

Board – CBSE

Class – 9th

Topic – Forces and laws of motion

1. A stone of 1 kg is thrown with a velocity of 20 m s^{-1} across the frozen surface of a lake and comes to rest after travelling a distance of 50 m. What is the force of friction between the stone and the ice?
2. What is the momentum of a body of mass 200 g moving with a velocity of 15 m/s.?
3. A body of mass 5 Kg starts and rolls down 32 m of an inclined plane in 4s. Find the force acting on the body?
4. Derive the law of conservation of momentum from Newton's third law?
5. From a rifle of mass 4 kg, a bullet of mass 50 g is fired with an initial velocity of 35 m s^{-1} . Calculate the initial recoil velocity of the rifle.
6. Two objects, each of mass 1.5 kg, are moving in the same straight line but in opposite directions. The velocity of each object is 2.5 m s^{-1} before the collision during which they stick together. What will be the velocity of the combined object after collision?
7. A force of 15 N acts for 5s on a body of mass 5 Kg which is initially at rest. Calculate.
 - a) final velocity of the body
 - b) the displacement of the body
8. A scooter is moving with a velocity of 20 m/s when brakes are applied. The mass of the scooter and the rider is 180Kg. the constant force applied by the brakes is 500 N.
 - a) How long should the brakes be applied to make the scooter comes to a halt?
 - b) How far does the scooter travel before it comes to rest?
9. A bullet travelling at 360 m/s; strikes a block of soft wood. The mass of the bullet is 2.0g. The bullet comes to rest after penetrating 10 cm into the wood?
 - a) Find the average deceleration force exerted by the wood.
 - b) Find the time taken by the bullet to come to rest.
10. A certain particle has a weight of 30 N at a place where the acceleration due to gravity is 9.8 m/s^2
 - a) What are its mass and weight at a place where acceleration due to gravity is 3.5 m/s^2
 - b) What will be its mass & weight at a place where acceleration due to gravity is zero.
11. Two objects of masses 100 g and 200 g are moving along the same line and direction with velocities of 2 m s^{-1} and 1 m s^{-1} , respectively. They collide and after the collision, the first object moves at a velocity of 1.67 m s^{-1} . Determine the velocity of the second object.

12. A truck starts from rest and rolls down a hill with a constant acceleration. It travels a distance of 400 m in 20 s. Find its acceleration. Find the force acting on it if its mass is 7 metric tonnes
(Hint: 1 metric tonne = 1000 kg.)
13. A stone is dropped from a 100m high tower. How long does it take to fall?
a) the first 50m and
b) the second 50m.
14. A body of mass 10Kg starts from rest and rolls down an inclined plane. It rolls down 10m in 2S?
 $t = 4.47\text{sec}$
a) What is the acceleration attained by the body?
b) What is the velocity of the body at 2S?
c) What is the force acting on the body?
15. A body of mass 2Kg is at rest at the origin of a frame of reference. A force of 5 N acts on it at $t = 0$. The force acts for 4S and then stops.
a) What is the acceleration produced by the force on the body?
b) What is the velocity at $t = 4\text{s}$?
c) Draw the $v - t$ graph for the period $t = 0$ to $t = 6\text{S}$.
d) Find the distance travelled in 6S.