Momentum , Force as rate of change of momentum , The connection between Newton's first law and second law

CLASS-IX

SUBJECT : PHYSICS
CHAPTER NUMBER: 9
CHAPTER NAME : FORCE AND LAWS OF MOTION

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: 1800 120 2316
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

Home Assignment

1. A motor car of mass 1200 kg is moving along a straight line with a uniform velocity of 90 km/h. Its velocity is slowed down to 18 km/h in 4s by an unbalanced external force. Calculate the acceleration and change in momentum. Also calculate the magnitude of the force required.
2. A force acts for 10s on a stationary body of mass 100 kg after which the force ceases to act. The body moves through a distance of 100m in the next 5s. Calculate (i) the velocity acquired by the body, (ii) acceleration produced by the force and (iii) the magnitude of the force.
3. Derive the relation between force and acceleration using Newton's second law of motion.
4. How the first law of motion can be mathematically stated from the mathematical expression for the second law of motion ?

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Newton's third law of motion's application , Newton's third law of motion using second law

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Home Assignment

1. Name and state the action and reaction in the following cases ;
(a) firing of a bullet from a gun,
(b) hammering a nail,
(c) a book lying on a table,
(d) moving rocket,
(e) a person moving on the floor, and
(f) a moving train colliding with a stationary train

2. (a) Explain why is it difficult to hold a hose, which ejects a large amount of water at a high velocity.
(b) Why action and reaction do not cancel each other ?

3. (a) If some one jumps to the shore from a boat the boat moves in the opposite direction. Explain.
(b) When air from an inflated balloon is allowed to be released, the balloon moves in a direction opposite to that of air. Explain.

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Numerical

To propel a rocket, some mass of fuel in the rocket is burned. The resultant gas is then expelled from the rear of the rocket at some high speed (much larger than that of the rocket). Hence the rocket itself is accelerated with an acceleration of magnitude a_0

(a) How is the direction of the rocket's acceleration related to the direction along which the gas is expelled?

(b) Does the expelled gas exert a force on the rocket ? If so, in which direction is this force ?

(c) Suppose that the same mass of gas is expelled with larger speed so that its acceleration is twice as large. What then would be the magnitude of the rocket's acceleration ?

(d) Suppose that more fuel is burned per second so that twice as large a mass of gas is expelled with the original acceleration. What then would be the magnitude of the rocket's acceleration ?

(e) Suppose that twice as large a mass of gas is expelled with an acceleration twice as large as the original one. What then would be the magnitude of the rocket's acceleration ? How much larger would be the force exerted on the rocket by the gas (compared to the force exerted on it in the original situation)?

THANKING YOU

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