Lakhmir Singh Solutions Class 9 Physics

Chapter 2: Force And Laws of Motion

Question 1:

What name is given to the product of mass and velocity of a body?

ANSWER:

The product of mass and velocity of a body is called momentum.

Question 2:

Name the physical quantity which is considered to be a measure of the quantity of motion of a body.

ANSWER:

Momentum is the physical quantity which is considered to be a measure of the quantity of motion of a body.

Question 3:

What is the SI unit of momentum?

ANSWER:

The SI unit of momentum is kilogram meter per second (kg.m/s).

Question 4:

State whether momentum is scalar or vector.

ANSWER:

Momentum is a vector quantity.

Aakash Institute

Question 5:

What is the total momentum of the bullet and the gun before firing?

ANSWER:

The total momentum of the bullet and gun before it is fired is zero.

Question 6:

Name the physical quantity whose unit is kg.m/s.

ANSWER:

Momentum is the physical quantity whose unit is kg.m/s.

Question 7:

What will be the momentum of a body of mass '*m*' which is moving with a velocity '*v*'?

ANSWER:

Momentum of a body of mass 'm' moving with a velocity 'v' = $m \times v$

Question 8:

What is the usual name of the forces which cannot produce motion in a body but only change its shape?

ANSWER:

Balanced forces are the forces which cannot produce motion in a body but can change its shape.

Question 9:

Aakash Institute

Name the unbalanced force which slow down a moving bicycle when we stop pedalling it.

ANSWER:

Friction is the unbalanced force which slows down a moving bicycle when we stop pedalling it.

Question 10:

State whether the following statement is true or false :
Unbalanced forces acting on a body change its shape.

ANSWER:

False, unbalanced forces acting on a body changes its speed or its direction of motion, but does not change its shape.

Question 11:

When a ball is dropped from a height, its speed increases gradually. Name the force which causes this change in speed.

ANSWER:

Gravity is the force which causes this change in the speed of the ball.

Question 12:

Name the property of bodies (or objects) to resist a change in their state of rest or of motion.

ANSWER:

The property of bodies to resist a change in their state of rest or of motion is called inertia.

Question 13:

What is the other name of Newton's first law of motion?

Aakash Institute

ANSWER:

'Galileo's law of inertia' is the other name for Newton's first law of motion.

Question 14:

The mass of object A is 6 kg whereas that of another object B is 34 kg. Which of the two objects, A or B, has more inertia?

ANSWER:

Object B has more inertia because heavier objects have greater inertia than lighter objects.

Question 15:

Name the scientist who gave the laws of motion.

ANSWER:

Sir Isaac Newton gave the laws of motion.

Question 16:

State whether force is a scalar or a vector quantity.

ANSWER:

Force is a vector quantity.

Question 17:

With which physical quantity should the speed of a running bull be multiplied so as to obtain its momentum?

ANSWER:

The speed of a running bull should be multiplied by the mass (of the bull) so as to obtain its momentum.

Aakash Institute

Question 18:

Fill in the following blanks with suitable words :
(a) _____ is a measure of the inertia of a body.
(b) When a running car stops suddenly, the passengers are jerked _____.
(c) When a stationary car starts suddenly, the passengers are jerked _____.
(d) Newton's first law of motion is also called Galileo's law of _____.
(e) If there were no unbalanced force of _____ and no _____ resistance, a moving bicycle would go on moving forever.

ANSWER:

(a) Mass is a measure of the inertia of a body.
(b) When a running car stops suddenly, the passengers are jerked forward.
(c) When a stationary car starts suddenly, the passengers are jerked backward
(d) Newton's first law of motion is also called Galileo's law of inertia.
(e) If there were no unbalanced force of friction and no air resistance, a moving bicycle would go on moving forever.

Question 19:

Explain why, it is easier to stop a tennis ball than a cricket ball moving with the same speed.

ANSWER:

It is easier to stop a tennis ball than a cricket ball moving with the same speed because it has less momentum than the cricket ball.

Question 20:

Explain the meaning of the following equation :
$p = m \times v$
where symbols have their usual meanings.

ANSWER:

The given equation describes the momentum of a body as the product of its mass and velocity.
$P = m \times v$

Aakash Institute

where, P = momentum
m = mass of the body
v = velocity of the body

Question 21:

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

ANSWER:

A Karate player can break a pile of tiles with a single blow of his hand. This is because he strikes the piles of tiles with very fast motion of his hand. In doing so, large momentum of the fast moving hand is almost 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 apart.

Question 22:

Calculate the momentum of a toy car of mass 200 g moving with a speed of 5 m/s.

ANSWER:

We know that:
Momentum = mass × velocity
$= m \times v$
Here, mass, m = 200 g
or m = 0.2 kg
And, velocity, v = 5 m/s
Putting these values in the above formula, we get:
Momentum = 0.2 × 5 kg.m/s = 1 kg.m/s.

Question 23:

What is the change in momentum of a car weighing 1500 kg when its speed increases from 36 km/h to 72 km/h uniformly?

ANSWER:

We know that:
Momentum = mass × velocity

Aakash Institute

$= m \times v$

Here, mass, m = 1500 kg

And, velocity, v = 36 km/h

$=36\times\frac{1000}{3600}=36\times\frac{1000}{3600}=36\times\frac{10}{36}=10$ m/s=36×10003600=36×10003600=36×1036=10 m/s

Putting these values in the above formula, we get:

Initial Momentum = 1500 × 10 kg.m/s = 15000 kg.m/s

Also, we know that:

Momentum = mass × velocity

$= m \times v$

Here, mass, m = 1500 kg

And, velocity, v = 72 km/h

$=72\times\frac{1000}{3600}=72\times\frac{1000}{3600}=\frac{72}{2}\times\frac{10}{36}=20$ m/s=72×10003600=72×10003600=722×1036=20 m/s

Putting these values in the above formula, we get:

Final Momentum = 1500 × 20 kg.m/s = 30000 kg.m/s.

The change in momentum of a car weighing 1500 kg when its speed increases from 36 km/h to 72 km/h = 30000 kg.m/s − 15000 kg.m/s = 15000 kg.m/s.

Question 24:

A body of mass 25 kg has a momentum of 125 kg.m/s. Calculate the velocity of the body.

ANSWER:

We know that:

Momentum = mass × velocity

$= m \times v$

Here, mass, m = 25 kg

And, momentum = 125 kg.m/s

Putting these values in the above formula, we get:

125 kg.m/s = 25 × velocity

$\Rightarrow \text{Velocity}=\frac{125}{25}\Rightarrow \text{Velocity}=\frac{125}{25}\Rightarrow \text{Velocity}=5$ m/s⇒Velocity=12525⇒Velocity=125525⇒Velocity=5 m/s

Question 25:

Akash Institute

Calculate the momentum of the following :

(a) an elephant of mass 2000 kg moving at 5 m/s
(b) a bullet of mass 0.02 kg moving at 400 m/s

Figure

ANSWER:

(a) We know that:
Momentum = mass × velocity
= $m \times v$
Here, mass, m = 2000 kg
velocity, v = 5 m/s
Putting these values in the above formula, we get:
Momentum = 2000 × 5 kg.m/s = 10000 kg.m/s

(b) We know that:
Momentum = mass × velocity
= $m \times v$
Here, mass, m = 0.02 kg
And, velocity, v = 400 m/s
Putting these values in the above formula, we get:
Momentum = 0.02 × 400 kg.m/s = 8 kg.m/s

Question 26:

Which of the two, balanced forces or unbalanced forces, can change the shape of an object? Give an example to illustrate your answer.

ANSWER:

Balanced forces can change the shape of an object.
For example, on pressing a rubber ball between our hands, the shape of the rubber ball changes from spherical to oblong.

Question 27:

Aakash Institute

Describe the term 'inertia' with respect to motion.

ANSWER:

The tendency of a body to remain at rest (stationary) or in uniform motion is called inertia. It is the property of a body to resist a change in its state of motion or of rest.

Question 28:

State Newton's first law of motion. Give two examples to illustrate Newton's first law of motion.

ANSWER:

According to Newton’s first law of motion:
A body at rest will remain at rest and a body in motion will continue in motion in a straight line with a constant velocity, unless it is compelled by an external force to change its state of rest or of uniform motion.

Examples:
(a) A book lying on a table cannot change its state of rest unless an external force is applied on the book.
(b) A car set free on a sloppy road will continue to be in motion unless an external force applied by hands or brakes to bring the car to rest.

Question 29:

On what factor does the inertia of a body depend? Which has more inertia, a cricket ball or a rubber ball of the same size?

ANSWER:

The inertia of a body depends on its mass.
A cricket ball has more inertia than a rubber ball of the same size because it has more mass than a rubber ball.

Question 30:

Why do the passengers in a bus tend to fall backward when it starts suddenly?

Aakash Institute

ANSWER:

When a bus starts suddenly, the passengers tend to jerk backward. This is because their bodies possess inertia due to which the passengers tend to remain in their state of rest (or stationary state) even when the bus has started moving.

Question 31:

Explain why, a person travelling in a bus falls forward when the bus stops suddenly.

ANSWER:

When a moving bus stops suddenly, the passengers are jerked forward because of inertia. The passengers tend to remain in their state of motion (which they possess in a moving bus) even though the bus has come to rest.

Question 32:

Give reason for the following :

When a hanging carpet is beaten with a stick, the dust particles start coming out of it.

ANSWER:

When a hanging carpet is beaten with a stick, the dust particles come out of it because the force of the stick makes the carpet move to-and-fro slightly but the dust particles tend to remain at rest (or stationary) due to their inertia and hence get separated from the carpet.

Question 33:

When a tree is shaken, its fruits and leaves fall down. Why?

ANSWER:

When a tree (having flexible stems) is shaken vigorously, its fruits and leaves fall down. This is due to the fact that when the tree is shaken, it moves to-and-fro slightly but its fruits and leaves tend to remain at rest (or stationary) due to their inertia. Thus, they get detached from the tree and fall down.

Aakash Institute

Question 34:

Explain why, it is dangerous to jump out of moving bus.

ANSWER:

It is dangerous to jump out of a moving bus because the person who jumps is moving with the same speed as that of the bus and would tend to remain in motion (due to inertia) even after falling to the ground; thus, he may get hurt due to the resistance of the stationary ground.

Question 35:

What is the momentum in kg. m/s of a 10 kg car travelling at (a) 5 m/s (b) 20 cm/s, and (c) 36 km/h?

ANSWER:

(a) 5 m/s
We know that:
Momentum = mass × velocity
= $m \times v$
Here, mass, m = 10 kg
velocity, v = 5 m/s
Putting these values in the above formula, we get:
Momentum = 10 × 5 kg.m/s
= 50 kg.m/s

(b) 20 cm/s
We know that:
Momentum = mass × velocity
= $m \times v$
Here, mass, m = 10 kg
velocity, v = 20 cm/s
v = 0.2 m/s
Putting these values in the above formula, we get:
Momentum = (10)(0.2) kg.m/s
= 2 kg.m/s

(c) 36 km/h

Aakash Institute

We know that:
Momentum = mass × velocity
= $m \times v$
Here, mass, m = 10 kg
velocity, v = 36 km/h
$=36\times\frac{1000}{3600}=36\times\frac{1000}{3600}=36\times\frac{10}{36}=10$ m/s=36×10003600=36×10003600=36×1036=10 m/s
Putting these values in the above formula, we get:
Momentum = 10 × 10 kg.m/s = 100 kg.m/s

Question 36:

(a) Define momentum of a body. On what factors does the momentum of a body depend?
(b) Calculate the change in momentum of a body weighing 5 kg when its velocity decreases from 20 m/s to 0.20 m/s.

ANSWER:

The quantity of motion of a body which is equal to the product of the mass and velocity of the body is known as momentum of body. It is a vector quantity and is expressed in kg.m/s.

The momentum of a body is defined as the product of its mass and velocity.
Thus, momentum = mass × velocity
$p = m \times v$

The momentum of a body depends on two factors i.e., mass and velocity of the body.

For example,
Given that:
mass, m = 5 kg
velocity, v_1 = 20 m/s
Therefore, momentum of a body moving with velocity v_1, $p_1 = m \times v_1$
= 5 × 20 = 100 kg.m/s

Now,
mass, m = 5 kg
velocity, v_2 = 0.20 m/s
Therefore, momentum of a body moving with velocity v_1, $p_2 = m \times v_1$
= 5 × 0.20 = 1 kg.m/s
Change in the momentum of a body = $p_1 - p_2$

Aakash Institute

$= 100 - 1$
$= 99$ kg.m/s

Question 37:

(a) Define the term 'force'.
(b) State the various effects of force.

ANSWER:

(a) Force is defined as the push or pull on an object. Force causes an object to move, to speed up, slow down, change shape or change direction.

(b) Force can produce the following effects:

1. It can move a stationary body.
2. It can stop a moving body.
3. It can change the speed of a moving body.
4. It can change the direction of a moving body.
5. It can change the shape (and size) of a body.

Question 38:

Give one example each where :

(a) a force moves a stationary body.
(b) a force stops a moving body.
(c) a force changes the speed of a moving body.
(d) a force changes the direction of a moving body.
(e) a force changes the shape (and size) of a body.

ANSWER:

(a) The force of an engine can move a stationary car.

(b) The force of brakes can stop a moving car.

(c) Suppose one is riding a bicycle at a certain speed. Now, if someone pushes the moving bicycle from behind, then the speed of bicycle increases and it will move faster. On the other hand, if someone pulls the moving bicycle from behind then the speed of bicycle

Aakash Institute

decreases and it will move slower. Thus, a push or pull can change the speed of the moving bicycle. As push or pull is a force, we can say that a force can change the speed of a moving bicycle (or any other moving body).

(d) If we blow air from our mouth towards the smoke rising up from a burning incense stick (agarbatti), then the direction of motion of the smoke changes. In this case, the force exerted by the blowing air changes the direction of the moving smoke.

(e) The shape of kneaded wet clay (geeli mitti) changes when a potter converts it into pots of different shapes and sizes. This happens because the potter applies force on the kneaded wet clay.

Question 39:

(a) What do you understand by the terms "balanced forces" and "unbalanced forces"? Explain with examples.
(b) What type of forces − balanced or unbalanced − act on a rubber ball when we press it between out hands? What effect is produced in the ball?

ANSWER:

(a) *Balanced forces*: If the resultant of all the forces acting on a body is zero, the forces are called balanced forces.
Example: When we push a concrete wall with our hands the wall doesn't move. This is because the force by us is balanced by the other forces acting on the wall.

Unbalanced force: If the resultant of all the forces acting on a body is not zero, the forces are called unbalanced force.
Example: If we push a toy car lying on the ground, we find that the toy car starts moving. This is because the force exerted by our hand is not balanced by the other forces acting on the toy car.

(b) The balanced forces change the shape of the rubber ball when we squeeze it.

When we press a rubber ball between our two hands, the shape of the ball alters from spherical to oblong. This is because two equal and opposite forces (balanced force) are applied by our hands.

Question 40:

Aakash Institute

(a) What happens to the passengers travelling in a bus when the bus takes a sharp turn? Give reasons for your answer.
(b) Why are road accidents at high speeds very much worse than road accidents at low speeds?

Figure

ANSWER:

(a) When a bus turns a corner sharply, the passengers tend to fall sideways because of their tendency to continue moving in the straight line (inertia).

(b) It is a common observation that road accidents due to vehicles travelling at high speeds are much worse than those with vehicles at low speeds. This is because the momentum of vehicles running at greater speeds is very high and causes a lot of damage to the vehicles and injures the passengers during the collision.

Question 41:

When a toothpaste tube is squeezed, its shape changes. The force responsible for this is an example of :

(a) balanced forces
(b) centripetal forces
(c) unbalanced forces
(d) centrifugal forces

ANSWER:

(a) balanced force
This is because a balanced force changes the shape of the object.

Question 42:

The inertia of an object tends to cause an object :

(a) to increase its speed

Aakash Institute

(b) to decrease its speed
(c) to resist a change in its state of motion
(d) to decelerate due to friction

ANSWER:

(c) to resist a change in its state of motion
Inertia is the tendency of an object to resist a change in its state of motion.

Question 43:

When we talk of a force acting on a body, it usually means :

(a) electrical force
(b) balanced force
(c) unbalanced force
(d) nuclear force

ANSWER:

(c) unbalanced force
Unbalanced forces are responsible for producing a change in the state of motion of a body. So when we talk of a force, it usually means unbalanced force.

Question 44:

A passenger in a moving train tosses a coin which falls behind him. This shows that the motion of train is :

(a) accelerated
(b) uniform
(c) retarded
(d) along circular track

ANSWER:

(a) accelerated
When the coin is tossed it was also moving with the horizontal speed of the train. The coin falls behind because the train is in an accelerated motion and no force is acting on the coin to speed up along with the train.

Aakash Institute

Question 45:

'When a hanging carpet is beaten with a stick, the dust particles start coming out of it'. This phenomenon can be best explained by making use of :

(a) Newton's third law of motion
(b) Newton's law of gravitation
(c) Newton's first law of motion
(d) Newton's second law of motion

ANSWER:

(c) Newton’s first law of motion
This is because beating the carpet with a stick makes the carpet move to-and-fro quickly, but the dust particles tend to remain at rest due to their inertia and get separated from the carpet.

Question 46:

A water tanker filled up to two-thirds of its tank with water is running with a uniform speed. When the brakes are suddenly applied, the water in its tank would :

(a) move backward
(b) move forward
(c) rise upwards
(d) remain unaffected

ANSWER:

(b) move forward
This is because of the inertia of the water in the tank that makes it remain in its state of motion even though the water tanker has stopped moving.

Question 47:

If we release a magnet held in our hand, it falls to the ground. The force which makes the magnet fall down is an example of :

Aakash Institute

(a) balanced force
(b) unbalanced force
(c) magnetic force
(d) muscular force

ANSWER:

(b) unbalanced force
This is because an unbalanced force is responsible to bring about a change in the state of motion of an object.

Question 48:

The inertia of a moving object depends on :

(a) momentum of the object
(b) speed of the object
(c) mass of the object
(d) shape of the object

ANSWER:

(c) mass of the object
The inertia of a moving object depends on the mass of the object. Heavier objects tend to resist a change in their state more than the lighter objects do.

Question 49:

When a rubber balloon held between the hands is pressed, its shape changes. This happens because :

(a) balanced forces act on the balloon
(b) unbalanced forces act on the balloon
(c) frictional forces act on the balloon
(d) gravitational forces act o the balloon

ANSWER:

(a) balanced forces act on the balloon.
Balanced forces are responsible for bringing about a change in the shape of an object.

Aakash Institute

Question 50:

Which of the following effect cannot be produced by an unbalanced force acting on a body?

(a) change in speed of the body
(b) change in shape of the body
(c) change in direction of motion of body
(d) change in state of rest of the body

ANSWER:

(b) change in shape of the body
Unbalanced forces tend to change the state of motion of a body.

Question 51:

A plastic ball and a clay ball of equal masses, travelling in the same direction with equal speeds, strike against a vertical wall. From which ball does the wall received a greater amount of momentum?

ANSWER:

The wall will receive equal momentum from both the balls. This is because both the balls have equal mass and equal velocity.

Question 52:

A moving bicycle comes to rest after sometimes if we stop pedalling it. But Newton's first law of motion says that a moving body should continue to move for ever, unless some external force acts on it. How do you explain the bicycle case?

ANSWER:

If we stop pedalling a bicycle, moving at a uniform speed, it does not go on moving forever. It eventually comes to rest after some time. This is because the moving bicycle has been compelled to change its state of uniform motion by the external force of air resistance and friction. If there were no air resistance and no friction to oppose the motion of the bicycle, then, according to the first law of motion, the moving bicycle would go on moving forever on a horizontal road. It cannot stop by itself.

Aakash Institute

Question 53:

A man throws a ball weighing 500 g vertically upwards with a speed of 10 m/s.

(i) What will be its initial momentum?
(ii) What would be its momentum at the highest point of its flight?

ANSWER:

(i) We know that:
Momentum = mass × velocity
$= m \times v$
Here, mass, m = 500 g
We can convert grams (g) to kilograms (kg). A kilogram has 1000 grams.
m = 500 / 1000
m = 0.5 kg
Also, velocity, v =10 m/s
Putting these values in the above formula, we get:
Momentum = 0.5 × 10 = 5 kg.m/s

(ii) Its momentum at the highest point of its flight would be zero. At the maximum height the velocity of the ball is zero.

Question 54:

A car is moving on a level road. If the driver turns off the engine of the car, the car's speed decreases gradually and ultimately it comes to a stop. A student says that two forces act on the car which bring it to a stop. What could these forces be? Which of these two forces contributes more to slow down and stop the car?

ANSWER:

These forces could be the frictional force and air resistance.
Force of friction contributes more towards the slowing down and stopping the car.

Question 55:

Aakash Institute

There are two types of forces X and Y. The forces belonging to type X can produce motion in a stationary object but cannot change the shape of the object. On the other hand, forces belonging to type Y cannot produce motion in a stationary object but can change the object. What is the general name of the forces as (a) X, and (b) Y?

ANSWER:

(a) The general name of the forces such as X is unbalanced forces
(b) The general name of the forces such as Y is balanced forces.

Question 1:

Which physical quantity corresponds to the rate of change of momentum?

ANSWER:

Force is the physical quantity which corresponds to the rate of change of momentum.

Question 2:

State the relation between the momentum of a body and the force acting on it.

ANSWER:

Force=Change in MomentumTime TakenForce=Change in MomentumTime Taken

Question 3:

What is the unit of force?

ANSWER:

Newton is the unit of force.

Aakash Institute

Question 4:

Define one newton force.

ANSWER:

One Newton is that force which when acts on a body of mass 1 kg produces an acceleration of 1 m/s^2 in it.

Question 5:

What is the relationship between force and acceleration?

ANSWER:

The acceleration produced in a body is directly proportional to the force acting on it.

Question 6:

If the mass of a body and the force acting on it are both doubled, what happens to the acceleration?

ANSWER:

If the mass of a body and the force acting on it are both doubled, the acceleration remains the same.

Question 7:

Name the physical quantity whose unit is 'newton'.

ANSWER:

Force is the physical quantity whose unit is ‘Newton’.

Question 8:

Which physical principle is involved in the working of a jet aeroplane?

Aakash Institute

ANSWER:

Principle of conservation of momentum is involved in the working of a jet aeroplane.

Question 9:

Name the principle on which a rocket works.

ANSWER:

A rocket works on the principle of conservation of momentum.

Question 10:

Is the following statement true or false :
A rocket can propel itself in a vacuum.

ANSWER:

The given statement is true. A rocket propulsion system works on the principle of conservation of momentum.

Question 11:

What is the force which produces an acceleration of 1 m/s^2 in a body of mass 1 kg?

ANSWER:

A force of 1 Newton produces an acceleration of 1 m/s2 in a body of 1 mass kg.

Question 12:

Find the acceleration produced by a force of 5 N acting on a mass of 10 kg.

ANSWER:

We know that:
Force = mass × acceleration

Aakash Institute

$= m \times a$

Here, mass, m = 10 kg

force, F = 5 N

Putting these values in the above formula, we get:

5 N = 10 × acceleration

$\Rightarrow \text{acceleration} = \frac{5}{10} \Rightarrow \text{accleration} = 0.5 \text{ m/s}^2 \Rightarrow$acceleration=510⇒accleration=0.5 m/s2

Question 13:

A girl weighing 25 kg stands on the floor. She exerts a downward force of 250 N on the floor. What force does the floor exert on her?

ANSWER:

According to Newton's third law of motion, the floor exerts a force of 250 N on her in the upward direction.

Question 14:

Name the physical quantity which makes it easier to accelerate a small car than a large car.

ANSWER:

Mass (of the car) is the physical quantity which makes it easier to accelerate a small car than a large car.

Question 15:

Fill in the following blanks with suitable words :

(a) To every action, there is an _____ and _____ reaction.

(b) Momentum is a _____ quantity. Its unit is _____.

(c) Newton's second law of motion can be written as Force = mass × _____ or Force = _____ of change of _____.

(d) Forces in a Newton's third law pair have equal _____ but act in opposite _____.

(e) In collisions and explosions, the total _____ remains constant, provided that no external _____ acts.

ANSWER:

Akash Institute

(a) To every action, there is an equal and opposite reaction.
(b) Momentum is a vector quantity. Its unit is kg.m/s.
(c) Newton's second law of motion can be written as Force = mass × acceleration or Force = rate of change of momentum.
(d) Forces in a Newton's third law pair have equal magnitude but act in opposite directions.
(e) In collisions and explosions, the total momentum remains constant, provided that no external force acts.

Question 16:

Explain the meaning of the following equation :
$F = m \times a$
where symbols have their usual meanings.

ANSWER:

The given equation gives us a relationship between 'force' and 'acceleration' according to the Newton's second law of motion.
$F = m \times a$
where,
m = mass of a body
a = acceleration of the body
F = force acting on the body

Question 17:

To take the boat away from the bank of a river, the boatman pushes the bank with on oar. Why?

ANSWER:

While rowing the boat, the boatman pushes the water backwards with the oar so that the water exerts an equal and opposite push on the boat which makes the boat move forward. In fact, harder the boatman pushes back the water with oars, greater is the force exerted by the water and faster the boat moves forward.

Question 18:

Aakash Institute

Why does a gunman get a jerk on firing a bullet?

Figure

ANSWER:

When a bullet is fired from a gun, the force pushing the bullet forward is equal to the force pushing the gun backward. However, because of the high mass of the gun, it moves only a little distance backward and gives a backward jerk or kick to the shoulder of the gunman.

Question 19:

If action is always equal to reaction, explain why a cart pulled by a horse can be moved.

ANSWER:

In a horse cart, the horse pushes the ground in backward direction. According to Newton's third law of the motion, the ground pushes the horse in forward direction. Thus, the horse moves in the forward direction. As the cart is attached to the horse, the cart too moves in the forward direction.

Question 20:

Explain how a rocket works.

ANSWER:

The hot gases, produced by the rapid burning of the fuel, rush out of a jet at the bottom of the rocket at a very high speed. The equal and opposite reaction force of the downward going gases pushes the rocket upwards. A rocket can propel itself even in vacuum because it does not require air for obtaining uplift or for burning its fuel.

Question 21:

Aakash Institute

Do action and reaction act on the same body or different bodies? How are they related in magnitude and direction. Are they simultaneous or not?

ANSWER:

Action and reaction act on different bodies. The action and reaction forces are equal in magnitude but they do not always produce equal acceleration in the two bodies on which they act.

Question 22:

If a man jumps out from a boat, the boat moves backwards. Why?

ANSWER:

When a man jumps out of a boat to the bank of the river, the boat moves backwards, away from him. This is due to the fact that to step out of the boat, the man pushes the boat with his foot in backward direction. The push of the man on the boat is the action. The boat exerts an equal force on the man in forward direction which enables him to move forward. This force exerted by the boat on the man is reaction. Since the boat is floating on water and not fixed, it moves backward due to the force exerted by the man.

Question 23:

Why is it difficult to walk on a slippery road?

ANSWER:

On the slippery ground, the friction is much less and we cannot exert a backward action force on it which would produce a forward reaction force on us. Hence, it becomes difficult to walk on a slippery road.

Question 24:

Explain why, a runner presses the ground with his feet before he starts his run.

ANSWER:

Aakash Institute

A runner presses the ground with his feet before he starts his run to receive a large reaction force by the ground on which he exerts an action force, in the forward direction. In this way, he can gain a great speed.

Question 25:

A 60 g bullet fired from a 5 kg gun leaves with a speed of 500 m/s. Find the speed (velocity) with which the gun recoils (jerks backwards).

ANSWER:

Here, mass of bullet = 60 g

$=\frac{60}{1000}=601000$

= 0.06 kg

velocity of bullet = 500 m/s

mass of gun = 5 kg

Now, putting these values in the formula:

Mass of bullet × Velocity of bullet = Mass of gun × Recoil velocity of gun

We get,

0.06 × 500 – 5 × Recoil velocity of gun

Recoil velocity of gun$=\frac{0.06\times5005}{}=0.06\times5005$

$=\frac{0.06\times5005}{}=\frac{0.06\times500}{1005}=0.06\times100=0.06\times5005=0.06\times5001005=0.06\times100$

Recoil velocity of gun = 6 m/s

Question 26:

A 10 g bullet travelling at 200 m/s strikes and remains embedded in a 2 kg target which is originally at rest but free to move. At what speed does the target move off?

ANSWER:

Here,

Mass of the bullet, m = 10 g = 0.01 kg

Velocity of the bullet, v = 200 m/s

Mass of the target, M = 2 kg

Mass of the (target+bullet) after hitting = V (say)

Momentum of the system before hitting = (0.01)(200) + (2)(0) = 2

Momentum of the system after hitting = (2 + 0.01)V

Aakash Institute

(after hitting the bullet sticks to the target)

Now,
By law of conservation of momentum,

Momentum of the system before hitting = Momentum of the system after hitting
$\Rightarrow 2 = (2 + 0.01)V$
$\Rightarrow V = 0.995$ m/s

This is the velocity with which the bullet and the target moves after hitting.

Question 27:

A body of mass 2 kg is at rest. What should be the magnitude of force which will make the body move with a speed of 30 m/s at the end of 1 s?

ANSWER:

The body gains speed 30 m/s in 1 s. So, the acceleration is,
$a = 30/1 = 30$ m/s^2
Mass, $m = 2$ kg
Force = mass × acceleration
Force = $m \times a$
$= 2 \times 30 = 60$
The magnitude of force = 60 N

Question 28:

A body of mass 5 kg is moving with a velocity of 10 m/s. A force is applied to it so that in 25 seconds, it attains a velocity of 35 m/s. Calculate the value of the force applied.

ANSWER:

Here, mass, $m = 5$kg
Let us calculate the value of acceleration by using the first equation of motion,
Given that:
initial velocity, $u = 10$ m/s
final velocity, $v = 35$ m/s
time taken, $t = 25$ seconds
Putting these values in the equation, we get:

Aakash Institute

$v = u + at$
$\Rightarrow 35 = 10 + a \times 25$
$\Rightarrow 35 = 10 + 25a$
$\Rightarrow 35 - 10 = 25a$
$\Rightarrow 25 = 25a$
$\Rightarrow a = \frac{25}{25} \Rightarrow a = 1 \text{ m/s}^2 \Rightarrow a = \frac{25}{25} \Rightarrow a = 1 \text{ m/s2}$
Now, putting $m = 5$ kg and $a = 1$ m/s^2 in equation we get,
Force = mass × acceleration
Force = $m \times a$
Force = 5 × 1
Force = 5 N

Question 29:

A car of mass 2400 kg moving with a velocity of 20 m s^{-1} is stopped in 10 seconds on applying brakes. Calculate the retardation and the retarding force.

ANSWER:

Let us first calculate the retardation $= \frac{(v-u)}{t} = v\text{-}ut$

$= \frac{(0-20)}{10} = \frac{-20}{10} = \frac{-20}{10} = -2 \text{ m/s}^2 = 0\text{-}20\text{-}10 = -20\text{-}10 = -20\text{-}10 = -2$ m/s2

Now, we are going to find retarding force = mass × acceleration
= 2400 kg × −2
= −4800 N
The negative sign implies that the force on the car is acting opposite to the motion of the car.

Question 30:

For how long should a force of 100 N act on a body of 20 kg so that it acquires a velocity of 100 m/s?

ANSWER:

We are going to find acceleration
Force = mass × acceleration
$100 = 20 \times a \Rightarrow a = \frac{100}{20} \Rightarrow a = 5 \quad 100 = 20 \times a \Rightarrow a = \frac{100}{20} \Rightarrow a = 5$
Now, putting these values in the equation:

Aakash Institute

$v=u+at \Rightarrow 100=0+5\times t \Rightarrow 100=5t \Rightarrow t=20$v=u+at⇒100=0+5×t⇒100=5t⇒t=20
So, the required time is 20 s.

Question 31:

How long will it take a force on 10 N to stop a mass of 2.5 kg which is moving at 20 m/s?

ANSWER:

We are going to find acceleration
Force = mass × acceleration
10 = 2.5 × *a*
$\Rightarrow 102.5=a \Rightarrow 10\times 102.5\times 10=a \Rightarrow a=4 \Rightarrow 102.5=a \Rightarrow 10\times 102.5\times 10=a \Rightarrow a=4$
Now, putting these values in the equation:
$v=u+at \Rightarrow 20=0+4\times t \Rightarrow 20=4t \Rightarrow 204=t \Rightarrow t=5s$v=u+at⇒20=0+4×t⇒20=4t⇒204=t⇒t=5s

Question 32:

The velocity of a body of mass 10 kg increases from 4 m/s to 8 m/s when a force acts on it for 2 s.
(a) What is the momentum before the force acts?
(b) What is the momentum after the force acts?
(c) What is the gain in momentum per second?
(d) What is the value of the force?

ANSWER:

(a) Momentum = Mass × velocity
= 10 × 4
= 40 kg.m/s

(b) Momentum = Mass × velocity
= 10 × 8
= 80 kg.m/s

(c) The gain in momentum per second = Momentum Gaintime
$=80-40 \quad 2=40 \quad 2=20 \text{ kg.m/s}^2$=80-402=402=20 kg.m/s2

(d) Force is the rate of change of momentum or the momentum gain or lost per second.
So, force = 20 kg.ms/^{2} = 20 N

Aakash Institute

Question 33:

A gun of mass 3 kg fires a bullet of mass 30 g. The bullet takes 0.003 s to move through the barrel of the gun and acquires a velocity of 100 m/s. Calculate :

(i) the velocity with which the gin recoils.
(ii) the force exerted on gunman due to recoil of the gun

ANSWER:

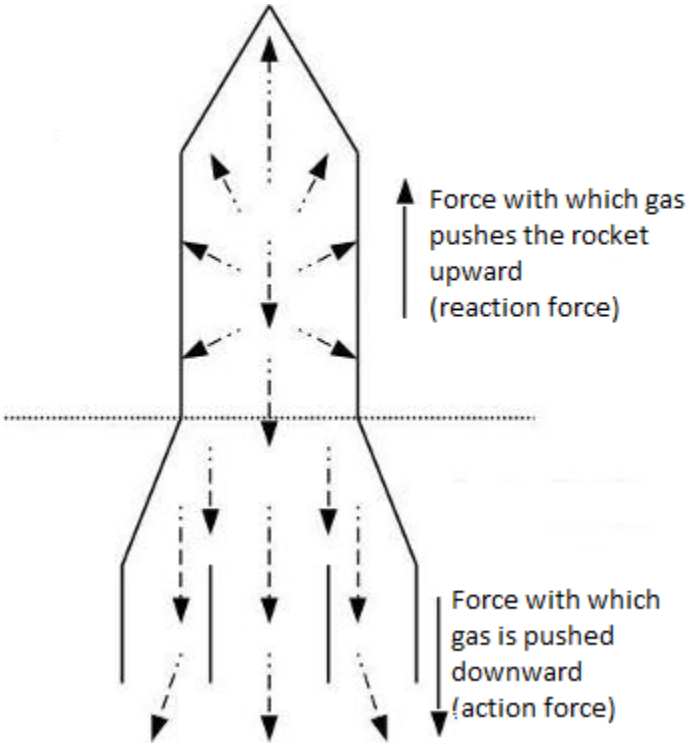
Mass of bullet, m = 30 g
$=\frac{30}{1000}\text{kg}=0.03\text{ kg}$=301000kg=0.03 kg
Velocity of bullet, v = 100 m/s
Mass of gun, M = 3 kg
$\text{Recoil velocity of gun, } V=-\frac{0.03\times100}{3}\Rightarrow V=-\frac{3}{3}\Rightarrow V=-1\text{ m/s}$Recoil velocity of gun, V=-0.03×1003⇒V=-33⇒V=-1 m/s

Question 34:

Draw a diagram to show how a rocket engine provides a force to move the rocket upwards. Label the diagram appropriately.

ANSWER:

Aakash Institute



Question 35:

Name the laws involved in the following situations :
(a) the sum of products of masses and velocities of two moving bodies before and after their collision remains the same.
(b) a body of mass 5 kg can be accelerated more easily by a force than another body of mass 50 kg under similar conditions
(c) when person A standing on roller skates pushes another person B (also standing on roller skates) and makes him move to the right side, then the person A himself gets moved to the left side by an equal distance.
(d) if there were no friction and no air resistance, then a moving bicycle would go on moving for ever.

ANSWER:

(a) Law of conservation of momentum is involved.
(b) Newton's second law of motion is involved.
(c) Newton's third law of motion is involved.
(d) Newton's first law of motion is involved.

Aakash Institute

Question 36:

(a) State and explain Newton's second law of motion.
(b) A 1000 kg vehicle moving with a speed of 20 m/s is brought to rest in a distance of 50 metres :
(i) Find the acceleration
(ii) Calculate the unbalanced force acting on the vehicle.

ANSWER:

(a) Newton's Second law of motion states that the force 'F' acting on a body of mass 'm' producing acceleration 'a' is equal to the product of the mass and acceleration of the body.
That is, F = ma
It can be derived from the concept of momentum.
Suppose a body of mass 'm' has initial velocity 'u' and after time 't' its velocity becomes 'v'.
The initial momentum is, $P_i = mu$
The final momentum is $P_f = mv$
The change in momentum with respect to time 't' is
$= (mv - mu)/t = m(v - u)/t = F$ …….(1)
We know, acceleration, $a = (v - u)/t$
So, (1) implies,
$F = m(v - u)/t = ma$
Which is Newton's Second law of motion.

(b) (i) Final velocity, $v = 0$ (because the car is brought to rest)
Distance covered, $s = 50$ m
So, Force = mass × acceleration
But we do not know the value of a.
Making use of the third equation of motion we get,
$v^2 - u^2 = 2as$
$\Rightarrow 0 - 20^2 = 2 \times a \times 50$
$\Rightarrow -400 = 100a$
$\Rightarrow a = -4$
The acceleration = -4 m/s^2

(ii) Force = mass × acceleration
Mass = 1000 kg
Force = $1000 \times (-4)$
$= -4000$ N
Unbalanced force acting on the vehicle is −4000 N.

Question 37:

Aakash Institute

(a) Explain why, a cricket player moves his hands backwards while catching a fast cricket ball.
(b) A 150 g ball, travelling at 30 m/s, strikes the palm of a player's hand and is stopped in 0.05 second. Find the force exerted by the ball on the hand.

ANSWER:

(a) By moving the hand backwards, a fielder increases the time of action of the force on his hands. When the time increases, the force reduces and the chances of the fielder getting hurt and dropping the ball decreases.

(b) Mass of the ball, m = 150 g = 0.15 kg
Initial velocity of the ball, u = 30 m/s
Initial momentum of the ball, p_i = mu = 4.5 kg.m/s
The player's hand stops the ball in 0.05 s.
Thus, final momentum of the ball is, p_f = 0
So, change in momentum of the ball = $p_f - p_i$
= 0 − 4.5
= −4.5 kg.m/s
So, rate of change of momentum is = −4.5/0.05 = −90 N
This is the force exerted by the hand on the ball.
So, the force exerted by the ball on the hand is = 90 N

Question 38:

(a) State Newton's third law of motion and give two examples to illustrate the law.
(b) Explain why, when a fireman directs a powerful stream of water on a fire from a hose pipe the hose pipe tends to go backward.

Figure

ANSWER:

(a) According to Newton's third law of motion, whenever one body exerts a force on another body, the second body exerts an equal and opposite force on the first body.

Examples:
(i) Jet airplanes utilize the principle of action and reaction. In the modern jet aircraft, the hot gases obtained by the rapid burning of fuel rush out of a jet from the rear end of the aircraft at a great speed. The equal and opposite reaction of the backward-heading gases pushes the aircraft forward at a great speed.

Aakash Institute

(ii) While rowing a boat, the boatman pushes the water backwards with the oars. The water exerts an equal and opposite push on the boat which makes the boat move forward. In fact, harder the boatman pushes back the water with the oars, greater is the reaction force exerted by water and faster moves the boat, in forward direction.

(b) When a fireman directs a powerful stream of water on fire from a hose pipe, he has to hold the hose pipe strongly because of its tendency to go backwards. The backward movement of the hose pipe is due to the backward reaction of the water rushing through it in the forward direction at a great speed.

Question 39:

(a) State the law of conservation of momentum.
(b) Discuss the conservation of momentum in each of the following cases :
(i) a rocket taking off from ground.
(ii) flying of a jet aeroplane.

ANSWER:

(a) The law of conservation of momentum states the total momentum of a system remains unchanged in the absence of any external force.

(b) (i) A rocket taking off from ground
Answer: In rocket, a large volume of gases produced by the combustion of fuel is allowed to escape through it in the backward direction. Due to the very high velocity, the backward rushing gases have a large momentum. They impart an equal and opposite momentum to the rocket due to which the rocket moves forward with a great speed.

(ii) Jet aeroplanes utilize the principle of action and reaction. In modern jet aircrafts, the hot gases obtained by the rapid burning of fuel rush out of a jet at the rear end of the aircraft at a great speed. The equal and opposite momentum of the gases heading backwards pushes the aircraft forward at a great speed.

Question 40:

Aakash Institute

(a) If a balloon filled with air and its mouth untied, is released with its mouth in the downward direction, it moves upwards. Why?
(b) An unloaded truck weighing 2000 kg has a maximum acceleration of 0.5 m/s^2. What is the maximum acceleration when it is carrying a load of 2000 kg?

ANSWER:

(a) If the inflated balloon is released with its mouth untied in the downward direction, then it will move upwards because the air rushes out of balloon in the downward direction. The equal and opposite reaction of downward thrust of air pushes the balloon upwards.

(b) Force of unloaded truck:
m = 2000 kg
a = 0.5 m/s^2
Force = mass × acceleration
= 0.5 × 2000
= 1000 N
Force of loaded truck:
We have to find maximum acceleration,
M = [2000+2000]
Force = mass × acceleration
⇒ 1000 = a × 4000
$\Rightarrow \frac{1000}{4000} = a \Rightarrow a = 0.25 \Rightarrow 10004000 = a \Rightarrow a = 0.25$
The maximum acceleration when it is carrying a load of 2000 kg is 0.25 m/s^2.

Question 41:

The rockets work on the principle of conservation of :

(a) mass
(b) energy
(c) momentum
(d) velocity

ANSWER:

(c) momentum

The chemicals inside the rocket burn and produce a high-velocity blast of hot gases which move out through the tail nozzle of the rocket. As these gases move in downward direction with tremendous speed, the rocket moves up to balance the momentum of gases.

Aakash Institute

Question 42:

An object of mass 2 kg is sliding with a constant velocity of 4 m/s on a frictionless horizontal table. The force required to keep this object moving with the same velocity is :

(a) 32 N
(b) 0 N
(c) 2 N
(d) 8 N

ANSWER:

(b) 0 N
The object will keep on moving on a frictionless horizontal surface by itself due to Newton's First law of motion.

Question 43:

The physical quantity which makes it easier to accelerate a small car than a large car is measured in the unit of :

(a) m/s
(b) kg
(c) kg.m/s
(d) $kg.m/s^2$

ANSWER:

(b) kg
The quantity is mass and it is expressed in kilograms.

Question 44:

According to the third law of motion, action and reaction :

(a) always act on the same body but in opposite directions
(b) always act on different bodies in opposite directions

Aakash Institute

(c) have same magnitudes and directions
(d) act on either body at normal to each other

ANSWER:

(b) always act on different bodies in opposite directions.

Question 45:

The unit of measuring momentum of a moving body is :

(a) $m\ s^{-1}$
(b) $kg.m\ s^{-1}$
(c) $kg.m\ s^{-2}$
(d)$Nm^2\ kg^{-2}$

ANSWER:

(b) $kg.ms^{-1}$

Question 46:

A boy of mass 50 kg standing on ground exerts a force of 500 N on the ground. The force exerted by the ground on the boy will be :

(a) 50 N
(b) 25000 N
(c) 10 N
(d) 500 N

ANSWER:

(d) 500 N
This is because the ground exerts an equal and opposite force on the boy.

Question 47:

A Honda City car, a Maruti Alto car, A Tata Nano car and a Mahindra Scorpio car, all are running at the same speed of 50 m/s under identical conditions. If all these cars are hit from

Aakash Institute

behind with the same force and they continue to move forward, the maximum acceleration will be produced in :

(a) Figure
(b) Figure
(c) Figure
(d) Figure

ANSWER:

(c) Tata Nano
Because the mass of Tata Nano is the least among the four and acceleration is inversely proportional to the mass of the object.

Question 48:

The acceleration produced by a force of 5 N acting on a mass of 20 kg in m/s2 is :

(a) 4
(b) 100
(c) 0.25
(d) 2.5

ANSWER:

(c) 0.25
Acceleration = Force / Mass
= 5 / 20
= 0.25

Question 49:

Which of the following situations involves the Newton's second law of motion?

(a) a force can stop a lighter vehicle as well as a heavier vehicle which are moving
(b) a force can accelerate a lighter vehicle more easily than a heavier vehicle which are moving
(c) a force exerted by a lighter vehicle on collision with a heavier vehicle results in both the vehicles coming to a standstill'

Aakash Institute

(d) a force exerted by a escaping air from a balloon in the downward direction makes the balloon to go upwards

ANSWER:

(b) A force can accelerate a lighter vehicle more easily than a heavier vehicle which are moving.
Since, F = ma
$\Rightarrow a = F/m$
Lesser the mass, higher the acceleration.

Question 50:

A fielder pulls his hands backwards after catching the cricket ball. This enables the fielder to :

(a) exert larger force on the ball
(b) reduce the force exerted by the ball
(c) increase the rate of change of momentum
(d) keep the ball in hands firmly

ANSWER:

(b) reduce the force exerted by the ball
He does this to increase the change in momentum time of the ball. This helps him to save himself from getting hurt by the ball.

Question 51:

Why are car seat-belts designed to stretch somewhat in a collision?

ANSWER:

Car seat-belts are designed to be stretchable, as stretching the seat-belt allows the large momentum of a passenger to reduce gently and the passenger is prevented from being thrown forward violently. Therefore, major injuries can be prevented if the car suffers a collision.

Aakash Institute

Question 52:

The troops (soldiers) equipped to be dropped by parachutes from an aircraft are called paratroopers. Why do paratroopers roll on landing?

Figure

ANSWER:

When a parachutist lands on the ground, the momentum he has is high enough to hurt him on hitting the ground. Rolling on the ground just after landing will convert the kinetic energy of fall into rotational energy which will be dissipated gradually by the friction of the ground. Thus, the parachutist will have a safe landing if he rolls on landing.

Question 53:

Why would an aircraft be unable to fly on the moon?

ANSWER:

Air is necessary for an aircraft to be able to fly. Aircraft cannot fly on moon in the absence of air as the pressure difference between the upper and lower part of the wing is required for producing lift. Moreover, air is also necessary to burn the fuel of the plane.

Question 54:

Explain why it is possible for a small animal to fall from a considerable height without any injury being caused when it reaches the ground.

ANSWER:

Small animals have low mass and hence their momentum is small. So, when they fall from a considerable height, their momentum is not large enough to cause considerable damage to their bodies. However, falling from too great a height will definitely kill them.

Question 55:

Aakash Institute

A boy of mass 50 kg running at 5 m/s jumps on to a 20 kg trolley travelling in the same direction at 1.5 m/s. What is their common velocity?

ANSWER:

Momentum = Momentum of the boy + Momentum of the trolley
= Mass of boy × velocity of boy +Mass of trolley × Velocity of trolley
Momentum = Mass of the boy and trolley × common velocity
⇒ 280 = (50+20) × common velocity
⇒ 280 = 70 × common velocity
⇒ $\frac{280}{70}$=28070=common velocity
⇒ 4 = common velocity

Hence, common velocity is 4 m/s.

Question 56:

A girl of mass 50 kg jumps out of a rowing boat of mass 300 kg on the bank, with horizontal velocity of 3 m/s. With what velocity does the boat begin to move backwards?

ANSWER:

The force F_1 exerted by girl is the 'action' and the force F_2 exerted by the boat is the 'reaction'.
Now, momentum of the girl in one direction must be equal to the momentum of the boat in opposite direction.
$m_1 \times v_1 = m_2 \times v_2$
⇒ $50 \times 3 = 300 \times v_2$
⇒ $v_2 = 0.5$
Hence, velocity with which the boat begins to move backwards is 0.5 m/s.

Question 57:

A truck of mass 500 kg moving at 4 m/s collides with another truck of mass 1500 kg moving in the same direction at 2 m/s. What is their common velocity just after the collision if they move off together?

ANSWER:

Common velocity just after the collision if they move off together will be:
$v=\frac{(m_1 \times u_1)+(m_2+u_2)}{m_1+m_2}$v=m1×u1+m2+u2m1+m2

Aakash Institute

m_1 = 500kg,
u_1 = 4 m/s
m_2 = 1500kg
u_2 = 2 m/s
$v=\frac{(500+4)+(1500\times2)}{500+1500}\Rightarrow v=\frac{2000+3000}{2000}\Rightarrow v=\frac{5000}{2000}\Rightarrow v=\frac{5000}{2000}\Rightarrow v=2.5\ m/s$v=500+4+1500×2500+1500⇒v=2000+30002000⇒v=50002000⇒v=50002000⇒v=2.5 m/s
This is their common velocity after collision.

Question 58:

A ball X of mass 1 kg travelling at 2 m/s has a head-on collision with and identical ball Y at rest. X stops and Y moves off. Calculate the velocity of Y after the collision.

ANSWER:

According to the law of conservation of momentum, the two momenta given are equal to each other.
Before collision, momentum of the first ball is = (1)(2) = 2 kg.m/s
Before collision, momentum of the second ball = (1)(0) = 0

After collision, momentum of the first ball = (1)(0) = 0
After collision, momentum of the second ball is = (1)(v)

Now,
2 + 0 = 0 + 1v
⇒ v = 2
The velocity of Y after the collision is 2m/s.

Question 59:

A heavy car A of mass 2000 kg travelling at 10 m/s has a head-on collision with a sports car B of mass 500 kg. If both cars stop dead on colliding, What was the velocity of car B?

ANSWER:

$m_1 \times v_1 = m_2 \times v_2$
m_1 = 2000 kg,
v_1 = 10 m/s
m_2 = 500 kg
v_2 = ?

Aakash Institute

$2000 \times 10 = 500 \times v_2$
$20000 = 500 \times v_2$
$v_2 = 20000/500$
$= 40$ m/s
The velocity of car B is 40 m/s.

Question 60:

A man wearing a bullet-proof vest stands still on roller skates. The total mass is 80 kg. A bullet of mass 20 grams is fired at 400 m/s. It is stopped by the vest and falls to the ground. What is then the velocity of the man?

ANSWER:

Here, mass of bullet = 20 g
$= \frac{20}{1000}\text{kg} = 0.02 \text{ kg} = \frac{20}{1000}\text{kg} = 0.02$ kg
Velocity of bullet = 400 m/s
Momentum of the bullet before hitting the man is = (0.02)(400) = 8 kg.m/s
After hitting the man the bullet stops and falls on the ground.
Mass of mass, M = 80 kg
If v is the velocity of the man after being hit by the bullet then,
$Mv = 8$
$\Rightarrow v = 8/80 = 0.1$ m/s
This is the required velocity of the man.

Aakash Institute