Answer on Question #48150-Physics-Mechanics-Kinematics-Dynamics

The speed of a train is reduced from $v_0 = 16.6667\frac{m}{s}$ at the same time as it travels a distance of $s = 450\ m$ if the retardation is uniform, find how much further it will travel before coming to rest ($v = 0$)?

Solution

We have velocity at the initial moment of time v_0, then train begin its retardation on distance s to speed $v = 0$. We need to determine the time t_{rest} needed to stop after train travels distance s.

First we can find acceleration:

$$a = \frac{v^2}{2s}.$$

Then we can determine time from retardation begins to stop train:

$$t_{rest} = \frac{v}{a} = \frac{v}{\frac{v^2}{2s}} = \frac{2s}{v} = \frac{2 \cdot 450}{16.6667} = 54\ s.$$

Answer: 54 s.