

Answer on Question #51380, Physics, Mechanics, Kinematics, Dynamics

Question:

Two subway stops are separated by 1500 m. If a subway train accelerates at 1.2 m/s^2 from rest through the first half of the distance and decelerates at -1.2 m/s^2 through the second half, what are (a) its travel time and (b) its maximum speed?

Answer:

a) Time of acceleration equals:

$$\frac{d}{2} = \frac{at_a^2}{2}$$

$$t_a = \sqrt{\frac{d}{a}}$$

For deceleration $t_d = t_a$. Therefore, total time equals:

$$t = 2t_a = 2\sqrt{\frac{d}{a}} = 2\sqrt{\frac{1500 \text{ m}}{1.2 \frac{\text{m}}{\text{s}^2}}} = 70.7 \text{ s}$$

b) Maximum speed equals:

$$v = at_a = a\sqrt{\frac{d}{a}} = \sqrt{da} = \sqrt{1500 \text{ m} \cdot 1.2 \frac{\text{m}}{\text{s}^2}} = 42.4 \frac{\text{m}}{\text{s}}$$

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