Answer on Question #57742, Physics / Mechanics | Relativity

A ball is thrown vertically into the air with an initial speed of 22.8 m/s. During its flight at one instant the ball was observed to be moving with a velocity of -16.1 m/s. Calculate the elapsed time between these two velocities. Round your answer to three significant digits.

Solution:

Choose upward as the positive vertical direction. Then, after the ball is released, it is free falling object with acceleration a = -g. The acceleration of gravity is 9.8 m/s².

The kinematic equation is

$$v = v_0 - gt$$

From given,

$$v = -16.1 \text{ m/s}$$
$$v_0 = 22.8 \text{ m/s}$$

Thus, time between these two velocities

$$t = \frac{v_0 - v}{g} = \frac{22.8 - (-16.1)}{9.8} = 3.97 \text{ s}$$

Answer: 3.97 s