

[QUESTION 1] - If a set of multiple forces acts on a heavy wooden box resting on a rough floor and the box does not move at all, the net resultant force acting on the box is:

A) Infinite B) Equal to the applied force C) Zero D) Equal to the weight of the box

[QUESTION 2] - A briefcase is placed on a table. Identify the forces acting on it and explain why the briefcase remains completely stationary despite these forces acting on it.

[QUESTION 3] - State the fundamental definition of an unbalanced force. What specific change does an unbalanced force produce in a body's state of motion?

[QUESTION 4] - A rider on a horseback falls forward when the galloping horse suddenly stops dead. This dangerous event happens due to:

A) Inertia of rest of the horse B) Inertia of motion of the rider
C) Inertia of direction of the rider D) Centripetal force acting on the horse

[QUESTION 5] - When a hanging thick woolen carpet is beaten hard with a heavy stick, dust particles immediately start falling out of it. Explain this phenomenon using the concept of inertia.

[QUESTION 6] - Define the term 'Inertia'. Name the physical quantity of a body that serves as a direct quantitative measure of its inertia.

[QUESTION 7] - Two bodies of masses 2 kg and 10 kg possess exactly equal linear momentum. Which body will move with a higher velocity?

A) The 10 kg body B) The 2 kg body
C) Both will move with the same velocity D) Data is insufficient to determine

[QUESTION 8] - A cricket fielder pulls his hands backward while catching a fast-moving cricket ball. Explain how this action saves his hands from severe injury using the concept of momentum.

[QUESTION 9] - Define linear momentum and state its standard SI unit. Is momentum a scalar or a vector physical quantity?

[QUESTION 10] - A constant force of 20 N acts on a body of mass 5 kg. The acceleration produced in the body is:

- A) 100 m/s² B) 4 m/s² C) 0.25 m/s² D) 15 m/s²

[QUESTION 11] - Derive the mathematical formula $F = ma$ from Newton's Second Law of Motion, assuming the mass of the moving body remains completely constant.

[QUESTION 12] - State Newton's Second Law of Motion in words. Define 1 Newton unit of force based on this law.

[QUESTION 13] - An action force and its corresponding reaction force always act on:

- A) The same body in the same direction B) Different bodies in opposite directions
C) The same body in opposite directions D) Different bodies in the same direction

[QUESTION 14] - Explain how a sailor manages to jump out of a rowing boat onto the riverbank, and why the boat moves backward into the water during this process.

[QUESTION 15] - State Newton's Third Law of Motion. Give one common everyday application that functions based entirely on this law.

[QUESTION 16] - A bullet of mass 20 g is fired horizontally with a velocity of 150 m/s from a pistol of mass 2 kg. The recoil velocity of the pistol is:

- A) -1.5 m/s B) -15 m/s C) 1.5 m/s D) 0.15 m/s

[QUESTION 17] - Prove the Law of Conservation of Momentum for a direct collinear collision between two spheres A and B moving in an isolated system without external forces.

[QUESTION 18] - State the Law of Conservation of Momentum. Write down its general mathematical formula representing the state before and after a collision.