1. A bucket of water of mass 100 metric tons accelerates from rest to a stop at 72 km/h on a horizontal track. Calculate the work done by the locomotive engine neglecting friction.

Solution.

$$A = \Delta\frac{mv^2}{2} = \frac{mv^2}{2} - \frac{m{v_0}^2}{2} = \frac{m(v^2 - {v_0}^2)}{2}$$

Given: $m = 100\ 000\ kg,\ v = 72\frac{km}{hour} = 72\frac{1000 \cdot m}{3600\ s} = 20\frac{m}{s},\ v_0 = 0\frac{km}{hour}$

Find: A—?

$$A = \frac{100\ 000\ kg \cdot (20^2\left(\frac{m}{s}\right)^2 - 0)}{2} = 20\ MJ$$

Answer:
$A = 20\ MJ$