

Answer on Question #68260 Physics / Mechanics | Relativity

A stone is thrown vertically upward with a speed of 12.0 m/s from the edge of a cliff 70.0 m high;

- (a) How much later does it reach the bottom of the cliff?
- (b) What is its speed just before hitting?
- (c) What total distance did it travel?

Solution:

(a) The displacement of the stone is equal 70.0 m, so

$$s = v_0 t + \frac{at^2}{2}.$$

$$70 = -12t + 5t^2,$$

$$t^2 - 2.4t - 14 = 0$$

$$D = 5.76 + 4 \times 14 = 61.76$$

$$t = \frac{2.4 + \sqrt{61.76}}{2} = 5.13 \text{ s.}$$

(b) $v = v_0 + at = -12 + 10 \times 5.13 = 39.3 \frac{\text{m}}{\text{s}}$

(c) $l = l_1 + l_2 = 2l_1 + s.$

$$l_1 = \frac{v_0^2}{2g} = \frac{144}{20} = 7.2 \text{ m.}$$

Thus total distance

$$l = 2 \times 7.2 + 70 = 84.4 \text{ m.}$$

Answers:

- (a) 5.13 s.
- (b) $39.3 \frac{\text{m}}{\text{s}}$
- (c) 84.4 m.

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