

Answer Question #65330 – Physics – Mechanics

A stone with a mass of 0.450 kg is dropped from the edge of a cliff. When the stone strikes the ground, the internal energy of the stone and ground increase by 1770 J. If the stone is initially at rest when it is dropped, how high above the ground is the cliff?

Solution. Since the stone was at rest initially, it had only potential energy equal to $E = mgh$, where $m = 0.450\text{kg}$ – the mass of the stone, $g = 9.8\frac{m}{s^2}$ – gravitational acceleration, h – the height of the cliff (the ground level is considered as the zero level of potential energy).

According to the law of conservation of energy the potential energy of the stone is transformed into kinetic energy (before the strike). Then the kinetic energy is transformed into internal energy of the stone and ground (after the strike). Therefore the initial potential energy of the stone is equal to the sum of change in internal energy of the stone and the ground.

$$mgh = 1770 \rightarrow h = \frac{1770}{0.450 \cdot 9.8} \approx 401m.$$

Answer. $401m$

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