IX Physics 3.NLM

Exercise Solutions

LEVEL-1

1. Momentum is a vector quantity.

2. 9.8 N = 1kgf = 1kgwt.

3. $5g \times 250$ m/s = $5 \times 1000 \times v$ m/s
   v= 0.25m/s

4. Cannon after firing recoils due to Newton's 3rd law of motion.

5. F= 2×10^5 N, m = 4×10^4 kg
   a = $2 \times 10^5 / 4 \times 10^4$. = 5
   v = u + at
   v = 50 m/s

6. 60 gm × 50 m/s = M × 2m/s
   M = 1500gm = 1.5kg

7. M father : M Son
   60: 30 = 2:1

8. Newton's 2nd law of motion gives us a measure of Force.(F=ma)

9. According to the law of inertia of motion a body will continue moving with constant velocity until unless any force is acting on it. When a bus is moving straight the passengers inside are also moving straight but when suddenly the bus turns left passengers still continue to move straight because no force is acting on passengers so they will move with the same magnitude and direction i.e. outwards when the bus turns.

10. F= mv/t = (0.15kg × 20)/0.1 = 30N

11. ma = (1/60)m × a1
    a1= 60a
    v= u + a1t
    2400 = 60a
    a= 40 m/s^2

12. Galileo's law of inertia is also known as Newton's first law of motion.

13 F= mv/t
   t= 500/ 10 × 50m/s = 1 sec.

14. Reduce impulsive force.

15. Vector sum of action and reaction is equal to zero.

16. m (V2-V1) = 2000 × 18 × 5/18 = 10000Kg.m/s

17. All the systems have the same momentum.

LEVEL-2

1. $v = \sqrt{2gh}$
   $v = \sqrt{2 \times 10 \times 0.8} = 4 m/s$
   Momentum $= 10 \times 4 = 40 kg.m/s$

2. $v^2 = u^2 + 2as$, 60 km/h = 50/3 m/s
   $= a = v^2/2s$
   $= a = 2500/9 \times 2 \times 20 = 250/36 \ m/s^2$
   When speed is = 120km/h = 100/3 m/s
   $s = (10000/9) \times (36/2 \times 250) = 20 \times 4 = 80m$

3. $F = vm/t$
   $Ma = vm/t$
   $a = 5/2 = 2.5 \ m/s2$

4. $a = v^2/2s = 10 \times 10 / 2 \times 25 = -2 \ m/s^2$
   $F = 25 \times 100 \times -2 = -5000N$

5. $m1v1 = m2v2$
   $D \times 4/3 \pi r^3 \times v = D \times 4/3 \pi (2r)^3 \times v2$
   $v2 = v/8$

6. Acceleration = zero

7. $v = u + at$
   $a = 300/0.003 = 100000$
   $F = 0.01 \times 100000 = 1000N$

8. $F = mvn$

9. $Favg = m(Vf - Vi)/ t$
   $Favg = 500 \times 0.001 \times 4/ 0.001 \ sec = 2000N$
   $10- F = m(Vf - Vi)/ t$
   $F = 10 \times (10 + 2)/ 4 = -30 \ N$ (opposite direction)

Subjective Solutions

1. This is due to Newton's first law of motion. First law of motion is called the law of inertia. This law states that an object will be at rest and an object will be in motion unless an external force applied to it. Due to this reason, a person getting down from the moving bus falls in the direction of motion of the bus.

2. On shaking or giving jerks to the branches of a tree, the fruits fall down. When branches are shaken in one direction, the fruits and leaves due to inertia remain at the original position due to inertia of rest. This causes the breakup of the stalk and they fall down.

3. Combined momentum is zero because same mass and same speed and also moving away from each other (m1v1=m2v2)

4. $m_1v_1=m_2v_2$
$D \times l^3 \times v_1 = K$ unit
$m_2v_2 = D \times (2l)^3 \times v_1 = 8K$ unit

5. Velocity is constant acceleration is zero so force is also zero.

6. The slope of the VT graph gives us acceleration.
$M_1 \times \tan 45 : M_2 \times \tan 30$
$1: 2 \times 1/\sqrt{3}$
$\sqrt{3} : 2$

7. True, $F=ma$
$8- v^2 = u^2 + 2as$
$a= v^2/2s$
$F=ma$
When velocity and displacement is double
$a_1= 4v^2/2\times 2s$
$a_1 = 2a$
New force $= ma_1= 2ma = 2F$

9. Ref. Q-8 (force will also change)

10. When mass is double then applying force is also double.

11. $F = m\,a$
$F = (0.1 \times 840 \times 840)/2 \times 1.5$
$F = 23520N$

12. $f = ma$
$f = d \times 4/3\ \pi r^3 \times a$
$r = (3f/4\ \pi da)^{1/3}$

13. Force exerted = - kux N

14. Momentum

15. Inertia is the reason that people in cars need to wear seat belts. A moving car has inertia, and so do the riders inside it. When the driver applies the brakes, an unbalanced force is applied to the car. Normally, the bottom of the seat applies an unbalanced force-friction-which slows the riders down as the car slows.

17. 1-C, 2-A, 3-B (Ref. Newton's law of motion)

18. It's difficult to walk on ice because there's very little friction between the bottoms of your shoes and the ice. Friction is a force that opposes motion.
Shoes and boots with a traction tread that grip the ice provide more friction and make it easier to walk on ice.

19. Newton's first law.

20. Ref. page No. 95

21. True, conservation of momentum.

22. Spray the aerosol in the direction opposite to the spaceship. You will get some velocity in the direction opposite to the direction of spraying. So you will move towards the spaceship and can reach there. Here, the law of conservation of momentum is used.

23. $m_1v_1 = m_2v_2$
$1000 \times v_1 = 1 \times 1$
$v_1 = 1/1000$ m/s.