



Octahedral classes, kharadi
2nd floor, yashwant plaza, near bank of India,

Class 09 - Science

Nlm 2

Maximum Marks: 105

Time Allowed: 1 hour and 30 minutes

Section A

1. Why do the driver and the person seated in front seat need a seat belt? **3**
2. A motorcar of mass 1200 kg is moving along a straight line with a uniform **3**
velocity of 90 km/h. Its velocity is slowed down to 18 km h⁻¹ in 4 s by an
unbalanced external force. Calculate the acceleration and change in
momentum. Also, calculate the magnitude of the force required.
3. A cracker of mass 100 g explodes into two pieces of equal mass. Show that **3**
these two pieces of the cracker fly in the opposite direction?
4. Two objects of masses 100 g and 200 g are moving along the same line and **3**
direction with velocities of 2 ms⁻¹ and 1 ms⁻¹ respectively. They collide and
after the collision, the first object moves at a velocity of 1.67 ms⁻¹. Determine
the velocity of the second object.
5. Why does a boat tend to leave the shore, when passengers are alighting from **3**
it?
6. Describe balanced forces with the help of two examples. **3**
7. An iron sphere of mass 1 kg is dropped from a height of 10 m. If the **3**
acceleration of sphere is 9.8 ms⁻², calculate the momentum transferred to the
ground by the ball.
8. Which would require a greater force, accelerating a 2 kg mass at 5 ms⁻² or a 4 **3**
kg mass at 2 ms⁻²?
9. State Newton's third law of motion and how does it explain the walking of **3**
man on the ground?
10. A car of mass 1000 kg moving with a velocity of 45 km h⁻¹ collides with a tree **3**
and comes to rest in 5s. What will be the force exerted by the car on the tree?
11. A man throws a ball of mass 0.4 kg vertically upwards with a velocity of 10 **3**
m/s. What will be its initial momentum? What would be its momentum at the
highest point of its reach?

12. Which of the following has more inertia: 3
 - a. a rubber ball and a stone of the same size?
 - b. a bicycle and a train?
 - c. a five-rupee coin and a one-rupee coin?
13. An automobile vehicle has a mass of 1500 kg. What must be the force between the vehicle and road if the vehicle is to be stopped with the negative acceleration of 1.7 ms^{-2} ? 3
14. When a carpet is beaten with a stick, dust comes out of it. Explain. 3
15. An object of mass 1 kg travelling in a straight line with a velocity of 10 ms^{-1} collides with and sticks to a stationary wooden block of mass 5 kg. Then they both move off together in the same straight line. Calculate the total momentum just before the impact and just after the impact. Also, calculate the velocity of the combined object. 3
16. Explain, why is it difficult for a fireman to hold a hose, which ejects large amounts of water at a high speed. 3
17. A body of mass 500 g is at rest on a frictionless surface. Calculate the distance travelled by it in 10 s when acted upon by a force of 10^{-2} N . 3
18. A boy of mass 40 kg jumps with a horizontal velocity of 5 ms^{-1} onto a stationary cart with frictionless wheels. The mass of the cart is 3 kg. What is his velocity as the cart starts moving? Assume that there is no external unbalanced force working in horizontal direction. 3
19. From the rifle of mass 4 kg, a bullet of mass 50 g is fired with an initial velocity of 35 ms^{-1} . Calculate the initial recoil velocity of the rifle. 3
20. Why does an athlete run a certain distance before taking a leap? 3
21. Why do you fall in the forward direction when a moving bus brakes to a stop and fall backward when it accelerates from rest? 3
22. A hockey ball of mass 200 g travelling at 10 ms^{-1} is struck by a hockey stick so as to return it along its original path with a velocity at 5 ms^{-1} . Calculate the change of momentum occurred in the motion of the hockey ball by the force applied by the hockey stick. 3
23. Give a few examples of Newton's third law of motion. 3
24. Explain why the sole of a shoe is worn out. 3
25. A bullet fired against a glass window pane makes a hole in it, and the glass pane is not cracked. But on the other hand, when a stone strikes the same 3

glass pane, it gets smashed. Why is it so?

26. Why is it difficult to balance our body, when we accidentally step on a peel of banana? 3
27. A bullet of mass 10 g travelling horizontally with a velocity of 150 ms^{-1} strikes a stationary wooden block and comes to rest in 0.03 s. Calculate a distance of penetration of the bullet into the block. Also calculate the magnitude of the force exerted by the wooden block on the bullet. 3
28. Explain why some of the leaves may fall from a tree, if we vigorously shake its branch. 3
29. On a certain planet, a small stone tossed up at 15 m/s vertically upwards takes 7.5 s to return to the ground. What is the acceleration due to gravity on the planet? 3
30. Describe our walking in terms of Newton's third law of motion. 3
31. Explain why some of the leaves may get detached from a tree if we vigorously shake its branch. 3
32. A bullet of mass 10 g strikes a sand bag with a velocity of 10^3 ms^{-1} and gets embedded after travelling 5 cm. Calculate
(i) the resistive force exerted by the sand bag on the bullet.
(ii) the time taken by the bullet to come to rest. 3
33. A truck starts from rest and rolls down a hill with constant acceleration. It travels a distance of 400 metres in 20 s. Find its acceleration. Find the force acting on it, if its mass is 7 metric tons. 3
34. A stone of 1 kg is thrown with a velocity of 20 ms^{-1} across the frozen surface of the lake and comes to rest after travelling a distance of 50 m. What is the force of friction between the stone and the ice? 3
35. A bullet of mass 20 g is horizontally fired with a horizontal velocity 150 ms^{-1} from a pistol of mass 2 kg. What is the recoil velocity of the pistol? 3

