Answer on Question#40535, Physics, Mechanics

What amount of water in kg would be lifted by a motor having power 0.5 hp at the height of 5 m in 98 seconds?

Solution:

The motor provides the force that lifts the mass up a height h against the force of gravity. Horsepower is a unit of power, which is work performed per unit time, P = W/t. If you know the power and the amount of time, the work that's performed by the motor is given by:

$$W = P \cdot t$$

where P = power and t = time.

Since the water is lifted through a height of h = 5 m, work done is equal to the potential energy PE = mgh.

$$W = mgh$$

So,

$$Pt = mgh$$

Solve for mass (m):

$$m = \frac{Pt}{gh}$$

One electrical horsepower is equal to 746 watts, g = the acceleration due to gravity at the surface of the Earth (9.8 m/s²)

Thus,

$$m = \frac{Pt}{gh} = \frac{0.5 \cdot 746 \cdot 98}{9.8 \cdot 5} = 746 \text{ kg}$$

Answer. m = 746 kg.