



PHYSICS

BOOKS - PSEB

Force And Laws of Motion

Exercise

1. An object experience a net zero external unbalanced force. Is it possible for the object to be travelling with a non-zero velocity? If yes,

state the conditions that must be placed on the magnitude and direction of the velocity. If no, provide a reason.



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2. When a carpet is beaten with a stick, the dust comes out of it ? Explain.



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3. Why is it advised to tie any luggage kept on the roof of a bus with rope ?



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4. A batsman hits a cricket ball which then rolls on a level ground. After covering a short distance, the ball comes to rest. The ball slows to a stop because

A. the batsman did not hit the ball hard enough.

B. velocity is proportional to the force exerted on the ball

C. there is a force on the ball opposing the motion.

D. there is no unbalanced force on the ball, so the ball would want to come to rest.

Answer: there is a force on the ball opposing the motion.



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5. A truck starts from rest and rolls down a hill with constant acceleration. It travels a distance of 400 m in 20 s. Find its acceleration. Find the force on it if its mass is 7 metric tonnes.



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6. A stone of 1 kg is thrown with a velocity of 20ms^{-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 ?



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7. A 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40000 N and the track offers a friction force of 5000 N, then calculate: the acceleration of the train.



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8. An automobile vehicle has mass of 1,500 kg. What must be the force between vehicle and the road if vehicle is to be stopped with negative acceleration of $1.7ms^{-2}$?



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9. What is the momentum of an object of mass m moving with velocity v ?

A. $(mv)^2$

B. mv^2

C. $\frac{1}{2}mv^2$

D. mv

Answer:



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10. Using a horizontal force of 200 N, we intend to move a wooden cabinet across a floor with constant velocity. What is the friction force that will be exerted on the cabinet ?



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11. Two objects, each of mass 1.5 kg, are moving in the same straight line but in the opposite directions. The velocity of each object is 2.5m s^{-1} before the collision during which they stick together. What will be the velocity of combined object after collision ?



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12. According to the third law of motion when we push on an object, the object pushes back on us with an equal and opposite force. If the object is a massive truck parked along the roadside, it will probably not move. A student justifies this by answering that the two opposite and equal forces cancel each other. Comment on this logic and explain why the truck does not move.



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13. A hockey ball of mass 200 g travelling at 10m.s^{-1} is struck by a hockey stick so as to return it along its original path with a velocity at 5m.s^{-1} . Calculate the change in momentum occurred in the motion of hockey ball by the force applied by hockey stick.



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14. A bullet of mass 10 kg travelling horizontally with a velocity of 150m.s^{-1} strikes a stationary wooden block and come to rest in

0.03 s. Calculate the distance of penetration of the bullet into the block. Calculate the magnitude of force exerted by the wood in block in the bullet.



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15. An object of mass 1 kg travelling in straight line with a velocity of 10ms^{-1} collides with it and sticks to a stationary wooden block of mass 5 kg. Then both move off together in the same straight line. Calculate the total

momentum before the impact and just after the impact. Also calculate the velocity of combined object.



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16. An object of mass 100 kg is accelerated uniformly from a velocity of 5ms^{-1} to 8ms^{-1} in 6s. Calculate the initial and final momentum of the object. Also find the force exerted on the object.



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17. Akhtar, Kiran and Rahul were riding in a motor car that was moving with a high velocity on an express-way when an insect hit the windshield and got struck on wind-screen.

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 motor car (because change in the velocity of insect was much more than that of motor car).

Akhtar said that since the motor car was

moving with a larger velocity, it exerted a larger force on the insect. As a result, the insect died. Rahul while putting in entirely new explanation said that both the motor car and the insect experienced the same force and same change in their momentum. Comment on these suggestions.



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18. How much momentum will a dumb-bell of mass 10 kg transfer to the floor if it falls from

a height of 80 cm ? Take its downward acceleration to be $10ms^{-2}$.



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