

HOTS (Higher Order Thinking Skills)

Q. 1. Why does an athlete run a certain distance before taking a leap?

Ans. An athlete runs a certain distance before taking a leap so that the inertia of motion of his body at the time of leaping may help him in his muscular efforts.

Q. 2. Two balls of the same size of different materials, rubber and iron are kept on the smooth floor of a moving train. The brakes are applied suddenly to stop the train. Will the balls start rolling? If so, in which direction? Will they move with the same speed? Give reasons for your answer.

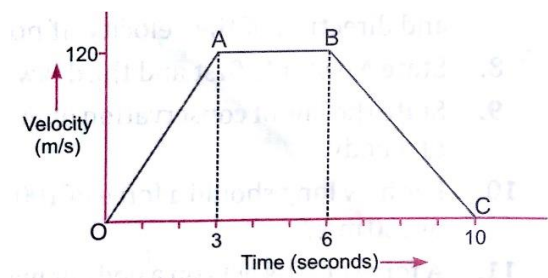
Ans. Yes, the balls will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest but due to inertia the balls try to remain in motion, therefore, they begin to roll. Since the masses of the balls are not the same, therefore, the inertial forces are not same on both the balls. Thus, the balls will move with different speeds.

Q. 3. The velocity-time graph of an object of mass $m = 120\ 50\text{ g}$ is shown in figure. Observe the graph carefully and answer the following questions.

(a) Calculate the force on the object in time interval 0 to 3 s.

(b) Calculate the force on the object in the time interval 6 to 10 s.

(c) Is there any time interval in which no force acts on the object? Justify your answer.



Ans. (a) Acceleration during interval 0 to 3s

$$a_1 = \frac{v-u}{t} = \frac{120-0}{3} = 40\text{ m/s}^2$$

$$\text{Given mass, } m = 50\text{ g} = \frac{50}{1000}\text{ kg}$$

$$\therefore \text{Force, } F_1 = ma_1 = \left(\frac{50}{1000}\right) \times 40\text{ N}$$

(b) Acceleration during interval 6 to 10 s

$$a_2 = \frac{v_2 - v_1}{t} = \frac{0 - 120}{(10 - 6)}$$

$$= -\frac{120}{4} = -30\text{ m/s}^2$$

$$\text{Force, } F_2 = ma_2 = \frac{50}{1000} \times (-30) = -1.5 \text{ N}$$

(c) During time interval 3 to 6 s, the velocity of object is constant, so in this time interval, acceleration is zero and hence force, $F (= ma)$ is zero.]

Q. 4. If an object is not moving, does it mean that no force is acting on it?

Ans. No, it implies that all the forces acting on the body are balanced.

Q. 5. A horse continues to apply a force in order to move a cart with a constant speed. Explain why?

Ans. A horse exerts a continuous force to move the cart with a constant velocity to overcome the force of friction between ground and cart.