Short Answer Type Questions – I

[2 marks]

Q. 1. What is the ratio of SI units to CGS units of momentum? How do you measure the effect of an impulsive force on the body?

Ans. A ratio of SI units to CGS units of momentum is (kg m/s)/(g cm/s) *i.e.,* 10^5.
The effect of an impulse force on the body is measured only in terms of impulse.

Q. 2. On which factors does friction depend?

Ans. The force of friction is directly proportional to the weight of the body sliding over the surface. The force of friction also depends on the nature of the surfaces in contact.

Q. 3. 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 glass pane, it gets smashed. Why is it so?

Ans. When the bullet strikes the glass pane, the part of the glass pane which comes in contact with the bullet immediately shares the large velocity of bullet and makes a hole, while the remaining part of the glass remains at rest and is therefore not smashed due to inertia of rest.

But when a slow moving stone strikes the same glass pane, the various parts of the glass pane gets enough time to share the velocity of the stone, and the glass is smashed.

Q. 4. Why can a small mass such as a bullet kill a person when fired from a gun?

Ans. It is so because even if the mass of the bullet is small, it moves out of the gun with a very high velocity, due to which the momentum produced is high ($p = mu$). This high momentum of the bullet kills a person.

Q. 5. Why does a boat tend to leave the shore, when passengers are alighting from it?

Ans. When the passengers alight from the boat, they push the boat in backward direction. As a result, the tendency to slip back into water. This difficulty is usually overcome by the boatman by tying the boat to some rigid support.

Q. 6. Describe our walking in terms of Newton's third law of motion.

Ans. When we walk on the ground or road, our foot pushes the ground backward (action) and the ground pushes our foot forward (reaction). Thus, the forward reaction exerted by the ground on our foot makes us walk forward.

Q. 7. There are three solids made up of aluminium, steel and wood, of the same shape and same volume. Which of them would have highest inertia?

Ans. Steel has the highest inertia. 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.

Q. 8. Why does a cricket player moves his hand backward while catching the ball?

Ans. A fast moving cricket ball has a large momentum. In stopping or catching this ball, its momentum has reduced to be zero. Now, when a cricket player moves back his hands on catching the fast ball, then the time taken to reduce the momentum of ball to zero is increased. Due to more time taken to stop the ball, the rate of change of momentum of ball is decreased and hence a small force is exerted on the hands of player. So, the hands of player do not get hurt.

Q. 9. Two identical bullets are fired one by a light rifle and the other by a heavy rifle with the same force. Which rifle will hurt the shoulder more and why?

Ans. According to conservation of momentum, the rifle recoils with same momentum as that of bullet. As momentum = mass X velocity; so light rifle will recoil with larger velocity and hence, will hurt the shoulder more.

Q. 10. Water sprinkler used for grass lawns begins to rotate as soon as as the water is supplied. Explain the principle on which it works.

Ans. 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.