Answer on Question #51371-Physics-Mechanics-Kinematics-Dynamics

A ball of moist clay falls $h = 17.5\ m$ to the ground. It is in contact with the ground for $t = 19.0\ ms$ before stopping. (a) What is the average acceleration of the ball during the time it is in contact with the ground? (Treat the ball as a particle.)

(b) Is the average acceleration up or down?

Solution

(a) The speed of the ball before the contact is

$$v = \sqrt{2gh},$$

where $g = 9.81\frac{m}{s^2}$ is the acceleration due to the gravity.

The average acceleration of the ball during the time it is in contact with the ground is

$$\bar{a} = \frac{v_f - v_i}{t} = \frac{0 - \sqrt{2gh}}{t} = -\frac{\sqrt{2 \cdot 9.81\frac{m}{s^2} \cdot 17.5\ m}}{19.0 \cdot 10^{-3}s} = -975\frac{m}{s^2}.$$

(b) The sign "-" in average acceleration means that it directed up (the velocity of the ball before the contact is down, but the final velocity of the ball is zero).

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