6.01 $m = 90\,kg$ $\rho = \frac{m}{V}$ $\rho_v = 1{,}0\,\frac{kg}{dm^3}$

$\rho \cdot V = m$ $= 1{,}0 \cdot 10^3\,\frac{kg}{m^3}$

$V = \frac{m}{\rho}$

$V = \frac{90\,kg}{1{,}0\,\frac{kg}{dm^3}} = 90\,dm^3 = 90\,l$

$V = \frac{90\,kg}{1{,}0 \cdot 10^3\,\frac{kg}{m^3}} = 90 \cdot 10^{-3}\,m^3 = 0{,}090\,m^3$

6.02 $\rho = \frac{m}{V}$ $V = A \cdot h = \pi r^2 \cdot h$

$= \pi \cdot \left(\frac{d}{2}\right)^2 \cdot h = \pi \cdot \left(\frac{2{,}471\,cm}{2}\right)^2 \cdot 5{,}50\,cm$

$= 26{,}375\,cm^3$

$2 \cdot r = d = 2{,}471\,cm$

$h = 5{,}50\,cm$

$\rho = \frac{0{,}046133\,kg}{26{,}375\,cm^3}$

$= 1{,}7490 \cdot 10^{-3}\,\frac{kg}{cm^3}$

$= 1{,}75\,\frac{kg}{dm^3}$

6.03

$\rho = \frac{m}{V} = \frac{m}{a^2 \cdot h}$ $m = (65{,}85 \pm 0{,}05)\,g$

$\bar{\rho} = \frac{65{,}85\,g}{11{,}4^2 \cdot 63{,}7\,mm^3} = 7{,}9543 \cdot 10^{-3}\,\frac{g}{mm^3}$ $a = (11{,}4 \pm 0{,}2)\,mm$

$h = (63{,}7 \pm 0{,}3)\,mm$

$\rho_{max} = \frac{65{,}90\,g}{11{,}2^2 \cdot 63{,}4\,mm^3} = 8{,}2862 \cdot 10^{-3}\,\frac{g}{mm^3}$

$\rho_{min} = \frac{65{,}80\,g}{11{,}6^2 \cdot 64{,}0\,mm^3} = 7{,}6406 \cdot 10^{-3}\,\frac{g}{mm^3}$

$\Delta\rho = \frac{\rho_{max} - \rho_{min}}{2} = \frac{(8{,}2862 - 7{,}6406) \cdot 10^{-3}}{2}\,\frac{g}{mm^3} = 3{,}228 \cdot 10^{-4}\,\frac{g}{mm^3}$

$\rho = \bar{\rho} \pm \Delta\rho = (8{,}0 \pm 0{,}3) \cdot 10^{-3}\,\frac{g}{mm^3} = (8{,}0 \pm 0{,}3)\,\frac{g}{cm^3}$

6.07 $G_e = 40 \cdot 10^3\,N$ $A_f = 0{,}12\,m^2$

$$p = \frac{F}{A} = \frac{G_e}{2 \cdot A_f} = \frac{40 \cdot 10^3\,N}{2 \cdot 0{,}12\,m^2} = \underline{1{,}7 \cdot 10^5\,Pa}$$

6.09

Kraft fra vann + atmosfære

a) $p = p_0 + \rho g h$

$= 1{,}01 \cdot 10^5\,Pa + 998\,\frac{kg}{m^3} \cdot 9{,}81\,\frac{N}{kg} \cdot 2{,}00\,m$

$= \underline{1{,}21 \cdot 10^5\,Pa}$

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

$pA = F$

$F = 1{,}21 \cdot 10^5\,\frac{N}{m^2} \cdot 25\,m \cdot 5{,}0\,m$

$= 1{,}5 \cdot 10^7\,N = \underline{15\,MN}$

fra kon vann: $\Delta p = \rho g h$

$\Delta p = p - p_0$ $F = \rho g h \cdot A$

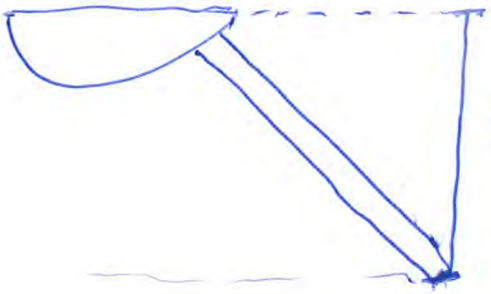
$F = 998\,\frac{kg}{m^3} \cdot 9{,}81\,\frac{N}{kg} \cdot 2{,}00\,m \cdot 25\,m \cdot 5{,}0\,m$

$= \underline{2{,}4 \cdot 10^6\,N}$

$= \rho_v \cdot V_v \cdot g = 998\,\frac{kg}{m^3} \cdot 25 \cdot 5{,}0 \cdot 2{,}00\,m^3 \cdot 9{,}81\,\frac{N}{kg}$

$= \underline{2{,}4 \cdot 10^6\,N}$

6.10



$A = \pi \cdot r^2$

$r = \frac{1}{2} d = 5{,}0\,cm$

$= 5{,}0 \cdot 10^{-2}\,m$

$A = \pi \cdot (5{,}0 \cdot 10^{-2}\,m)^2$

$= 7{,}85 \cdot 10^{-3}\,m^2$

$0{,}00785\,m^2$

$F = p \cdot A = (p_0 + \rho g h) \cdot A$

$= (1{,}01 \cdot 10^5 + 998 \cdot 9{,}81 \cdot 150)\,\frac{N}{m^2} \cdot A$

$= (1{,}01 \cdot 10^5 + 14{,}685 \cdot 10^5) \cdot 7{,}85 \cdot 10^{-3}\,m^2$

uten atmosfæren:

$= 11{,}5\,kN \approx \underline{12\,kN}$

6.11 $A_1 = 49\,cm^2$ $F_1 = G_1 = m_1 \cdot g$

$A_2 = 40 \cdot A_1$ F_2

$$p = \frac{F_2}{A_2} = \frac{F_1}{A_1}$$

$$F_2 = \frac{F_1}{A_1} \cdot A_2$$

$$F_2 = \frac{m \cdot g \cdot 40 \cdot \cancel{A_1}}{\cancel{A_1}} = 40 \cdot m \cdot g = 40 \cdot 10\,kg \cdot 9{,}81\,\frac{N}{kg}$$

$$= 400 \cdot 9{,}81\,N$$

F_2 blir for stor for ham.

6.13

a) $m = \rho \cdot V$

$$= 7{,}8\,\frac{g}{cm^3} \cdot 4{,}0\,cm^3 = 7{,}8 \cdot \frac{10^{-3}\,kg}{(10^{-2}\,m)^3} \cdot 4{,}0 \cdot (10^{-2}\,m)^3$$

$$= 31{,}2 \cdot 10^{-3}\,kg$$

$$G = m \cdot g = 31{,}2 \cdot 10^{-3}\,kg \cdot 9{,}81\,\frac{m}{s^2} = 0{,}31\,N$$

b) $O = \rho_v \cdot V \cdot g = 0{,}998 \cdot 10^3\,\frac{kg}{m^3} \cdot 4{,}0 \cdot (10^{-2}\,m)^3 \cdot 9{,}81\,\frac{N}{kg}$

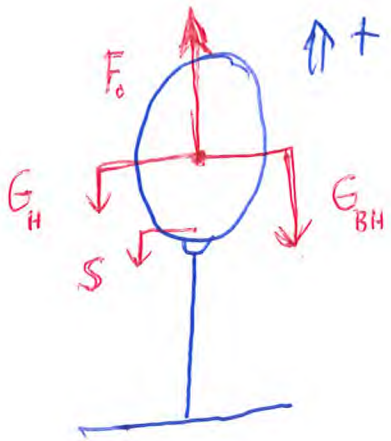
c) Kraft = Motkraft $= 0{,}039\,N$ $= 0{,}039\,N$

6.14 $V = 10\,m^3$ H_2-gass

$\rho_H = 0{,}090\,\frac{kg}{m^3}$

$\rho_L = 1{,}24\,\frac{kg}{m^3}$

$m_{BH} = 2{,}0\,kg$



a) $F_0 = ?$

$\sum F = 0$

$F_0 - S - G_H - G_{BH} = 0$

$F_0 - G_H - G_{BH} = S$

$S = F_0 - \rho_H \cdot V \cdot g - m_{BH} \cdot g$

$S = 121{,}6\,N - 0{,}090\,\frac{kg}{m^3} \cdot 10\,m^3 \cdot 9{,}81\,\frac{N}{m^3} - 2{,}0\,kg \cdot 9{,}81\,\frac{N}{kg}$

$= \underline{93\,N}$

a) $F_0 = \rho_L \cdot V_L \cdot g$

$= 1{,}24\,\frac{kg}{m^3} \cdot 10\,m^3 \cdot 9{,}81\,\frac{N}{kg}$

$= 121{,}6\,N$

$= \underline{0{,}12\,kN}$

6.17 a) $T = t + T_0 = (27 + 273)\,K = \underline{300\,K}$

b) $T = t + T_0 = (1538 + 273)\,K = \underline{1811\,K}$

c) $T = t + T_0$

$T - T_0 = t$

$t = (4 - 273)\,^\circ C = \underline{-269\,^\circ C}$

d) $T = t + T_0 \Rightarrow t = T - T_0$

$t = (5780 - 273)\,^\circ C = \underline{5507\,^\circ C}$

6.18 a) $T = t + T_0 = (27 + 273)K = 300K$

$E_K = \frac{3}{2}kT = \frac{3}{2} \cdot 1{,}38 \cdot 10^{-23} \frac{J}{K} \cdot 300K = \underline{6{,}21 \cdot 10^{-21} J}$

b) $m_{Ne} = 20{,}18\,u = 20{,}18 \cdot 1{,}66 \cdot 10^{-27} kg = 3{,}349 \cdot 10^{-26} kg$

$N = \frac{m}{m_{Ne}} = \frac{0{,}0040 kg}{3{,}349 \cdot 10^{-26} kg} = 1{,}194 \cdot 10^{23}$

$E = N \cdot E_K = 1{,}194 \cdot 10^{23} \cdot 6{,}21 \cdot 10^{-21} J = \underline{0{,}74 kJ}$

c) $\frac{1}{2} m v^2 = E_K$

$v = \sqrt{\frac{2E_K}{m}} = \sqrt{\frac{2 \cdot 6{,}21 \cdot 10^{-21} J}{3{,}349 \cdot 10^{-26} kg}} = 608{,}9 \frac{m}{s}$

$= \underline{0{,}61 \frac{km}{s}}$

6.20 $p_1 = 100 kPa$

$V_1 = 1{,}50 dm^3$

$T_1 = (273 + 27)K = 300K$

$V_2 = 0{,}800 dm^3$

$T_2 = (273 + 327)K = 600K$

$\frac{p_2 \cdot V_2}{T_2} = \frac{p_1 \cdot V_1}{T_1} \quad | \cdot \frac{T_2}{V_2}$

$p_2 = \frac{p_1 \cdot V_1}{T_1} \cdot \frac{T_2}{V_2}$

$p_2 = \frac{100 kPa \cdot 1{,}50 \cancel{dm^3} \cdot 600K}{300K \cdot 0{,}800 \cancel{dm^3}}$

$p_2 = \frac{100 kPa \cdot 1{,}50 \cdot 2}{0{,}800} = \frac{300 kPa}{0{,}800} = \underline{375 kPa}$

6.21 $V_1 = 1{,}50\,m^3$ ① $p_1 = 200\,kPa$ $t = 20{,}0°C$ $T_1 = 293\,K$

a) $\frac{p_2 V_2}{T_2} = \frac{p_1 V_1}{T_1}$ $\quad T_2 = T_1$

$p_2 = p_1 \frac{V_1}{V_2} = 200\,kPa \cdot \frac{1{,}50\,m^3}{1{,}00\,m^3} = \underline{300\,kPa}$ ②

b) $p_3 V_3 = p_2 V_2$

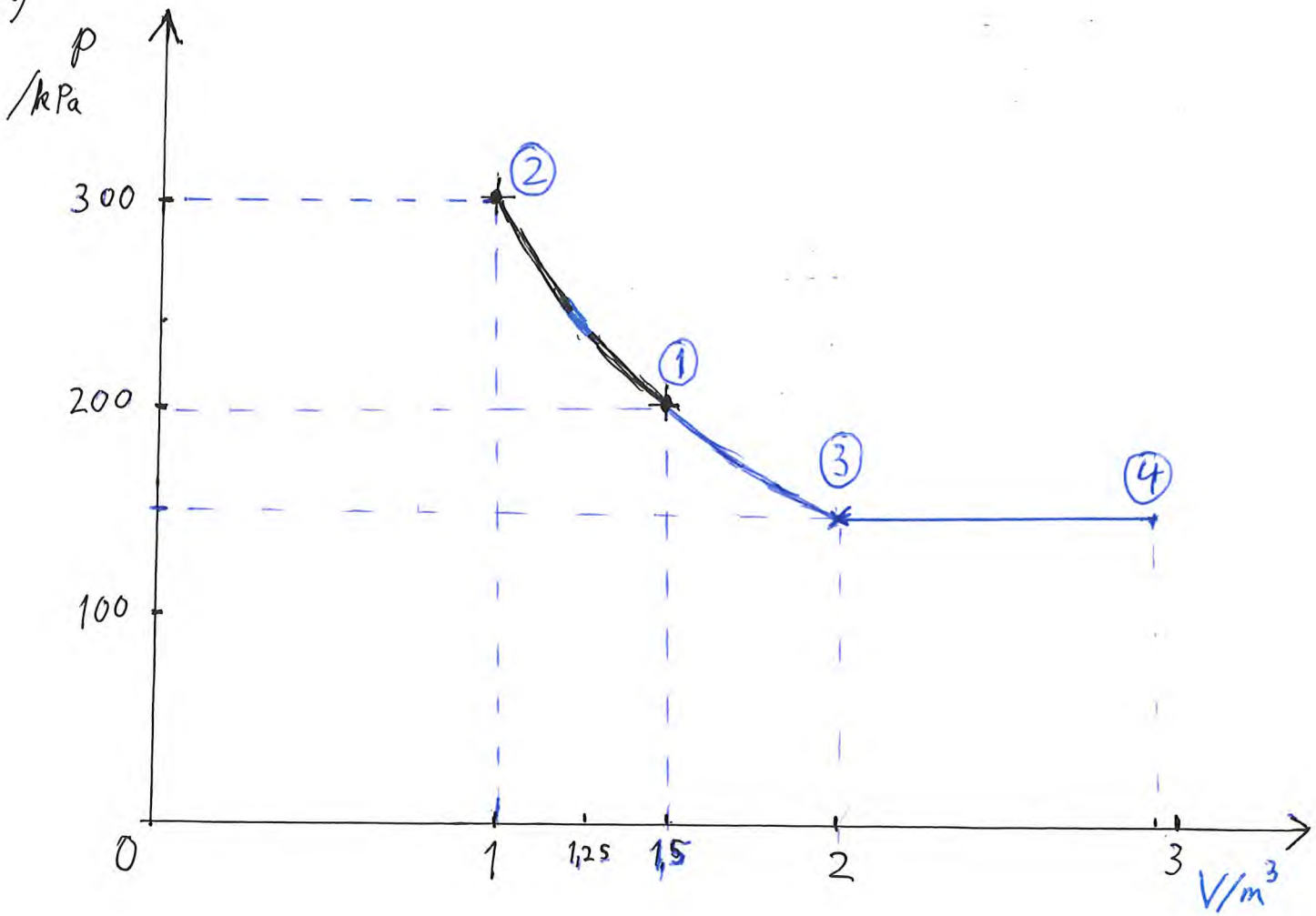
$V_3 = \frac{p_2}{p_3} V_2 = \frac{300\,kPa}{150\,kPa} \cdot 1{,}00\,m^3 = \underline{2{,}00\,m^3}$ ③

c) $T_4 = (273 + 157)\,K = 430\,K$

$\frac{p_4 \cdot V_4}{T_4} = \frac{p_3 \cdot V_3}{T_3}$ og $p_4 = p_3$

$V_4 = \frac{V_1 T_2}{T_1} = \frac{2{,}00\,m^3 \cdot 430\,K}{293\,K} = \underline{2{,}94\,m^3}$ ④

d)



6.23 $V_0 = 360\,dm^3$ $t_0 = -20°C$ $p_0 = 1{,}013 \cdot 10^5\,Pa$

$l = 0{,}50\,m$ $b = 1{,}2\,m$ $A = l \cdot b = 0{,}60\,m^2$

$t_1 = -19°C$ åpen boks og $t_2 = -20°C$ lukket boks igjen

a) $\frac{p_2 V_2}{T_2} = \frac{p_1 V_1}{T_1}$ og $V_2 = V_1$

$\frac{p_2}{T_2} = \frac{p_1}{T_1} \Rightarrow p_2 = \frac{T_2}{T_1} \cdot p_1 \Rightarrow \Delta p = p_2 - p_1 = \left(\frac{T_2}{T_1} - 1\right) \cdot p_1$

$\Delta p = \left(\frac{273-20}{273-19} - 1\right) \cdot 1{,}013 \cdot 10^5\,Pa = -398{,}8\,Pa$

Undertrykket er på $\underline{0{,}40\,kPa}$

b) $F = \Delta p A = 398{,}8\,Pa \cdot 0{,}60\,m^2 = \underline{0{,}24\,kN}$

6.24 a) CO_2 $m = m_c + 2 \cdot m_o = 12{,}01u + 2 \cdot 16{,}00u = 44{,}01u$

$= 44{,}01 \cdot 1{,}66 \cdot 10^{-27}\,kg = \underline{7{,}31 \cdot 10^{-26}\,kg}$ $(7{,}3056 \cdot 10^{-26})$

b) $N = \frac{M}{m} = \frac{0{,}200\,kg}{7{,}3056 \cdot 10^{-26}\,kg} = 2{,}7376 \cdot 10^{24} = \underline{2{,}74 \cdot 10^{24}}$

c) $pV = NkT$

$V = \frac{NkT}{p} = \frac{2{,}7376 \cdot 10^{24} \cdot 1{,}38 \cdot 10^{-23}\,\frac{J}{K} \cdot 300K}{100 \cdot 10^3\,Pa} = \underline{0{,}113\,m^3}$

6.25 $N = 2{,}4 \cdot 10^{24}$ $p = 200 \cdot 10^3\,Pa$ $V = 48\,dm^3 = 48 \cdot (10^{-1}\,m)^3 = 48 \cdot 10^{-3}\,m^3$

a) $pV = NkT$

$T = \frac{pV}{Nk} = \frac{200 \cdot 10^3\,Pa \cdot 48 \cdot 10^{-3}\,m^3}{2{,}4 \cdot 10^{24} \cdot 1{,}38 \cdot 10^{-23}\,\frac{J}{K}} = \frac{9{,}6 \cdot 10^3\,J}{24 \cdot 1{,}38\,\frac{J}{K}} = 289{,}8\,K$

$t = T - T_0 = (289{,}8 - 273)°C = \underline{17°C}$

b) CO_2: $m = m_c + 2m_o = 12{,}01u + 2 \cdot 16{,}00u = 44{,}01u$

$= 44{,}01 \cdot 1{,}66 \cdot 10^{-27}\,kg = 7{,}3056 \cdot 10^{-26}\,kg$

$\rho = \frac{M}{V} = \frac{N \cdot m}{V} = \frac{2{,}4 \cdot 10^{24} \cdot 7{,}3056 \cdot 10^{-26}\,kg}{48 \cdot 10^{-3}\,m^3} = \underline{3{,}7\,\frac{kg}{m^3}}$

6.27 $V = 20\,dm^3$ $N = 2{,}6 \cdot 10^{25}$ $T = 300\,K$

isoterm til $V_2 = 15\,dm^3$

a) $pV = NkT = 2{,}6 \cdot 10^{25} \cdot 1{,}38 \cdot 10^{-23}\,\frac{J}{K} \cdot 300\,K = \underline{1{,}076 \cdot 10^5\,J}$

b) $p_1 = \frac{NkT}{V_1} = \frac{107640\,J}{20 \cdot (10^{-1}\,m)^3} = \underline{5{,}4\,MPa}$

$p_2 = \frac{NkT}{V_2} = \frac{1076407\,J}{15 \cdot (10^{-1}\,m)^3} = \underline{7{,}2\,MPa}$

c)