Answer on Question #44164 – Physics – Mechanics, Kinematics, Dynamics

Question:

A body is falling from a vertical height of 10 m pierces through a distance of 1 m in sand. Calculate the average retardation in sand. {g=accel. Due to gravity.}

Answer:

The law of conservation of energy:

$$\frac{mv^2}{2} + 0 = 0 + mgh$$

where h is height, g is acceleration due to gravity.

Therefore, speed before collision with sand equals:

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

Uniform deceleration in sand ($d = 1\ m$):

$$d = \frac{v^2}{2a}$$

The average retardation equals:

$$a = \frac{v^2}{2d} = \frac{2gh}{2d} = \frac{h}{d}g = 10g = 98.1\frac{m}{s^2}$$

Answer: $98.1\ \frac{m}{s^2}$