A car is traveling at 72.0 kilometer per hour (km/h) on a flat highway. If the coefficient of kinetic friction between the road and the tires on a rainy day is 0.135, what is the minimum distance needed for the car to stop?

Solution

Force acting on car $f = m\,a$

Frictional force $f = \mu\, m\, g$

Equating the above two

$m\,a = \mu\, m\, g$

$a = \mu\, g$

$a = 0.135 \times 9.8$

$a = 1.32\ m/s^2$

Given velocity 72 km/h = 72 x (5/18) = 20 m/s

a is negative, because it retards the motion

Using the equation of motion

$v^2 - u^2 = 2as$

$20^2 = 2\,(1.32)\,s$

$400 = 2.64\,s$

$s = 400 / 2.64$

$s = 151.5\ m$