

### Answer on Question #67144-Physics-Mechanics-Relativity

A table tennis ball is dropped unto the floor from a height of 4m and it rebounds to a height of 3m. If the time of contact with the floor is 0.01s. What is the magnitude and direction of the acceleration during the contact? Find the final velocity on hitting the ground?

#### Solution

The initial velocity on hitting the ground is

$$v_1 = \sqrt{2gh_1} = \sqrt{2(9.8)(4)} = 8.85 \frac{m}{s} \text{ Downward.}$$

From the conservation of energy the kinetic energy of a ball after on hitting the ground is equal to the potential energy at the highest point of trajectory:

$$\frac{mv_2^2}{2} = mgh_2$$

Thus, the final velocity on hitting the ground is

$$v_2 = \sqrt{2gh_2} = \sqrt{2(9.8)(3)} = 7.67 \frac{m}{s} \text{ Upward.}$$

The acceleration during the contact is

$$a = \frac{v_2 - (-v_1)}{t} = \frac{7.67 + 8.85}{0.01} = 1652 \frac{m}{s^2} \text{ Upward.}$$

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