# Force and Laws of Motion

## Multiple Choice Questions:

1 When an object undergoes acceleration
(A) Its speed always increases
(B) Its velocity always increases
(C) It always falls towards the earth
(D) A force always acts on it

2 Balanced forces may
(A) Move
(B) Accelerate
(C) Retard
(D) Deform

3 An unbalanced force acts on a body. The body :
(A) Must remain in same state
(B) Must move with uniform velocity
(C) Must be accelerated
(D) Must move along a circle.

4 A number of forces acting on a body do not cause any change in its state of rest or of uniform motion, the forces are
(A) Parallel
(B) Unbalanced
(C) Balanced
(D) Inclined

5 Example of force is :
(A) Friction
(B) Contact force
(C) Weight
(D) All of them

6 If no force acts on a body, it will
(A) gets deformed
(B) Move with increasing speed
(C) Either remain at rest or move with same speed along a straight line
(D) Break

7 If a body is not accelerated :
(A) Unbalanced force acts on it
(B) Forces acting are not balanced
(C) The resultant force is zero
(D) A single force acts on it

8 For moving a body from rest or stopping a moving body, we need
(A) Force
(B) Mass
(C) Direction
(D) Time

9 Friction is a/an :
(A) self adjusting force
(C) important force in daily life
(B) necessary evil
(D) all of these

10 Which of the following is responsible for the flow of water in rivers ?
(A) Magnetic force
(C) Force of friction
(B) Electrostatic force
(D) Gravitational force

11 Mass measures amount of in a body :
(A) inertia
(B) motion
(C) velocity
(D) acceleration

12 Momentum measures amount of in a body :
(A) Inertia
(B) Motion
(C) Velocity
(D) Acceleration

13 When a net force acts on an object, the object will be accelerated in the direction of the force with an acceleration proportional to :
(A) the force on the object
(B) the velocity of the object
(C) the mass of the object
(D) the inertia of the object

14 A body of mass 20 kg moves with an acceleration of 2 $ms^{-2}$. The rate of change of momentum in SI unit is:
(A) 40
(B) 10
(C) 4
(D) 1

15 Definition of force can be deduced from:
(A) newton's first law
(B) newton's second law
(C) newton's third law
(D) any one of the above

16 A body of mass $m$ strikes against wall with a speed $v$ and rebounds with the same speed along opposite direction. The change in magnitude of momentum is :
(A) Zero
(B) $mv$
(C) $-$mv
(D) 2mv

17 Force measures the rate of change of of a body :
(A) Mass
(B) Inertia

(C) Velocity
(D) Momentum

18 When a bus suddenly starts, the standing passengers lean backwards in the bus. This is an example of:
(A) Newton's first law
(B) Newton's second law
(C) Newton's third law
(D) None of these

19 A man sitting in a train in motion is facing the engine. He tosses a coin up, the coin falls behind him. The train is moving:
(A) forward with uniform speed
(B) backward with uniform speed
(C) forward with acceleration
(D) forward with retardation

20 Inertia depends upon :
(A) Acceleration of the body
(B) Velocity of the body
(C) Shape of the body
(D) Mass of the body

21 The momentum of a body of given mass is proportional to its :
(A) volume
(B) shape
(C) velocity
(D) colour

22 If the momentum of a body is halved then the velocity will be:
(A) Doubled
(B) Four times
(C) Three times
(D) Will become half

23 If the momentum of a body is doubled, then the kinetic energy will be:
(A) halved
(B) unchanged
(C) doubled
(D) 4 times

24 When a bullet is fired from a gun. The gun recoils to:
(A) Conserve mass
(B) Conserve momentum
(C) Conserve kinetic energy
(D) All of these

25 A bullet in motion hits and gets embedded in a solid resting on a frictionless table. What is conserved :
(A) Momentum and K.E.
(B) Momentum alone
(C) K.E. alone
(D) None of these

26 Kgm/s is the unit of :
(A) Force

(B) Momentum
(C) Kinetic energy
(D) None of these

27 For a jet plane flying with a very high speed, the forward motion of the plane could be accounted on the law of conservation of :
(A) Force
(B) Velocity
(C) Acceleration
(D) Momentum

28 Unit of impulse is :
(A) $kgm/s^2$
(B) kgm/s
(C) m/s
(D) $m/s^2$

29 A body of mass 20 kg is moving with a velocity of 4 m/s, what is the momentum with it?
(A) 100 kg m/s
(B) 80 kg m/s
(C) 40 kg m/s
(D) 20 kg m/s

30 The change is momentum of a body is 50 kg m/s in time 4 s. What is the force acting on it?
(A) 25 N
(B) 50 N
(C) 22.5 N
(D) 12.5 N

31 Choose wrong relation:
(A) $I = F \times t$
(B) $F \times t = p_2 - p_1$
(C) $I = p_2 - p_1$
(D) $I = \frac{F}{t}$

32 China and glass wares are packed with soft material when transported. This is done to:
(A) Increase impulse
(B) Reduce Impulsive force
(C) For cost cutting
(D) None of these

33 A cannon after firing recoils due to :
(A) Conservation of energy
(B) Newton's third law of motion
(C) Newton's first law of motion
(D) None of these

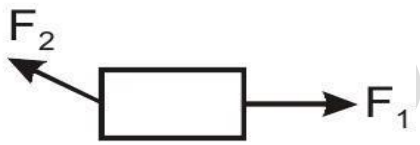
34 Spring in vehicles are introduced to :
(A) Reduce
(B) Reduce impluse
(C) Reduce force
(D) Reduce velocity

35 A man could swin in river because of :
(A) Newton's first law
(B) Newton's second law of motion
(C) Newton's third law of motion
(D) None of the above

36 A man walks on a rough surface in left direction. What is the direction of friction force acting on him?
(A) In left direction
(B) In right direction
(C) In arbitrary direction
(D) None of these

37 The vector sum of action and reaction :
(A) Is equal to zero
(B) Is not equal to zero
(C) May or may not be equal to zero
(D) None of these

38 State whether the following pair of force could be on action-reaction pair or not ?




(A) Not an action-reaction pair
(B) Is an action-reaction pair
(C) Depends on situation
(D) None of these

39 A book of weight 10 N is placed on a table. The force exerted by the surface of the table on the book will be:
(A) Zero
(B) 10 N
(C) 20 N
(D) None of these

40 If *A* and *B* are two objects with masses 10 kg and 30 kg respectively then :
(A) A has more inertia than *B*
(B) *B* has more inertia than *A*
(C) *A* and *B* have the same inertia
(D) None of the two have inertia

# Assertion and Reason Questions

DIRECTION: In each of the following questions, a statement of Assertion is given followed by a corresponding statement of Reason just below it. Of the statements, mark the correct answer as
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Assertion is false but reason is true

Q.41.
Assertion (A) : To every action, there is an equal and opposite reaction.
Reason(R): The action and reaction always act on two different objects.

Q.42.
Assertion (A) : Greater is the mass of a body, greater is its inertia.
Reason (R) : Mass of a body is a measure of inertia.

Q.43.
Assertion (A) : When we keep an object on a table, the object exerts a force downward and the table needs to exert an equal force upward or the table will collapse.
Reason (R) : The third law states that for every action there is an equal and opposite reaction.
Q.44.
Assertion (A) : A gun recoils after firing from a bullet.
Reason (R) : Action and reaction are equal and opposite and act on different bodies.

Q.45.
Assertion (A) : The wings of a bird push air downwards and the air must be pushing the bird upwards.
Reason (R) : For every action there is an equal reaction in the same direction.

Q.46.
Assertion (A) : When astronauts throw something in space, that object would move in opposite direction but with the same speed.
Reason (R) : The object would continue moving in the same direction with same speed.

Q.47.
Assertion (A) : The train has more inertia than the cart.
Reason (R) : The inertia of an object is measured by its mass.

Q.48.
Assertion (A) : Even though the action and reaction forces are always equal in magnitude, these forces may not produce accelerations of equal magnitude.
Reason (R) : Each force acts on a different object that may have the same mass.

Q.49.
Assertion (A) : When astronauts throw something in space, that object would move in opposite direction but with the same speed.
Reason (R) : The acceleration of an object produced by a net applied force is directly related to the magnitude of the force, and inversely related to the mass of the object.

Q.50.
Assertion (A) : During athletics meet, a high jumping athlete is provided either a cushion or a heap of sand on the ground to fall upon.

Reason (R) : The cushion or sand is used as it increases the athlete's momentum.

Q.51.
Assertion (A) : When a bullet is fired from a gun, the force sending the bullet forward is equal to the force sending the gun backward.
Reason (R) : Every action has an equal and opposite reaction.

Q.52.
Assertion (A) : When a firefly hits a bus, each of them exerts the same force on each other.
Reason (R) : Firefly has less mass as compared to the mass of the bus.

Q.53.
Assertion (A) : Force exerted by the ground on the man makes him move forward.
Reason (R) : Force exerted by the ground is a reactional force.

Q.54.

Assertion (A) : When a bullet is fired from a gun at rest, net finite momentum of bullet plus gun is zero.
Reason (R) : Internal forces can cause a change in linear momentum of the system.

Q.55.
Assertion: If a balanced force is applied on a wooden block it will move.
Reason: Unbalanced force changes the state of motion or rest while balanced force does not.

Q.56.
Assertion: When we stop pedalling a bicycle it slows down.
Reason: Force of friction always acts in the direction of motion.

Q.57.
Assertion: If a spring is stretched from one side, the size and shape of the spring changes.
Reason: Unbalanced force acting on the spring changes the size and shape of the spring in the direction of application.

Q.58.
Assertion: Sudden application of brakes in a moving car may cause injury.
Reason: Inertia is the tendency of an object to keep moving orbeing at rest undisturbed.

Q.59.
Assertion: A five rupee coin has more inertia than one rupee coin.
Reason: Inertia does not depend upon mass of the object.

Q.60.
Assertion: Momentum of an object which is the product of mass and velocity is a vector quantity.
Reason: Momentum has both direction as well as magnitude.

Q.61.
Assertion : Passengers standing in a bus are thrown outwards when the bus takes a turn suddenly.
Reason : Inertia is the property by virtue of which the body is unable to change by itself the state of rest and of uniform linear motion.

Q.62.
Assertion : The acceleration of the object is increasing in some cases.

Reason :
When the distance covered by the object at any time interval is greater than any of the distances covered in previous time intervals, ratio of velocity to time increases.

Q.63.
Assertion : A labour intends to move a wooden cabinet across a floor at a constant velocity with a horizontal force of 200 N and the friction force is also exerted on the cabinet.
Reason : Frictional forces act opposite to the direction of motion due to which it slows down.

Q.64.
Assertion : The sole of the shoe wears out after using it for few months.
Reason : The sole of the shoe creates a friction between sole and ground.

Q.65.
Assertion : The force acting between any two surfaces in contact and tending to oppose motion is called force of friction.
Reason : The force exerted by an electrically charged body is called electostatic force.

Q.66.
Assertion : A small mass such as a bullet kills a person when fired from a gun.
Reason : A small mass such as a bullet when fired has a very high momentum.

Q.67.
Assertion : Force is a push or pull acting on object.
Reason : The net force acting on the object is zero, whenever balanced forces act on it.

Q.68.
Assertion : A cricket player moves his hand backward while catching the ball.
Reason : In cricket match, when a ball is hit by a bat, the ball has a very momentum. Hence, to avoid any injuries, cricket players try to reduce the momentum while catching the ball.

Q.69.
Assertion : The momentum of an object is the product of its mass and velocity and has the same direction as that of the velocity.
Reason : Force is defined as the product of mass and acceleration.

Q.70.
Assertion : A force of one Newton produces an acceleration of 1m/s2 on an object of mass 1 kg.
Reason : Force of friction always opposes motion of objects.

# Case Study Questions

## Case Study-I

Akhtar, Kiran and Rahul were riding in a motorcar that was moving with a high velocity on an expressway when an insect hit the windshield and got stuck on the windscreen. Akhtar and Kiran started pondering over the situation. Kiran suggested that the insect suffered a greater change in momentum as compared to the change in momentum of the motorcar (because the change in the velocity of the insect was much more than that of the motorcar). Akhtar said that since the motorcar was moving with a larger velocity, it exerted a larger force on the insect. And as a result the insect died. Rahul while putting an entirely new explanation said that both the motorcar and the insect experienced the same force and a change in their momentum.


(71) Whose suggestion is correct ?
(a) Akhtar's suggestion is incorrect as momentum is never conserved
(b) Kiran's suggestion is incorrect as momentum is always conserved
(c) Rahul's suggestion is incorrect as momentum is never conserved
(d) All of them have given correct suggestion.

(72) Define momentum.
(a) Momentum is the product of mass and displacement.
(b) Momentum is the product of mass and distance.
(c) Momentum is the product of mass and velocity.
(d) Momentum is the product of mass and acceleration.

(73) What is the SI unit of momentum?
(a) SI unit of momentum is kg
(b) SI unit of momentum is kg/s.
(c) SI u nit of momentum is kg. m/s.
(d) SI u nit of momentum is m/s.

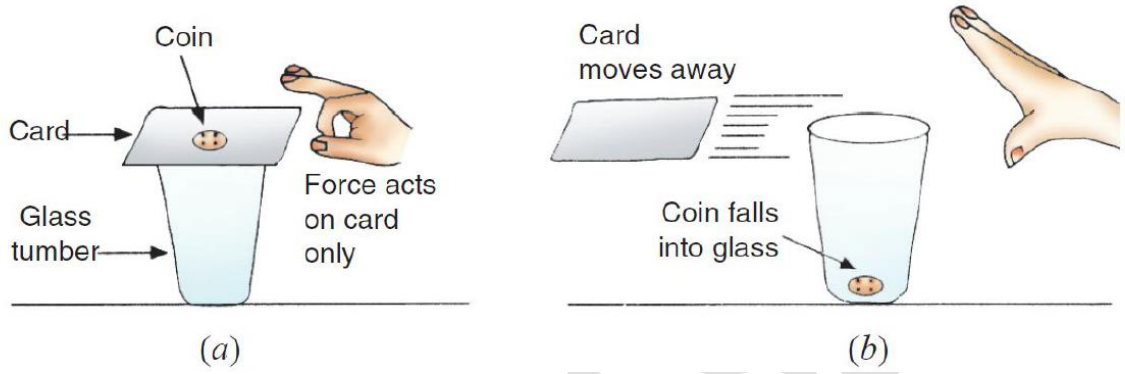
(74) Find the momentum of a man of mass 75 kg when he walks with a velocity of 2 m/s.
(a) P = 75 kgm/s
(b) P = 15 kgm
(c) P = 37.5 kgm/s
(d) P =150 kgm/s

(75) What is velocity?
(a) Distance travelled in given time
(b) Rate of change of momentum
(c) Rate of displacement

(d) Shortest distance travelled

## Case Study-II

**Read the following and answer any four questions from (i) to (v)**
We take a glass tumbler and place a thick square card on its mouth as shown in Figure (*a*). A coin is then placed above this card in the middle. Let us flick the card hard with our fingers. On flicking, the card moves away but the coin drops into the glass tumbler [see Figure (*b*)].




(76) Give reason for the above observation.
(a) The coin possesses inertia of rest, it resists the change and hence falls in the glass.
(b) The coin possesses inertia of motion; it resists the change and hence falls in the glass.
(c) The coin possesses inertia of rest, it accepts the change and hence falls in the glass.
(d) The coin possesses inertia of rest, it accepts the change and hence falls in the glass.

(77) Name the law involved in this case.
(a) Newton's second law of motion.
(b) Newton's first law of motion.
(c) Newton's third law of motion.
(d) Law of conservation of energy

(78) If the above coin is replaced by a heavy five rupee coin, what will be your observation. Give reason.
(a) Heavy coin will possess more inertia so it will not fall in tumbler.
(b) Heavy coin will possess less inertia so it will fall in tumbler.
(c) Heavy coin will possess more inertia so it will fall in tumbler.
(d) Heavy coin will possess less inertia so it will not fall in tumbler.

(79) Name the law which provides the definition of force.
(a) Law of conservation of mass
(b) Newton's third law.
(c) Newton's first law
(d) Newton's second law.

(80) State Newton's first law of motion.
(a) Energy can neither be created nor be destroyed, it can be converted from one form to another, total amount of energy always remains constant.
(b) A body at rest remains at rest or, if in motion, remains in motion at constant velocity unless it is acted upon by an external unbalanced force.

(c) For every action in nature there is an equal and opposite reaction.
(d) The acceleration in an object is directly related to the net force and inversely related to its mass.