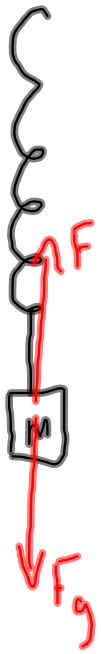
From Hw

PP|258

37. $k = 1.50\ N/m$

$x = +10.0\ cm$

$m = ?$



$F_a = kx$

$F_g = kx$

$mg = kx$

$m = \frac{kx}{g}$

$m = \frac{(1.50\ N/m)(0.100\ m)}{9.81\ m/s^2}$

$m = 0.0153\ kg$

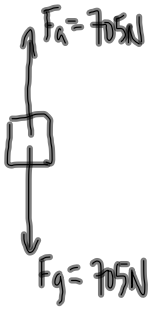
§6-4 Power + Efficiency

How much horsepower is generated by someone running up a set of stairs?

$F_g = 705\,N$

$\Delta d = 8(18.5cm)$

$\Delta t = 2.34s$



$W = F_{\parallel} \Delta d$

$W = (705N)(8)(0.185m)$

$W = 1043.4J$

To find the work done in 1 s:

$$\frac{W}{\Delta t} = \frac{1043.4J}{2.34s}$$

$$P = \frac{W}{\Delta t}$$

$$\text{POWER} = \frac{W}{\Delta t} = 446\,\frac{J}{s}$$ Watt (W)

$1\ hp = 746\ W$

$$x\ hp = 446\,W\left(\frac{1\ hp}{746\,W}\right)$$

$x = 0.598\ hp$

"Power" Bill

pay for the # of kWh

$P = \frac{W}{\Delta t}$

$P \cdot \Delta t$

Energy / work

$W = P \cdot \Delta t$

you really pay for

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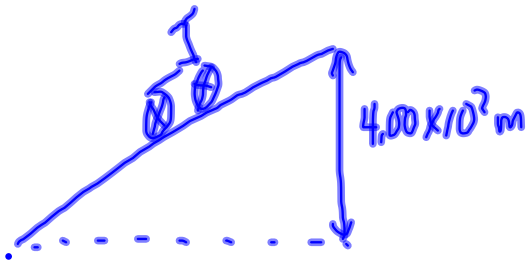
MP|264



$m = 60.0\,kg$

$\Delta d = 4.00 \times 10^2\,m$

$\Delta t = 1.00\,min = 60.0\,s$

a) $w = ?$

b) $P = ?$

$W = F_{||} \Delta d$

$W = F_g \Delta d$

$W = mg\Delta d$

a) $W = (60.0\,kg)(9.81\,m/s^2)(4.00 \times 10^2\,m)$

$W = 2.35 \times 10^5\,J$

b) $P = \frac{W}{\Delta t}$

$P = \frac{2.35 \times 10^5\,J}{60.0\,s}$

$P = 3.92 \times 10^3\,W$

Efficiency

$$\text{Efficiency} = \frac{E_O}{E_I} \times 100\%$$

where E_O is the output or useful energy (J)

E_I is the input energy (J)

MP|269

$E_I = 3.50 \times 10^3 \text{ J}$

$m = 0.500 \text{ kg}$
$h = 1.00 \times 10^2 \text{ m}$
} E_g (output energy)

$$E_g = mgh$$

$$E_g = (0.500\text{kg})(9.81\text{m/s}^2)(1.00 \times 10^2\text{m})$$

$$E_g = 490.5 \text{ J} \quad \text{(output energy)}$$

$$\text{Efficiency} = \frac{E_O}{E_I} \times 100\%$$

$$= \frac{490.5 \text{ J}}{3.50 \times 10^3 \text{ J}} \times 100\%$$

$$= 14.0\% \leftarrow$$ 14.0% of the chemical energy was transformed into gravitational PE

To Do

1. PP|266
2. PP|270-271

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