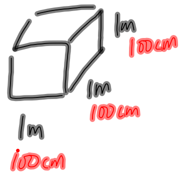
PP|250

28.



$V = (100\,cm)^3$

$V = 1000000\,cm^3$

$V = 1000000\,mL$

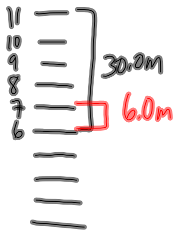
$V = 1000\,L$

$m\cancel{g} = 1000\,kg \quad 1.00 \times 10^3\,kg$

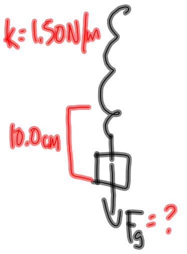
$$x\,kg = 1m^3 \left(\frac{100cm}{1m}\right)^3 \left(\frac{1mL}{1cm^3}\right)\left(\frac{1L}{1000mL}\right)\left(\frac{1.00\,kg}{1L}\right)$$

$E_g = mgh$

PP|254 ⇒ $W = \Delta E_g$ (Work-Energy Theorem)



PP|258 - Hooke's Law $F_a = kx$



$F_a = kx$

$F_g = kx$

$mg = kx$

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

mp|261 ⇒ $E_e = \frac{1}{2}kx^2$ and $W = \Delta E_e$ (Work-Energy Theorem)

$-$ ← compression

40. $F_a = 18N$

$x = -15\,cm$

$\Delta E_e = ?$

$F_a = kx$

$k = \frac{-18N}{-0.15m}$

$k = 120\,\frac{N}{m}$

$\Delta E_e = E_{e_2} - \cancel{E_{e_1}}$

$\Delta E_e = \frac{1}{2}kx^2$

$\Delta E_e = \frac{1}{2}(120\,N/m)(-0.15\,m)^2$

increase in potential energy of spring. $\longrightarrow$ $\Delta E_e = \cancel{1.35}\,J$

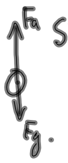
1.4

Power

S1: $F_g = 760N$

$\Delta d = 8 \times 17.5cm$

$\Delta t = 4.03s$



S2: $F_g = 690N$

$\Delta d = 8 \times 17.5cm$

$\Delta t = 2.16s$

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

$W = 760N(8 \times 0.175m)$

$W = 1064J$

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

$W = 690N(8 \times 0.175m)$

$W = 966J$

$$\text{Power} = \frac{1064J}{4.03s}$$

$$\text{Power} = 2.6 \times 10^2 \frac{J}{s}$$

$$\boxed{P = 2.6 \times 10^2 W}$$

$$\text{Power} = \frac{966J}{2.16s}$$

$$\text{Power} = 4.5 \times 10^2 \cancel{\frac{J}{s}}$$

$$\boxed{P = 4.5 \times 10^2 \ W}$$

Power is the rate at which work is done.

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

Where P is the power ($\frac{J}{s}$ or Watts)

W is the work (J)

Δt is the time to do the work (s)

mp|263

$W = 1.50 \times 10^5 J$

$\Delta t = 10.0s$

$P = ?$

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

$$P = \frac{1.50 \times 10^5 J}{10.0s}$$

$$\boxed{P = 1.50 \times 10^4 W}$$

mp|264 (look over)

A Note about units:

Your "power" bill changes you by the $\underbrace{kW}_{P} \cdot \underbrace{h}_{\Delta t}$

You are really being changed for the energy you use:

$W = P \Delta t$ (kW·h ⇒ energy unit)

Efficiency

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

where E_O → output energy (useful energy) (J)
E_I → input energy (energy used) (J)

mp|269

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

$m = 0.500 \text{ kg}$
$h = 1.00 \times 10^2 \text{ m}$
$\Big]\ E_g \Rightarrow E_O$ (useful energy)

Efficiency?

$$E_g = mgh$$
$$E_g = (0.500 \text{ kg})(9.81 \text{ m/s}^2)(1.00 \times 10^2 \text{ m})$$
$$E_g = 490.5 \text{ J}$$

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

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

$$\boxed{\text{Eff} = 14.0\%}$$

TO DO

① PP|266
② PP|270-271
③ p277|34-39