

Physics 10154 - Quiz 2A

A ball is thrown up vertically from ground level with some initial velocity. The ball is in free fall throughout its motion. 35 meters above ground, a person standing on top of a building watches the ball go by on its way up and starts a stop watch at that moment. The person measures 2.3 seconds from the time the ball passed until it reaches its maximum height.

- a) What was the initial velocity of the ball?
b) To what maximum height above ground level does the ball reach?

Last part

$$\Delta y = ?$$

$$v_{0y} = ?$$

$$v_y = 0$$

$$a_y = -9.8 \text{ m/s}^2$$

$$t = 2.3 \text{ s}$$

$$v_y = v_{0y} + a_y t$$

$$0 = v_{0y} - (9.8)(2.3)$$

$$v_{0y} = 22.54$$

↑
use as v for part 1

First part

$$\Delta y = 35$$

$$v_{0y} = ?$$

$$v_y = 22.54$$

$$a_y = -9.8$$

$$t = ?$$

$$v_y^2 = v_{0y}^2 + 2a_y \Delta y$$

$$(22.54)^2 = v_{0y}^2 + 2(-9.8)(35)$$

$$v_{0y}^2 = 1194$$

$$\boxed{v_{0y} = 35 \text{ m/s}}$$

b) Last part $\Delta y = v_y t - \frac{1}{2} a_y t^2$
 $= 0 - \frac{1}{2}(-9.8)(2.3)^2 = 25.9$

$$\Delta y_{\text{tot}} = 26 + 35 = \boxed{61 \text{ m}}$$