9. Force and Laws of Motion

Q 1 Why does a boxer move his head backwards to minimize the effect of on coming punch?

Mark (1)

Q 2 Briefly explain how an expert karate player breaks a slab of ice with a single blow.

Mark (1)

Q 3 What is meant by balanced forces?

Mark (1)

Q 4 A swimmer swims forward , even though he pushes water backward while swimming. Why?

Mark (1)

Q 5 When a force acting on a body has an equal & opposite reaction, then why should the body move at all.

Mark (1)

Q 6 What do you mean by impulsive force?

Mark (1)

Q 7 Define impulse.

Mark (1)

Q 8 Define momentum.

Mark (1)

Q 9 What force is needed to produce an acceleration of 2 m/s^2 in a body of mass 3kg?

Mark (1)

Q 10 Give a simple experiment to illustrate the inertia of rest.

Marks (2)

Q 11 Why it is advised to tie the luggage with a rope on the roof of buses?

Marks (2)

Q 12 In oil tankers some space is left at the top while filling them. Explain why?

Marks (2)

Q 13 A person is prone to more serious injuries when falling from a certain height on a hard concrete floor than on a sandy surface. Explain why.

Marks (2)

Q 14 A body is moving on a rough level road with a speed of 15m/s along a given direction. Does any force is needed to maintain this speed? Why?

Marks (2)

Q 15 What happens when you shake a wet piece of cloth?

Marks (2)

Q 16 An automobile vehicle has a mass of 1500 kg. What must be the force between the vehicle & road if the vehicle is to be stopped with a negative acceleration of 1.7 ms^{-2}?

Marks (2)

Q 17 What do you mean by the force of friction? How can it be minimised?

Marks (2)

Q 18 Define force. Give its SI unit.

Marks (2)

Q 19 Explain why does a gun recoil when a shot is fired from it?

Marks (3)

Q 20 Two persons manage to push a motorcar of mass 1200 kg at a uniform velocity along a level road. The same motorcar can be pushed by three persons to produce an acceleration of 0.2 ms^{-2} .With what force does each person push the motorcar?

Marks (3)

Q 21 A force of 5 N gives a mass m, an acceleration of 10 m/s^2 & on mass m2, an acceleration of 20 m/s^2 , what acceleration would it give if both the masses were tied together?

Marks (3)

Q 22 The following is the distance time table of an object in motion.

Time (s)	0	1	2	3.2	4	5	6	
Distance (m)	0	96	120	180	215	310	420	

a) What conclusion can you draw about the acceleration? Is it constant? Increasing? Decreasing? Or Zero?
b) What do you infer about the forces acting on the object?

Marks (3)

Q 23 A car with a dead battery, is to be pushed for some time so as to start it why? What does this example signify?

Marks (3)

Q 24 Which would require a greater force, accelerating 10g mass at 5 m/s^2, or a 20 g mass at 2 m/s^2?

Marks (3)

Q 25 How many types of inertia do the material bodies have?

Marks (3)

Q 26 State the three Newton's Laws of Motion.

Marks (3)

Q 27 At the top of the oil tankers, some space is left while filling them. Explain, why.

Marks (3)

Q 28 Two blocks made of different metals identical in shape and size are acted upon by equal forces which cause them to slide on a horizontal surface. The acceleration of the second block is found to be 4 times that of the first. What is the ratio of the mass of the first to second?

Marks (3)

Q 29 An 8000 kg engine pulls a train of 5 wagons, each wagon of mass 2000 kg, along a horizontal track. If the engine exerts a force of 40,000N & the track offers a friction force of 5,000 N.
Calculate

a) the net accelerating force,
b) the acceleration of the train, and
c) the force of wagon 1 on wagon 2.

Marks (5)

Q 30 Two cars weighing 1500 kg are made to collide with a wall. The initial & final velocities of the car are - 15.0 m/s & 2.6 m/s respectively. If the collision lasts for 0.15 s, then find impulsive force exerted on the car.

Marks (5)

Q 31 A bullet of mass 20 g and with the velocity of $150ms^{-1}$ moving horizontally strikes a wooden material and comes to rest in 0.02 s. Calculate the magnitude of the force exerted by the wooden material on the bullet.

Marks (5)

Q 32 Two football players of opposite teams collide while they are trying to hit a football on the ground and after colliding, they move off together. One with a mass of 60 kg was travelling with a velocity of 5.0 m s^{-1} and the other footballer with a mass of 55 kg was moving faster with a velocity 6.0 m s^{-1} towards the first player. What is the direction and the velocity with which they move after they become entangled?

Marks (5)

Q 33 A large bus and a van, both moving with a velocity of magnitude v, have a head-on-collision and both the vehicles stop after the collision. If the time of the collision is 1 sec then,
a) Which vehicle experiences smaller force of impact?
b) Which vehicle experiences the smaller momentum change?
c) Which vehicle experiences the greater acceleration?
d) Why is it that the truck suffers less damage than the car?

Marks (5)

Most Important Questions

Q 1 Define inertia.

Q 2 What force is needed to produce on acceleration of 2 m/sin a body of mass 3kg?

Q 3 What is meant by balanced forces?

Q 4 What is force?

Q 5 A person is prone to more serious injuries when falling from a certain height on a hard concrete floor than on a sandy surface. Explain why.

Q 6 Give a simple experiment to illustrate the inertia of rest.

Q 7 Write Newton's Laws of Motion.

Q 8 Which would require a greater force accelerating 10g mass at 5 m/s^2, or a 20 g mass at 2 m/s^2?

Q 9 Explain why does a gun recoil when a shot is fired from it?

Q 10 The following is the distance time table of an object in motion.

Time(s)	0	1	2	3	4	5	6	7
Distance(m)	0	1	8	27	67	125	216	343

a) What conclusion can you draw about the acceleration? Is it constant? Increasing? Decreasing? Or Zero?

b) What do you infer about the forces acting on the object?

Q 11 A hammer of mass 500 g, moving at 50 m/s, strikes a nail. The nail stops the hammer in a very short time of 0.01 s. What is the force of the nail on the hammer?

Q 12 Give the statement of second law of motion. Hence derive its mathematical formula.

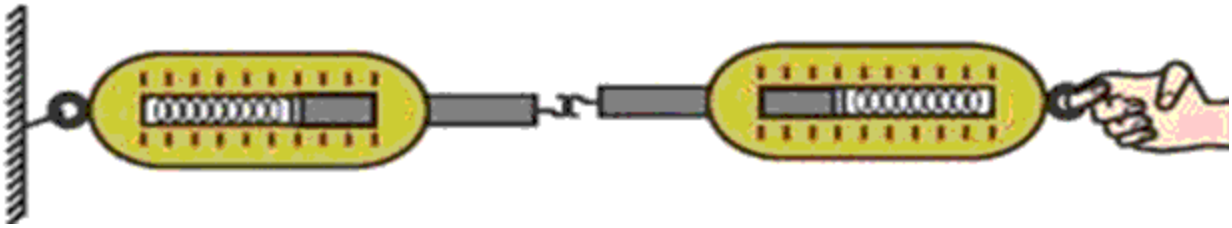
Q 13 why we tend to fall forward when a bus suddenly stops?

Q 14 Why we tend to fall backward when a bus suddenly starts?

Q 15 A force changes the velocity of a box having mass 2kg from 2 m/sec to 5 m/sec in 3sec. Find the acceleration and the magnitude of force.

Q 16 A girl of mass 40kg having velocity 2m/sec jumps on a stationary cart of mass 4kg. Find the common velocity with which both will travel?

Q 17 Two spring balance are attached to each other as given in the figure:



If some force pulls the right spring balance will the left spring balance show the same reading? Why?
Q 18 A ball of mass 5 kg moving with velocity 3m/sec strikes a ball of mass 2 kg kept at rest. If the lighter ball moves with a velocity 2 m/sec after the collision find the velocity of the heavier ball?

Q 19 A trolley of mass 30kg is kept at rest. A force makes it to move with velocity 3m/sec in 2 sec. Find the force applied on it?

Q 20 If action is always equal and opposite to reaction, then how a horse is able to pull the cart?

Q 21 Define inertia.

Q 22 What force is needed to produce on acceleration of 2 m/s^2 in a body of mass 3kg?

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Q 25 A person is prone to more serious injuries when falling from a certain height on a hard concrete floor than on a sandy surface. Explain why.

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