Answer on Question 54935, Physics, Mechanics | Kinematics | Dynamics

Question:

A cyclist is initially moving at $15\,m/s$. He covers $45m$ in the next $4.8s$. Find:

a) his acceleration

b) his speed after $4.8s$

Solution:

a) We can find the acceleration of the cyclist from the kinematic equation:

$$s = v_0 t + \frac{1}{2} a t^2,$$

where, s is the displacement, v_0 is the initial velocity, t is the time and a is the acceleration.

From this equation we obtain the acceleration of the cyclist:

$$a = \frac{2(s - v_0 t)}{t^2} = \frac{2(45m - 15\frac{m}{s} \cdot 4.8s)}{(4.8s)^2} = \frac{-54m}{23.04s^2} = -2.34\frac{m}{s^2}.$$

The sign minus means that the cyclist decelerate when he covers the distance of $45m$.

b) In order to find the speed of the cyclist after $4.8s$ we use another kinematic equation:

$$v = v_0 + at = 15\frac{m}{s} + \left(-2.34\frac{m}{s^2}\right) \cdot 4.8s = 15\frac{m}{s} - 11.23\frac{m}{s} = 3.77\frac{m}{s}.$$

Answer:

a) $-2.34\frac{m}{s^2}$.

b) $3.77\frac{m}{s}$.