Answer on Question #43397, Physics, Mechanics | Kinematics | Dynamics

A child, initially at rest at the top of 3.55 m high slide, slides down to a height of .480 m. At the bottom of the slide, the child has a speed of 2.45 m/s. If the mass of the child is 34.5 kg, what is the change in the mechanical energy of the child?

Solution.

Mechanical energy is the sum of potential and kinetic energy:

$$E_{mech} = E_{pot} + E_K$$

At the top and at the bottom of the slide corresponding child's energy is:

$$E_1 = E_{pot1} + E_{K1} = mgh_1 + 0 = mgh_1$$

$$E_2 = E_{pot2} + E_{K2} = mgh_2 + \frac{mV^2}{2}$$

The change in the mechanical energy:

$$\Delta E = E_1 - E_2 = mg(h_1 - h_2) - \frac{mV^2}{2}$$

Numerically:

$$\Delta E = 34.5kg \cdot 9.8\frac{m}{s^2} \cdot (3.55 - 0.48) - \frac{34.5kg \cdot \left(2.45\frac{m}{s}\right)^2}{2} \approx 934\,J$$

Answer: $934\,J$