

Answer Question #65855, Physics – Mechanincs – Relativity

A 73-kg boy is surfing and catches a wave which gives him an initial speed of 1.6 m/s. He then drops through a height of 1.55 m, and ends with a speed of 8.5 m/s. How much nonconservative work was done on the boy?

Solution. Use the law of conservation of energy. At the initial moment the boy has kinetic energy $\frac{mv_i^2}{2}$ and potential energy mgh . Total energy $E = \frac{mv_i^2}{2} + mgh$. At the final moment the body has kinetic energy $\frac{mv_f^2}{2}$. According to the condition of the problem
 $m = 73\text{kg}, v_i = 1.6\frac{\text{m}}{\text{s}}, v_f = 8.5\frac{\text{m}}{\text{s}}, h = 1.55\text{m}.$

According to the law of conservation of energy the work of the nonconservative forces can be found as subtraction of the initial and final energy

$$W = \frac{mv_f^2}{2} - \frac{mv_i^2}{2} - mgh.$$

$$\text{Hence } W = \frac{73 \cdot 8.5^2}{2} - \frac{73 \cdot 1.6^2}{2} - 73 \cdot 9.8 \cdot 1.55 \approx 1434.8\text{J}.$$

Answer. 1434.8J

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