(V/2.)

$m = 1.2 \text{ tons} = 1200 \text{ kg}$

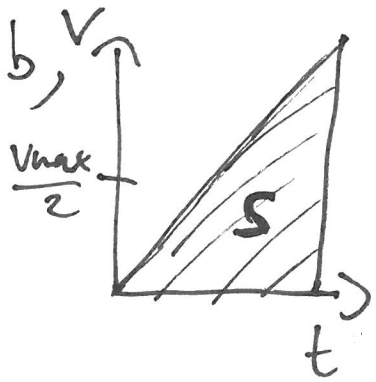
$\Delta t = 12 \text{ s}$

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

a) $F = m \cdot a = m \cdot \frac{\Delta v}{\Delta t} = 1200 \text{kg} \cdot \frac{27.8 \text{ m/s}}{12 \text{ s}} =$

$= 2780 \text{N}$

b)



$s = \frac{v_{max}}{2} \cdot \Delta t = \frac{27.8 \text{ m/s}}{2} \cdot 12 \text{s} =$

$= 166.8 \text{ m}$

c)

$W = F \cdot s = 2780 \text{N} \cdot 166.8 \text{ m} = 463704 \text{J} =$

$= 463.7 \text{kJ}$

d)

$$P = \frac{W}{t} = \frac{463\,7047}{12\,s} = 38642\,W\,(\text{watt}) =$$

$$= 38.68\,kW$$

e)

$$E = \frac{1}{2} m v^2 = \frac{1}{2} 1200\,kg \cdot (27.8\,m/s)^2 =$$

$$= 463704\,J$$

V/4.

$m = 70\,g = 0.07\,kg$

$h = 15\,cm = 0.15\,m$

$v = 30\,cm/s = 0.3\,m/s$

a) $W_{lift} = m \cdot g \cdot h = 0.07\,kg \cdot 9.81\,m/s^2 \cdot 0.15\,m =$

$= 0.103\,J$

b) $W_{acceleration} = E_{kin} = \frac{1}{2} m v^2 = \frac{1}{2} 0.07\,kg \cdot (0.3\,m/s)^2 =$

$= 0.00315\,J = 3.15\,mJ$

c) $W_{total} = W_{lift} + W_{acceleration} = 0.103\,J + 0.00315\,J =$

$= 0.10615\,J$

$P = \frac{W_{total}}{t} = \frac{0.10615\,J}{0.2\,s} = 0.531\,W$ (watt)

V/5.

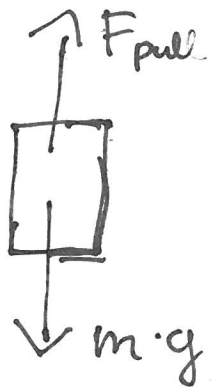
$m = 12\ kg \rightarrow$ 10kg water + 2 kg bucket

$h = 8\ m$

$v = 50\ cm/s = 0.5\ m/s$

$a = \emptyset$

a,



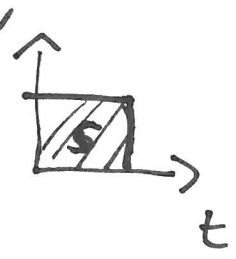
$\sum F = m \cdot a = \emptyset$

$F_{pull} = m \cdot g = 12kg \cdot 9.81\ m/s^2 = \underline{117.7N}$

b, $W = F_{pull} \cdot s = m \cdot g \cdot h = 117.7N \cdot 8m = \underline{941.7J}$

c, $P = \frac{W}{t}$

$s = v \cdot t$



$t = \frac{s}{v} = \frac{h}{v} = \frac{8m}{0.5\ m/s} = 16s$

$P = \frac{W}{t} = \frac{941.7J}{16s} = \underline{58.85\ W}$

d)

$4.8\,m^3 = 4.8 \cdot 10^3\,dm^3 = 4800\,\ell$

one bucket $\rightarrow 10\,\ell$

480 lifting up

$W_{total} = 480 \cdot 941.7\,J = 451968\,J$

$$E[cal] = \frac{E[J]}{4.19} = \frac{451968}{4.19} \approx 107868\,cal =$$

$\approx 107.9\,kcal$

✓/9.

$m = 0.8\,kg$

$h_1 = 2\,m$

$h_2 = 1.2\,m$

$\Delta h = h_1 - h_2 = 2\,m - 1.2\,m = 0.8\,m$

$E_{pot_1} - E_{pot_2} = m \cdot g \cdot h_1 - m \cdot g h_2 = m \cdot g \cdot \Delta h =$

$= 0.8\,kg \cdot 9.81\,m/s^2 \cdot 0.8\,m = 6.28\,J$

V/7.

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

$s = x = 2\,mm = 2 \cdot 10^{-3} \, m$

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

$$= 0.6 \, J$$

V/10.

$$E = m \cdot c^2 = 9.11 \cdot 10^{-31} \, kg \cdot (3 \cdot 10^8 \, m/s)^2 = 8.2 \cdot 10^{-14} \, J$$

$$1 \, eV = 1.6 \cdot 10^{-19} \, J$$

$$E[eV] = \frac{8.2 \cdot 10^{-14} \, J}{1.6 \cdot 10^{-19} \, J/eV} = 512438 \, eV \approx 512.4 \, KeV$$

VI/2.

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

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

VI/3.

a) $m = 70\,kg$

$$A = 200\,cm^2 = 200 \cdot 10^{-4}\,m^2 = 0.02\,m^2$$

$$p = \frac{F}{A} = \frac{m \cdot g}{A} = \frac{70kg \cdot 9.81\,m/s^2}{0.02\,m^2} = 34335\,pa \approx 34.3\,kpa$$

b) $A = 4\,cm^2 = 4 \cdot 10^{-4}\,m^2$

$$p = \frac{70kg \cdot 9.81\,m/s^2}{4 \cdot 10^{-4}\,m^2} = 1.72 \cdot 10^6\,pa = 1.72\,Mpa$$

(V1/5.)

a) ρ rho

$$\rho = 19.3 \frac{g}{cm^3} = 19\,300 \frac{kg}{m^3}$$

$$x = 10\,cm = 0.1\,m$$

$$m = \rho \cdot V$$

$$V = x^3 = (0.1\,m)^3 = 10^{-3}\,m^3$$

$$m = \rho \cdot V = 19\,300 \frac{kg}{m^3} \cdot 10^{-3}\,m^3 = \underline{19.3\,kg}$$

b, $p = \frac{F}{A}$

$$A = x^2 = (0.1\,m)^2 = 0.01\,m^2$$

$$p = \frac{F}{A} = \frac{m \cdot g}{A} = \frac{19.3\,kg \cdot 9.81\,m/s^2}{0.01\,m^2} = 18\,933\,Pa \approx$$

$$\underline{18.9\,kPa}$$