Answer on Question #83849, Physics / Mechanics | Relativity

An old 815 kg car (without anti-lock brakes) initially traveling along a flat road at 21.3m/s applies the brakes suddenly and begins skidding. The coefficient of kinetic friction between the tires and the road is 0.221. Assume the cars acceleration is constant, and it skids until it comes to rest.

a) Find the force of kinetic friction acting on the car while it is skidding.
b) Find the acceleration of the car.
c) Find the distance the car skids before coming to rest.

Solution

a) $F_{fr} = \mu mg$; where μ – coefficient of kinetic friction; g – gravitational acceleration;

$\overrightarrow{F_{fr}} = 0.221 \times 815 \times 9.8 =$ **1765 (N)**

b) The motion of the car is caused only by acting of the force of kinetic friction on it.

$\overrightarrow{F_{fr}} = m\vec{a}$

As the car is skidding, its velocity decreases, so:

$\overrightarrow{F_{fr}} = -m\vec{a}$

$\vec{a} = -\frac{\overrightarrow{F_{fr}}}{m} = -\frac{1765}{815} =$ **−2.17 (m/s²)**

c) $= \frac{V_{fin}^2 - V_0^2}{2a}$; where $V_{fin} = 0$ m/s because the car comes to the rest, hence

$l = \frac{-V_0^2}{2a} = \frac{21.3^2}{2 \times 2.17} =$ **104.5 (m)**

Answer

The force of kinetic friction is **1765 (N).**

The acceleration of the car is **−2.17 (m/s²).**

The distance the car skids before coming to rest is **104.5 (m).**