Answer on Question 69076, Physics, Mechanics, Relativity

Question:

The speed of a car is reduced from $54\ km/h$ to $36\ km/h$ in a certain time during which it travelled a distance of $125\ m$. Calculate the acceleration of the car.

Solution:

Let's first convert km/h to m/s:

$$v_i = 54\ \frac{km}{h} \cdot \frac{1000\ m}{1\ km} \cdot \frac{1\ h}{3600\ s} = 15\ \frac{m}{s},$$

$$v_f = 36\ \frac{km}{h} \cdot \frac{1000\ m}{1\ km} \cdot \frac{1\ h}{3600\ s} = 10\ \frac{m}{s}.$$

We can find the acceleration of the car from the kinematic equation:

$$v_f^2 = v_i^2 + 2ad,$$

here, v_i is the initial velocity of the car, v_f is the final velocity of the car, a is the acceleration of the car and d is the distance travelled by the car.

Then, we get:

$$a = \frac{v_f^2 - v_i^2}{2d} = \frac{\left(10\ \frac{m}{s}\right)^2 - \left(15\ \frac{m}{s}\right)^2}{2 \cdot 125\ m} = -0.5\ \frac{m}{s^2}.$$

The sign minus indicates that the car decelerates.

Answer:

$a = -0.5\ \frac{m}{s^2}$.