Answer on Question #72006 Physics / Other

A metal ball of mass $m = 0.5$ kg is dropped from top of a vertical Clift of height $h = 90$ m. When it hits the beach below it penetrates to a depth of $S = 6.0$ cm calculate the average retarding force of the sand (neglect air resistance).

Solution:

The velocity of the ball when it hits the beach

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

After penetration in the sad the ball stopped. So final velocity

$$v_f = 0$$

The depth of preparation

$$S = \frac{v_i^2 - v_f^2}{2a} = \frac{v_i^2}{2a} = \frac{gh}{a}$$

Where a is acceleration of the ball due to retarding force of the sand.

The Newton's second law

$$F = ma$$

gives

$$F = m\frac{gh}{S}$$

$$F = \frac{0.5 \times 10 \times 90}{0.06} = 7500 \text{ N} = 7.5 \text{ kN}.$$

Answer: $F = 7.5$ kN.