Chapter 9

ANSWERS

Multiple Choice Questions

1. (c) **2.** (b) **3.** (b) **4.** (c)

5. (a) **6.** (b) **7.** (c) **8.** (b)

Short Answer Questions

9. **Steel.** As the mass is a measure of inertia, the ball of same shape and size, having more mass than other balls will have highest inertia. Since steel has greatest density and greatest mass, therefore, it has highest inertia.

10. Yes. the balls will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest but due to inertia the balls try to remain in motion, therefore, they begin to roll. Since the masses of the balls are not the same, therefore, the inertial forces are not same on both the balls. Thus, the balls will move with different speeds.

11. From the light rifle, according to law of conservation of momentum or explanation by Newton's laws of motion.

12. The force applied by the horse balances the force of friction.

13. Law of conservation of momentum is applicable to isolated system (no external force is applied). In this case, the change in velocity is due to the gravitational force of earth.

14. Acceleration $= a = \frac{v - u}{t} = -\frac{80}{8}\,\text{ms}^{-2} = -10\,\text{ms}^{-2}$

Force $= ma = \frac{50}{1000} \times 10 = 0.5\text{N}$

15. Calculate using $F = ma$

Acceleration becomes one-fourth of the original.

16. Separation between them will increase. Initially the momentum of both of them are zero as they are at rest. In order to conserve the momentum the one who throws the ball would move backward. The second will experience a net force after catching the ball and therefore will move backwards that is in the direction of the force.

17. The working of the rotation of sprinkler is based on third law of motion. As the water comes out of the nozzle of the sprinkler, an equal and opposite reaction force comes into play. So the sprinkler starts rotating.

Long Answer Questions

18. (i) $m = 10\ g = \frac{10}{1000}\ kg$

$u = 10^3\ m/s$

$v = 0$

$s = \frac{5}{100}\ m$

$v^2 - u^2 = 2\ a\ s$

$0 - (10^3)^2 = 2.a.\ \frac{5}{100}$

$a = \frac{-1000 \times 1000}{2.5} \times 10$

$= -\ 10^7\ m\ s^{-2}$

$F = m.a = 10^5\ N$

(ii) $v = u + a\ t$

$0 = 10^3 - 10^7 t$

$10^7 t = 10^3$

$t = \frac{10^3}{10^7}$

$= 10^{-4}\ s$

19. $F = m\ a = kg\ m\ s^{-2}$

This unit is also called newton. Its symbol is N.

$m_1 = \frac{F}{a_1} = \frac{5}{8}\ kg,$

$m_2 = \frac{F}{a_2} = \frac{5}{24}\ kg,$

$M = \frac{5}{8} + \frac{5}{24}\ kg = \frac{5}{6}\ kg$

Acceleration produced in M,

$a = \frac{F}{M} = \frac{5}{5/6} = 6\ m\ s^{-2}$

20. Momentum = mass × velocity

SI unit of momentum is kg m s^{-1}

Force = Rate of change in momentum