

Answer on Question #73874 Physics / Mechanics | Relativity

A falling object requires $\tau = 1.50$ s to travel the last $s = 30$ m before hitting the ground. From what height above the ground h did it fall?

Solution:

Let us denote as t the total time of object motion. Then

$$h = \frac{gt^2}{2}$$

and

$$h - s = \frac{g(t - \tau)^2}{2}$$

These equations give

$$s = \frac{gt^2}{2} - \frac{g(t - \tau)^2}{2} = g\tau t - \frac{g\tau^2}{2}$$

So

$$t = \frac{s + \frac{g\tau^2}{2}}{g\tau} = \frac{s}{g\tau} + \frac{\tau}{2} = \frac{30}{9.8 \times 1.50} + \frac{1.50}{2} = 2.79 \text{ s}$$

Thus, the height

$$h = \frac{gt^2}{2} = \frac{9.8 \times 2.79^2}{2} = 38.16 \text{ m}$$

Answer: 38.16 m

Answer provided by <https://www.AssignmentExpert.com>