

Answer on Question#39127 – Physics – Mechanics | Kinematics | Dynamics

An object of mass 3 kg is moving on a rough surface with a velocity of 16m/s .It covers a distance of a of 20m before coming to rest. find the the opposing force.

Solution:

$m = 3\text{kg}$ is mass of the object;

$V_0 = 16 \frac{\text{m}}{\text{s}}$ is initial speed of the object;

$S = 20\text{m}$ is covered distance;

Rate equation for the object:

$$0 = V_0 - at$$

$$t = \frac{V_0}{a} \quad (1)$$

Equations of motion for the object:

$$S = V_0 t - \frac{at^2}{2} \quad (2)$$

(1) in (2)

$$S = \frac{V_0^2}{a} - \frac{V_0^2}{2a} = \frac{V_0^2}{2a}$$

$$2aS = V_0^2$$

$$a = \frac{V_0^2}{2S} \quad (3)$$

Second Newton's law along the X-axis for the object (F - opposing force):

$$F = ma \quad (4)$$

(3)in(4):

$$F = \frac{mV_0^2}{2S} = \frac{3\text{kg} \cdot \left(16 \frac{\text{m}}{\text{s}}\right)^2}{2 \cdot 20\text{m}} = 58\text{N}$$

Answer: opposing force is equal to 58N.