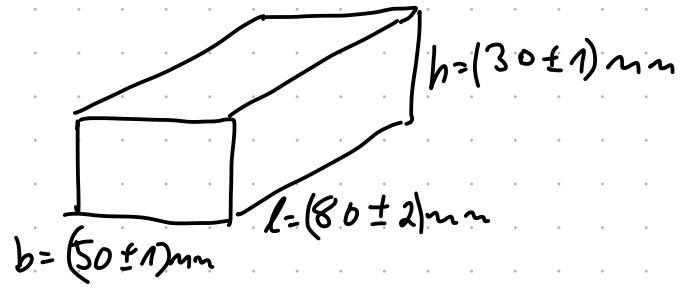
8.1

a)



$$\frac{\delta V}{V} = \frac{\delta l}{l} + \frac{\delta b}{b} + \frac{\delta h}{h} = \frac{2\,mm}{80\,mm} + \frac{1\,mm}{50\,mm} + \frac{1\,mm}{30\,mm}$$

$$= 0{,}025 + 0{,}02 + 0{,}033$$

$$\frac{\delta V}{V} = 0{,}0783 = 0{,}08 = 8\%$$

$$\delta V = V \cdot 0{,}0783 = 80\,mm \cdot 50\,mm \cdot 30\,mm \cdot 0{,}0783 = 9396\,mm^3$$

$$\underline{\delta V = 9396\,(10^{-1}\,cm)^3 = 9{,}396\,cm^3 = 9\,cm^3}$$

b) $$\rho = \frac{m}{V} = \frac{1{,}55\,kg}{l \cdot b \cdot h} = \frac{1{,}55\,kg}{80\,mm \cdot 50\,mm \cdot 30\,mm}$$

$$= \frac{1{,}55\,kg}{0{,}8\,dm \cdot 0{,}5\,dm \cdot 0{,}3\,dm} = 12{,}92\,\frac{kg}{dm^3}$$

$$\frac{\delta \rho}{\rho} = \frac{\delta m}{m} + \frac{\delta V}{V} = \frac{0{,}05\,kg}{1{,}55\,kg} + 0{,}0783 = 0{,}0323$$

$$\frac{\delta \rho}{\rho} = 0{,}111 \qquad \delta \rho = 0{,}111 \cdot 12{,}92\,\frac{kg}{dm^3} = 1{,}43\,\frac{kg}{dm^3}$$

$$\underline{\rho = (13 \pm 1)\,\frac{kg}{dm^3}}$$

8.2

a) Volum presset ned = Volum hevet opp

$$V_1 = V_2$$

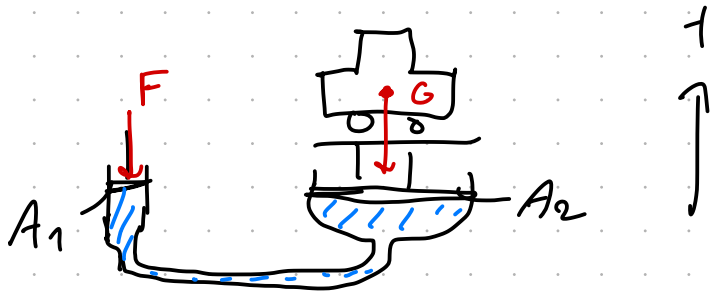
$$A_1 \cdot h_1 = A_2 \cdot h_2$$

$$h_2 = h_1 \frac{A_1}{A_2} = h_1 \frac{\pi \left(\frac{d_1}{2}\right)^2}{\pi \left(\frac{d_2}{2}\right)^2} = h_1 \frac{d_1^2}{d_2^2}$$

$$= 50\,cm \cdot \frac{(2{,}0\,cm)^2}{(15\,cm)^2} = 50\,cm \cdot \frac{4}{225} = 0{,}889\,cm$$

$$\underline{h_2 = 8{,}9\,mm}$$

b) $\frac{F}{G} = \frac{A_1}{A_2}$



$$G = F \cdot \frac{A_2}{A_1}$$

$G = m \cdot g$

$$m = \frac{F}{g} \cdot \frac{A_2}{A_1} = \frac{240\,N}{9{,}81\,N/kg} \cdot \frac{225}{4} = 1376\,kg$$

$$\underline{m = 1{,}4\,tonn}$$

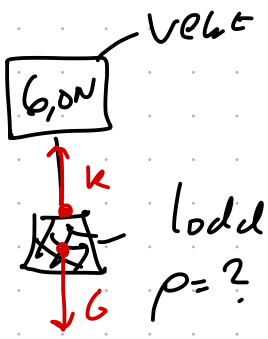
c) $\underline{W} = F \cdot s = 240N \cdot (-50 \cdot 10^{-2} m) = -120\,J = \underline{-0{,}12kJ}$

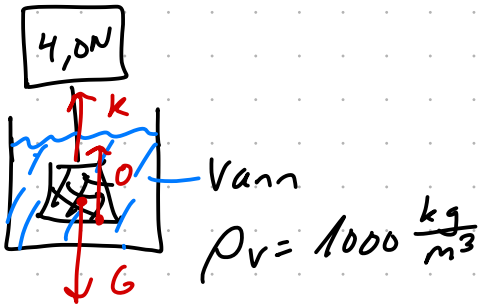
Nedover

d) $\underline{W} = F \cdot s = m \cdot g \cdot s = 1376\,kg \cdot 9{,}81\,\frac{N}{kg} \cdot 8{,}89 \cdot 10^{-3} m$

$$= 120\,J = \underline{0{,}12kJ}$$ Oppover

8.3





Lodd ; luft:

$K = G = 6{,}0\,N$

Lodd i vann :

$K + O - G = 0$

$K = 4{,}0\,N$

$G = 6{,}0\,N$

$O = G - K$

$$O = \rho_v \cdot V \cdot g = G - K$$

$$V = \frac{G-K}{\rho_v \cdot g}$$

$$G = mg = \rho V g$$

$$\rho = \frac{G}{V \cdot g} = \frac{G}{\frac{G-K}{\rho_v g} \cdot g} = \rho_v \frac{G}{G-K}$$

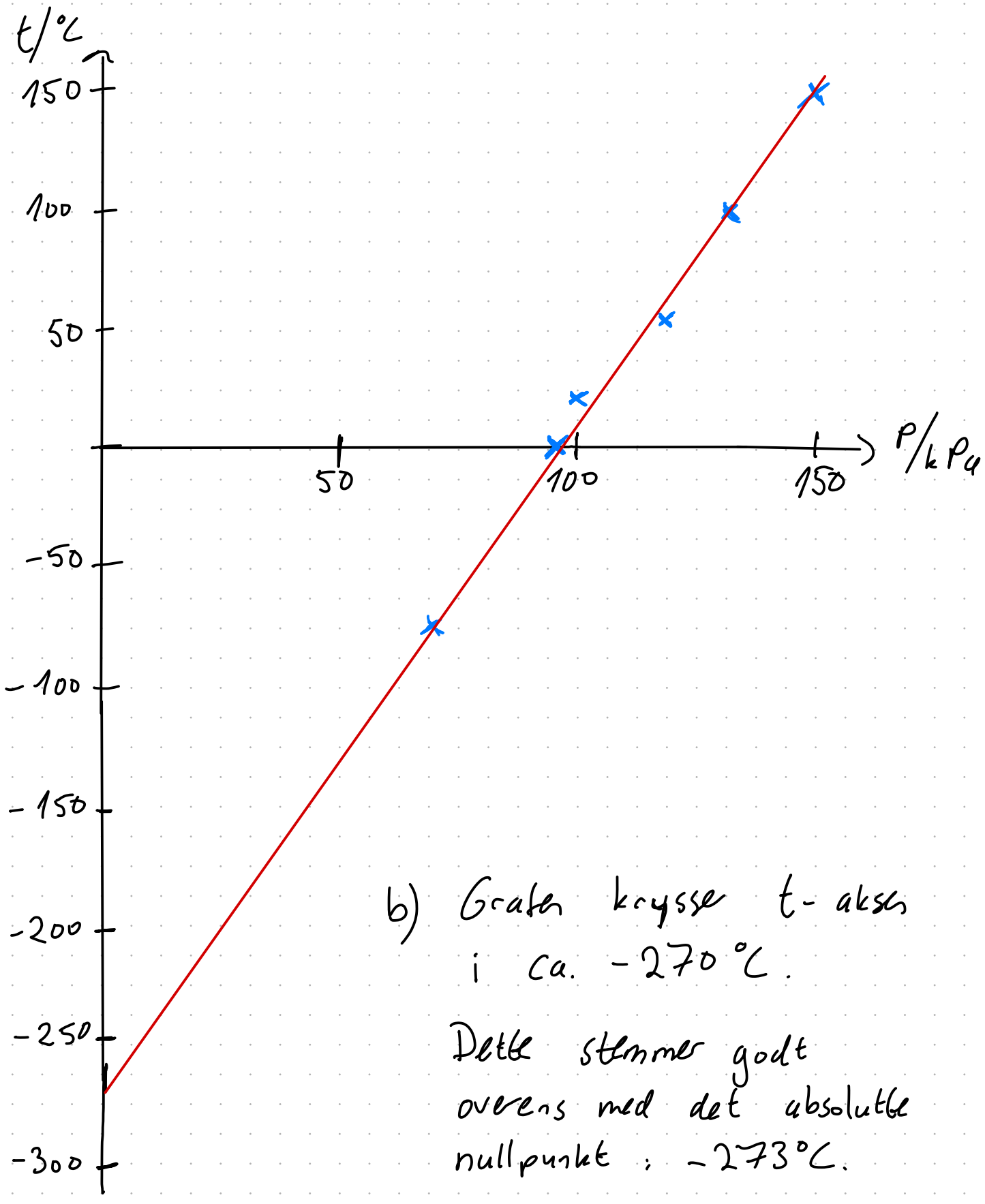
$$= 1000 \frac{kg}{m^3} \cdot \frac{6{,}0\,N}{6{,}0\,N - 4{,}0\,N} = 3000 \frac{kg}{m^3}$$

$$\rho = 3{,}0 \frac{kg}{dm^3}$$

8.4

t/°C	-78	0	20	60	100	150
p/kPa	70	95	100	120	130	150

a)



b) Grafen krysser t-aksen i ca. -270 °C.

Dette stemmer godt overens med det absolutte nullpunkt: -273°C.

Dere kan også løse b) ved å finne stigningstallet til grafen og regne dere frem.

8.5 Gjennomsnittlig translatorisk energi:

$$E_k = \frac{3}{2} kT$$

↑ ?

$$T = \frac{2E_k}{3k} = \frac{2 \cdot 3{,}20 \cdot 10^{-19}\,J}{3 \cdot 1{,}38 \cdot 10^{-23}\,\frac{J}{K}}$$

$$T = 15459\,K$$

$$\underline{T = 1{,}54 \cdot 10^{4}\,K}$$