

NCERT Most Important Questions For Class-9 Science Chapter-8 Force and Laws of Motion

1. Give one point of difference between balanced and unbalanced forces.

Answer

When forces acting on a body from all sides are equal, they cancel effect of each other and are known as balanced forces. On the other hand, when forces acting on a body are not equal/do not cancel each other are called unbalanced forces.

2. Mass of a body is doubled. How does its acceleration change under a given force?

Answer

Acceleration becomes half.

3. Mention any two kinds of changes that can be brought about in a body by force.

Answer

Change in speed/change of direction/change of shape.

4. State the SI unit of pressure. Mention the unit which we use to measure pressure exerted by a gas. What do you understand by normal atmospheric pressure?

Answer

Pascal Atmosphere (atm)

Atmospheric pressure at sea level = 1 atm

5. Define SI unit of force. A force of 2N acting on a body changes its velocity uniformly from 2 m/s to 5m/s in 10s. Calculate the mass of the body.

Answer

One Newton is the force that produces an acceleration of 1 m/s^{-2} on a body of mass 1 kg.

Here, $F = 2\text{N}$, $u = 2\text{m/s}$, $v = 5\text{m/s}$, $t = 10\text{s}$, $m = ?$

$$a = \frac{v - u}{t}$$

$$= \frac{5 - 2}{10}$$

$$= 0.3 \text{ m/s}^2$$

$$m = \frac{F}{a} = \frac{2}{0.3} \times 10 = \frac{20}{3} = 6.67 \text{ kg}$$

6. Derive Newton's first law of motion from the mathematical expression of the second law of motion.

Answer

Newton's first law states that a body stays at rest if it is at rest and moves with a constant velocity if a net force is applied on it. Newton's second law states that the net force applied on the body is equal to the rate of change in its momentum.

$$F = ma$$

$$F = m(v - u)/t$$

$$Ft = mv - mu$$

That is, when $F = 0$, $v = u$ for whatever time, t is taken. This means that the object will continue moving with uniform velocity, u throughout the time, t . If u is zero then v will also be zero, i.e., object will remain at rest.

7. Why is it easier to stop a tennis ball in comparison to a cricket ball moving with the same speed?

Answer

Tennis ball is lighter (less mass) than a cricket ball. Tennis ball moving with same speed has less momentum (mass \times velocity) than a cricket ball. It is easier to stop tennis ball having less momentum.

8.

What type of force is acting in the cases given above ?

Answer

(i) Accelerating unbalanced force.

(ii) No force.

(iii) Retarding unbalanced force.

9. What are the effects of the following on inertia of a body?

- (i) If force is doubled**
- (ii) If density is halved**
- (iii) If volume is reduced to one third.**

Answer

- (i) No effect.
- (ii) No effect.
- (iii) No effect.

Because inertia depends on mass of body only

10. What is meant by 'inertia'? What are different types of inertia? Give two examples in each case.

Answer

Inability of the body to change by itself its state of rest or state of uniform motion is called inertia.

Types: Inertia of rest: e.g. :

- (i) When a card is flicked with a finger the coin placed over it falls in the tumbler.
- (ii) Only the carom coin at the bottom of a pile is removed when a fast moving carom striker hits it.

Inertia of motion: e.g. :

- (i) When a moving bus stops suddenly, the luggage might slide towards the front side of the bus and fall.
- (ii) We tend to fall forward when a bus suddenly stops.

11.(i) Define momentum. Write its S.I. unit.

(ii) How much momentum will an object of mass 10 kg transfer to the floor, if it falls from a height of 5 m ($g = 10 \text{ m/s}^2$).

(iii) Explain how a karate player can break a pile of tiles with a single blow of his hand.

Answer

(i) Momentum is the product of mass and velocity.

SI unit of momentum is – kg m/s.

$$(ii) v^2 = u^2 + 2gh$$

$$v^2 = (0)^2 + 2(10)(5)$$

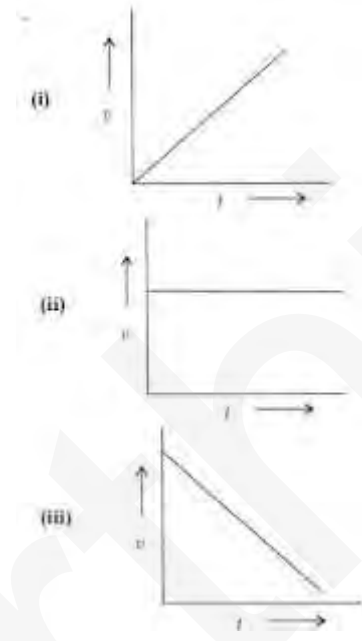
$$v^2 = 100$$

$$\therefore v = 10 \text{ m/s}$$

(ii) Momentum = $m \times v$

$$= 10 \times 10 = 100 \text{ kg m/s}$$

(iii) The karate player strikes the pile of tiles with his hand very fast. In doing so, the large



momentum of fast moving hand is reduced to zero in a very short time. This exerts a very large force on the pile of tiles which is sufficient to break them.

12.

(i) Two objects of masses 100 g and 200 g are moving along the same line and direction with velocities of 2 m/s and 1 m/s respectively. They collide and after the collision, the first object moves at a velocity of 1.67 m/s. Determine the velocity of the second object.

(ii) If a man jumps out from a boat, the boat moves backward. Why?

Answer

Let

$$(i) m_1 = 100 = 0.1 \text{ kg}$$

$$m_2 = 200 \text{ g} = 0.2 \text{ kg}$$

$$u_1 = 2 \text{ m/s}$$

$$u_2 = 1 \text{ m/s}$$

$$v_1 = 1.67 \text{ m/s}$$

According to law of conservation of momentum

$$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$$

$$0.1 \times 2 + 0.2 \times 1 = 0.1 \times 1.67 + 0.2 \times v_2$$

$$0.2 + 0.2 = 0.167 + 0.2 v_2$$

$$v_2 = 1.165 \text{ m/s}$$

(ii) It is based on Newton's third law of motion. As boat is floating and is not fixed, so it moves backward.

13. Explain why some of the leaves may get detached from a tree if we vigorously shake its branch.

Answer

Some leaves of a tree get detached when we shake its branches vigorously because branches come in motion while the leaves tend to remain at rest due to inertia of rest.

14. Why do you fall in the forward direction when a moving bus brakes to a stop and fall backwards when it accelerates from rest?

Answer

In a moving bus, a passenger moves with the bus due to inertia of motion. As the driver applies brakes, the bus comes to rest. But, the passenger tries to maintain inertia of motion. As a result, a forward force is exerted on him.

Similarly, the passenger tends to fall backwards when the bus accelerates from rest because when the bus accelerates, the inertia of rest of the passenger tends to oppose the forward motion of the bus. Hence, the passenger tends to fall backwards when the bus accelerates forward.