Answer on Question 65757, Physics, Mechanics, Relativity

Question:

A car increases its speed from 60 km/h to 65 km/h while a bicycle goes from rest to 3 m/s. Which undergoes greater acceleration after both travels in 10 seconds?

Solution:

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

$$v_{i\ car} = 60\ \frac{km}{h} \cdot \frac{1000\ m}{1\ km} \cdot \frac{1\ h}{3600\ s} = 16.6\ \frac{m}{s},$$

$$v_{f\ car} = 65\ \frac{km}{h} \cdot \frac{1000\ m}{1\ km} \cdot \frac{1\ h}{3600\ s} = 18\ \frac{m}{s}.$$

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

$$v_f = v_i + at,$$

here, v_i is the initial speed of the object, v_f is the final speed of the object, a is the acceleration of the object and t is the time.

Then, from this formula we can find the acceleration of the car and bicycle after both travels in 10 seconds:

$$a_{car} = \frac{v_{f\ car} - v_{i\ car}}{t} = \frac{18\ \frac{m}{s} - 16.6\ \frac{m}{s}}{10\ s} = 0.14\ \frac{m}{s^2},$$

$$a_{bicycle} = \frac{v_{f\ bicycle} - v_{i\ bicycle}}{t} = \frac{3\ \frac{m}{s} - 0\ \frac{m}{s}}{10\ s} = 0.3\ \frac{m}{s^2}.$$

As we can see, $a_{bicycle} > a_{car}$, so the bicycle undergoes greater acceleration after both travels in 10 seconds.

Answer:

The bicycle undergoes greater acceleration after both travels in 10 seconds.