 kg and velocity 6 m/s moving along a frictionless track collides with a cart with a mass 6 kg and velocity 2 m/s on the same track. After the collision both carts locked together.
(a) What is the total momentum of the carts before the collision?

36 kg m/s

(b) What is the total momentum of the carts after the collision?

36 kg m/s

(c) What is the velocity of the carts after the collision?

3.6 m/s

19. Work = ***Force x Distance***.

    W = ***F x d.***

20. A 60-kg box rests on a horizontal, frictionless surface. A girl pushes on the box with a force of 15 N 5 meters to the right. Find the work done by the girl.

    75 J

21. A 60 N force has been applied to a 20-kg block and move it 5 m along the direction of the force. How much work has been done to the block?

    300 J

22. How much work is required to lift a 40-kilogram closet to a window whose height is 5 meters from the ground?

    2000 J

23. Power = ***Work / time***

    = ***Force x velocity***

    P = ***W/t.***

    = ***F x v***

24. Calculate the power expended when a 400 N barbell is lifted 2.0 m in 5 s.

    160 W

25. A 400N force is applied to an object. If the object travels 20 m in 4 s, calculate the power expended on the object.

    2000 W

26. An elevator must lift 600 kg a distance of 20 m at a velocity of 5 m/s. What is the average power the elevator exerts during this trip?

    30000 W

27. Potential Energy = ***Mass x Acc. due to gravity x height***.

    PE = ***m x g x h***

28. A 50-kg box was lifted from ground level to the attic 8.0 m above. What is the change in potential energy?

    4000 J

29. A box has a mass of 8.0 kg. The box is lifted from the garage floor and placed on a shelf. If the box gains 320 J of Potential Energy (PE), how high is the shelf?

    4 m

30. A man climbs on to a wall that is 5.0 m high and gains 4500 J of potential energy. What is the mass of the man?

    90 kg

31. Spring Force = ***Spring constant (k) x Stretch (x).***

    Spring Potential Energy

    = ***½ x Spring constant (k) x Stretch square (x^2).***

    PE_s = ***½ x k x x^2.***

32. A spring with a constant of 60 N/m is compressed 0.5 m when pressed. (a) What's the spring force? (b) How much energy does the spring now store?

    (a) 30 J
    (b) 7.5 J

33. A spring has a potential energy of 72.0 J and a constant of 180.0 N/m. How far has it been stretched?

0.89 m

34. A spring has a potential energy of 72.0 J and has been stretched 1.2 m. What is the spring constant of the spring?

100 N/m

35. Kinetic Energy

= ***½ x mass x velocity square.***

KE = ***½ x m x v^2.***

36. A 5.0 kg car is rolling 4.0 m/s. How much kinetic energy does it have?

40 J

37. Determine the kinetic energy of a 500-kg roller coaster car that is moving with a speed of 20 m/s.

100000 J

38. A 50 kg cart has a kinetic energy of 32000 J, and then what is the speed of the cart?

35.8 m/s

39. (Work-Energy Theorem)
Work = ***Change of Energy***.

W = ***ΔE.***

40. A skater of mass 50 kg has an initial velocity of 6 m/s. He slides on ice where the frictional force is 36 N and was stopped eventually.
(a) What's the change of kinetic energy of the skater?

900 J

(b) How much work has been done to the skater?

900 J

(c) How far will the skater slide before he stops?

25 m

41. (Conservation of Energy)

Total Energy at point A = ***Total Energy at point B***

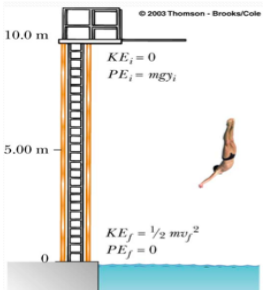
TE_A = TE_B

$PE_A + KE_A$ = ***$PE_B + KE_B$***

$mgh_A + ½\ mv_A^2$ = ***$mgh_B + ½\ mv_B^2$***

42. A diver of mass 50 kg drops from a board 10.0 m above the water surface.
(a) Find his speed 5.00 m above the water surface.

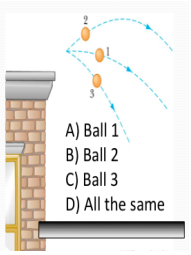
10 m/s



(b) Find his speed right above the water surface.

14.1 m/s

43. Three identical balls are thrown from the top of a building with the same initial speed. Initially,
Ball 1 moves horizontally
Ball 2 moves upward.
Ball 3 moves downward.
Neglecting air resistance, which ball has the fastest speed when it hits the ground?



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