Answer on Question 63485, Physics, Mechanics, Relativity

Question:

A $1900\ kg$ car moves along a horizontal road at speed $v_0 = 17.3\ m/s$. The road is wet, so the static friction coefficient between the tires and the road is only $\mu_s = 0.136$ and the kinetic friction coefficient is even lower, $\mu_k = 0.0952$. The acceleration of gravity is $9.8\ m/s^2$. Assume: No aerodynamic forces; $g = 9.8\ m/s^2$, forward is the positive direction. What is the highest possible deceleration of the car under such conditions? Answer in units of m/s^2.

Solution:

We can find the highest possible deceleration of the car under such conditions from the Newton's Second Law of Motion:

$$F_{net} = ma_{max},$$

here, F_{net} is the net force that acts on the car, m is the mass of the car and a_{max} is the highest possible deceleration of the car.

The only net force that acts on the car is the force of friction, so we can write:

$$F_{fr} = ma_{max},$$

$$\mu_k mg = ma_{max},$$

$$a_{max} = \mu_k g = 0.0952 \cdot 9.8\ \frac{m}{s^2} = 0.93\ \frac{m}{s^2}.$$

Answer:

$a_{max} = 0.93\ \frac{m}{s^2}$.