Answer on Question #90634, Physics / Mechanics | Relativity

A particle is projected vertically upwards from a point O with initial speed 12.5m/s. At the same instant another particle is released from rest at a point 10m vertically above O. Find the height above O at which the particles meet. (Take $g=10m/s^2$).

Solution:

Let the particles meet at a height h from O at time t.

Distance travelled by particle 1 in time t measured from O is

$$h = ut - \frac{1}{2}gt^2 \quad ......(1)$$

Distance travelled by particle 2 in time t measured from A is

$$10 - h = \frac{1}{2}gt^2 \quad ....(2)$$

as the particle 2 starts from rest, u =0.

Therefore

$$10 - \left(ut - \frac{1}{2}gt^2\right) = \frac{1}{2}gt^2$$

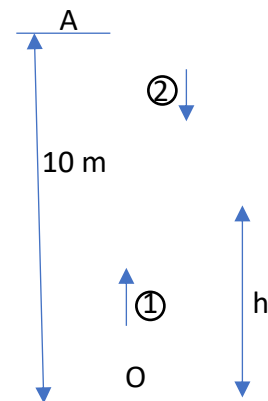$$10 - ut + \frac{1}{2}gt^2 = \frac{1}{2}gt^2$$

$$ut = 10$$

$$t = \frac{10}{u} = \frac{10}{12.5}$$

$$t = 0.8\,s$$

Distance travelled in 0.8 s measured from O is

$$h = 12.5 \times 0.8 - \frac{1}{2} \times 10 \times 0.8^2 \qquad \text{[substituting t=0.8 s in equation (1)]}$$

$$\boxed{h = 6.8\,m}$$

Answer: The height above O at which the particles meet is 6.8 m.