V|2

$m = 1200\,kg$

$\Delta t = 12\,s$

$v_{max} = 100\,km/h = 27{,}8\,\frac{m}{s}$

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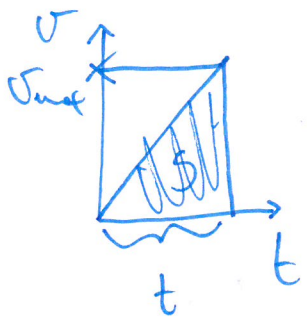
a) $F = m \cdot a = 1200\,kg \cdot \frac{27{,}8\,\frac{m}{s}}{12\,s} = \underline{\underline{2780\,N}}$

$a = \frac{\Delta v}{\Delta t}$

b) 

$s = \frac{v_{max}}{2} \cdot \Delta t = \frac{27{,}8\,\frac{m}{s}}{2} \cdot 12\,s =$

$= \underline{\underline{166{,}8\,m}}$

c) $W = F \cdot s = 2780\,N \cdot 166{,}8\,m = 463704\,J$

$463{,}7\,kJ$

d) $P = \frac{W}{t} = \frac{463704\,J}{12\,s} = 38642\,W = 38{,}6\,kW$

$W = F \cdot s \rightarrow \frac{v_{max} \cdot \Delta t}{2}$

$m \cdot a$

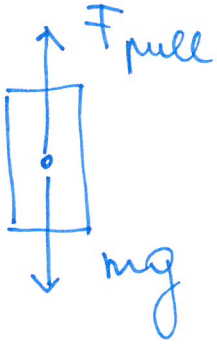
$a = \frac{\Delta v}{\Delta t}$

V|5 $m = 12\,kg$ — 10 kg water, 2 kg bucket

$10\,l = 10\,kg$

$h = 8\,m$

$v = 50\,cm/s = 0{,}5\,m/s$



a.) $\sum F = m \cdot a$

$a = 0$

$F_{pull} = m \cdot g = 12\,kg \cdot 9{,}81\,m/s^2 = \underline{117{,}7\,N}$

b.) $W = F_{pull} \cdot s = m \cdot g \cdot h = 117{,}7\,N \cdot 8\,m =$

$= \underline{941{,}7\,J.}$

c.) $P = \frac{W}{t}$ $\quad t = \frac{s \to h}{v} = \frac{8\,m}{0{,}5\,m/s} = 16\,sec$

$P = \frac{941{,}7\,J}{16\,sec} = 58{,}55\,W \left[\frac{J}{s}\right]$

d.) one bucket → 10 l

$4{,}8\,m^3 \to 4800\,dm^3 \to 4800\,l$

$\frac{4800\,l}{10\,l \to \text{one bucket}} = \underline{480 \text{ lifting up}}$

$W_{total} = 941{,}7\,J \cdot 480 = 451968\,J$

$E_{[cal]} = \frac{E}{4{,}19} = \frac{451968\,J}{4{,}19} = 107868\,cal$

$\downarrow$

$107{,}9\,kcal$

V9

$m = 0{,}8\,kg$

$h_1 = 2\,m$

$h_2 = 1{,}2\,m$

$\Delta h = 2\,m - 1{,}2\,m = 0{,}8\,m$

$E_{pot_1} - E_{pot_2} = m \cdot g \cdot \Delta h = 0{,}8\,kg \cdot 9{,}81\,\frac{m}{s^2} \cdot 0{,}8\,m =$

$\underline{\underline{6{,}28\,J}}$

V7

$k = 3 \cdot 10^5\,N/m$

$s = x = 2\,mm = 0{,}002\,m$

$E_{elastic} = \frac{1}{2} \cdot k \cdot s^2 = \frac{1}{2} \cdot 3 \cdot 10^5\,\frac{N}{m} \cdot (0{,}002\,m)^2 =$

$\underline{\underline{0{,}6\,J}}$

VI\10

$$E = m \cdot c^2 = 9{,}11 \cdot 10^{-31}\,kg \cdot \left(3 \cdot 10^8 \tfrac{m}{s}\right)^2 =$$

$$8{,}2 \cdot 10^{-14}\,J$$

$$E_{(eV)} = \frac{8{,}2 \cdot 10^{-14}\,J}{1{,}6 \cdot 10^{-19}} = 512438\,eV = 512{,}4\,keV$$

VII\2

$F = 100N$

$A = 1\,mm^2 = \left(10^{-3}\right)^2 m^2 = 10^{-6}\,m^2$

$$p = \frac{F}{A} = \frac{100N}{10^{-6}\,m^2} = 10^8\,Pa = 100\,MPa$$

(10^6)

VII\3

$m = 70kg$

$A = 200\,cm^2 = {}^{100.100}0{,}02\,m^2$

$$p = \frac{F}{A} = \frac{m \cdot g}{A} = \frac{70kg \cdot 9{,}81\,\frac{m}{s^2}}{0{,}02\,m^2} = 34335\,Pa$$

$34{,}3\,kPa$

$4\,cm^2 \rightarrow 4 \cdot 10^{-4}\,m^2$