Answer on Question #69881-Physics-Other

A trolley is moving horizontally with a speed of v m/sec w.r.t. ground. A man starts running from one end of a trolley with a speed of 2.5 m/sec w.r.t the trolley. After reaching the opposite end, the man turns back and continues running with a speed of 1.5 m/sec w.r.t. trolley in the backward direction. If the length of the trolley is L then find the maximum value of displacement of the man with respect to ground attained during whole motion.

Solution

From the conservation of energy:

$$\frac{mv_i^2}{2} = \frac{mv_f^2}{2} + mgh$$

The maximum value of displacement of the man with respect to ground attained during whole motion is

$$h = \frac{(v_i^2 - v_f^2)}{2g} = \frac{(2.5^2 - 1.5^2)}{2(9.8)} = 0.20\ m = 20\ cm.$$

Answer: $20\ cm$.