Answer on Question 60149, Physics – Mechanics | Relativity

Question:

How long will it take a car to accelerate from 50 km/hr to 90 km/hr if it produces an acceleration of 3 m/s^2 ?

Solution:

Let's first convert the initial and final velocities of the car from km/hr to m/s:

$$v_i = \left(50 \ \frac{km}{hr}\right) \cdot \left(\frac{1000 \ m}{1 \ km}\right) \cdot \left(\frac{1 \ hr}{3600 \ s}\right) = 13.9 \ ms^{-1},$$
$$v_f = \left(90 \ \frac{km}{hr}\right) \cdot \left(\frac{1000 \ m}{1 \ km}\right) \cdot \left(\frac{1 \ hr}{3600 \ s}\right) = 25 \ ms^{-1}.$$

By the definition, acceleration of a car is the rate of change of its velocity:

$$a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t},$$

here, $v_f = 25 m s^{-1}$ is the final velocity of the car, $v_i = 13.9 m s^{-1}$ is the initial velocity of the car, $a = 3 m/s^2$ is the acceleration of the car, t is the time that the car needs to accelerate from $13.9 m s^{-1}$ to $25 m s^{-1}$.

From this formula we can find the time *t*:

$$t = \frac{v_f - v_i}{a} = \frac{25 \, ms^{-1} - 13.9 \, ms^{-1}}{3 \, ms^{-2}} = 3.7 \, s.$$

Answer:

t = 3.7 s.

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