Answer on Question #71016, Physics / Mechanics | Relativity |

Question

The initial velocity of a car (m = 1000. kg) moving along a straight, horizontal road equals 72 km/h. What minimal time and distance are needed to stop the car if the static friction coefficient between the tires and the road equals 0.50?

Solution

$$m = 1000kg$$
$$v_0 = 72\,km/h = 20\,m/s$$
$$\mu = 0.5$$

Let us write Second Newton's Law for the car

$$F_{friction} = ma$$

Friction force

$$F_{friction} = \mu mg.$$

So, deceleration is $a = \mu g = 5ms^{-2}$.

Time needed to stop the car can be found from

$$t = \frac{v - v_0}{a} = \frac{0 - 20}{-5} = 4s.$$

Stopping distance is

$$S = \frac{v^2 - v_0^2}{2a} = \frac{0 - 400}{2 \cdot (-5)} = 40m$$

Answer: $4s$; $40m$.