Answer on Question #63309, Physics / Mechanics | Relativity

A box of mass 41.9 kg is moving across a level floor at a speed of 3.53 m/sec. A kinetic friction force of 104.4 N is acting on the box directed against its motion. How far must the box move for the force of friction to bring it to rest? Select one:

a. 4.07 m

b. 2.13 m

c. 17.3 m

d. 2.50 m

e. 3.31 m

Find: s - ?

Given:

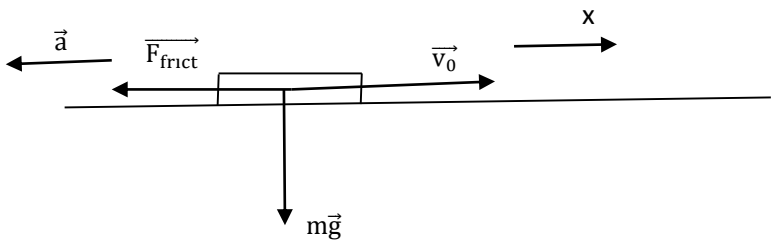
m=41.9 kg

v_0=3.53 m/s

F_{frict}=104.4 N

g=9.8 m/s^2

Solution:



Movement is delayed.

Distance:

$2as = v^2 - v_0^2$ (1),

where v=0 m/s

Of (1) $\Rightarrow$ $2as = v_0^2$ (2)

Of (2) $\Rightarrow$ $s = \frac{v_0^2}{2a}$ (3)

The body moves only under the influence of friction force (along OX):

$F_{frict} = ma$ (4)

Friction force:

$F_{frict} = \mu mg$ (5),

where μ is coefficient of friction

Of (5) $\Rightarrow$ $\mu = \frac{F_{frict}}{mg}$ (6)

Of (6) $\Rightarrow$ μ=0.2543

(5) in (4): $\mu mg = ma$ (7)

Of (7) $\Rightarrow$ $a = \mu g$ (8)

Of (8) $\Rightarrow$ a=2.4922 m/s^2

Of (3) $\Rightarrow$ s=2.5 m

Answer:

d. 2.50 m