

Answer of question #79950 -Physics- Mechanics - Relativity

A light-rail train going from one station to the next on a straight section of track accelerates from rest at 1.1 m/s^2 for 20s. It then proceeds at constant speed for 1100 m before slowing down at 2.2 m/s^2 until it stops at the station. What is the distance between the stations? How much time does it take the train to go between the stations?

Input Data:

Acceleration:

$$a_1 = 1.1 \frac{\text{m}}{\text{s}^2}$$

Acceleration time: $t_1 = 20\text{s}$

Distance at constant speed: $S_2 = 1100\text{m}$

Slow down to a stop: $a_2 = 2.2 \frac{\text{m}}{\text{s}^2}$

Solution:

Constant speed, dialed by train:

$$V_1 = a_1 t_1 = 1.1 * 20 = 22 \frac{\text{m}}{\text{s}}$$

The distance traveled during acceleration:

$$S_1 = \frac{a_1 t_1^2}{2} = 1.1 * \frac{400}{2} = 220\text{m}$$

Travel time at a constant speed:

$$t_2 = \frac{S_2}{V_1} = \frac{1100}{22} = 50\text{s}$$

Braking distance:

$$S_3 = \frac{a_2 t_3^2}{2} = \frac{2.2 * 10^2}{2} = 110\text{m}$$

Distance from station to station:

$$S = S_1 + S_2 + S_3 = 220 + 1100 + 110 = 1430\text{m}$$

Total travel time from station to station:

$$t = t_1 + t_2 + t_3 = 20 + 50 + 10 = 80\text{s}$$

Answer:

- $S=1430\text{m}$
- $t=80\text{s}=1\text{m } 20\text{s}$