Oppgave 1

$$v_{lyd} = 1230\ km/h = \frac{1230}{3{,}6}\ \frac{m}{s} = 342\ \frac{m}{s}$$

$$s = v \cdot t = 342\ \frac{m}{s} \cdot 3\,s = 1025\ m$$

Svar: c) 1 km

Oppgave 2

$$16\,000\ kWh = 16 \cdot 10^3 \cdot 10^3\ \frac{J}{s} \cdot h$$

$$= 16 \cdot 10^6\ \frac{J}{s} \cdot 3600\ s$$

$$= 57{,}6 \cdot 10^9\ J$$

Svar: d) 58 GJ

Oppgave 3

$$\rho = \frac{m}{V} = \frac{93{,}4\ \text{kg}}{80\ \text{dm}^3} = 1{,}1675\ \frac{\text{kg}}{\text{dm}^3}$$

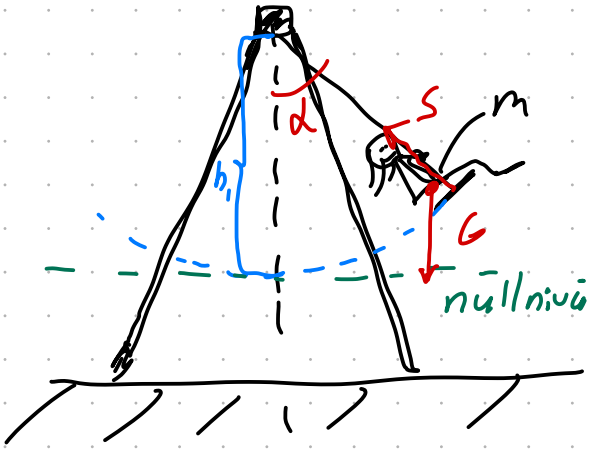
$$\frac{\delta\rho}{\rho} = \frac{\delta m}{m} + \frac{\delta V}{V} = 1\% + 5\% = 6\%$$

$$\delta\rho = \rho \cdot 0{,}06 = 1{,}1675\ \frac{\text{kg}}{\text{dm}^3} \cdot 0{,}06 = 0{,}070\ \frac{\text{kg}}{\text{dm}^3}$$

Skal ha 1 gjeldende siffer

Svar: b) $(1{,}17 \pm 0{,}07)\ \frac{\text{kg}}{\text{dm}^3}$

Oppgave 4



$\alpha = 48°$ $\longrightarrow V = 0$

$m = 12\,kg$

$h_1 = 3{,}0\,m$

Størst fart når hasken er på sitt laveste. Dette er nullnivået.

Kun tyngden utfører arbeid siden snorkraften er $\perp$ på v.

$$\frac{1}{2}mv_0^2 + mgh_0 = \frac{1}{2}mv^2 + mgh$$

($h_0 = 0$, $v = 0$)

$$h = h_1 - h_1\cos\alpha$$

$$h = h_1(1-\cos\alpha)$$

$$v_0 = \sqrt{2gh} = \sqrt{2gh_1(1-\cos\alpha)}$$

$$= \sqrt{2 \cdot 9{,}81\,m/s^2 \cdot 3{,}0\,m\,(1-\cos 48°)}$$

$$v_0 = 4{,}41\,\frac{m}{s}$$

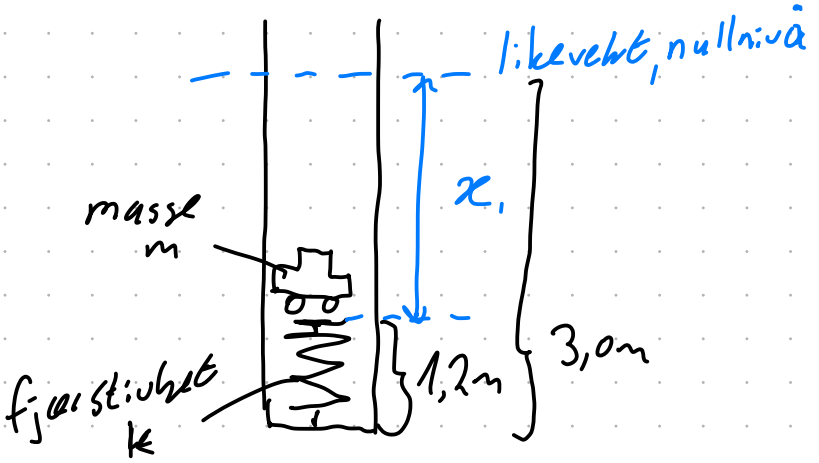
Svar: a) $4{,}4\,\frac{m}{s}$

Oppgave 5

$k = 40\ \frac{kN}{m}$

$m = 3{,}0\ kg$

$x_1 = 3{,}0m - 1{,}2m = 1{,}8m$



a) $F = k \cdot x_1 = 40\ \frac{kN}{m} \cdot 1{,}8m = 72\ kN$

Svar: c) 72 kN

b) Fra fjæren løses ut til bilen når sitt høyeste punkt, er det kun tyngden som gjør arbeid → bevaring av mekanisk energi.

$$mgh_0 + \frac{1}{2}mv_0^2 + \frac{1}{2}kx_0^2 = mgh + \frac{1}{2}mv^2 + \frac{1}{2}kx^2$$

0 | 2 | 0 | 2 | 0 på sitt høyeste punkt | 0

V_0 er gitt av den potensielle energien lagret i fjæren.

$$mgh_0 + \frac{1}{2}mv_0^2 + \frac{1}{2}kx_0^2 = mgh_1 + \frac{1}{2}mv_1^2 + \frac{1}{2}kx_1^2$$

0 | 0 | −1,8m | 0

$$V_0^2 = 2 \cdot g \cdot h_1 + \frac{k}{m}x_1^2 \qquad h = \frac{V_0^2}{2g}$$

$$h = \frac{2 \cdot g \cdot h_1 + \frac{k}{m} x_1^2}{2g} = h_1 + \frac{1}{2mg} k x_1^2$$

$$= -1{,}8\,m + \frac{1 \cdot 40 \cdot 10^3 \frac{N}{m} \cdot (1{,}8\,m)^2}{2 \cdot 3{,}0\,kg \cdot 9{,}81 \frac{m}{s^2}}$$

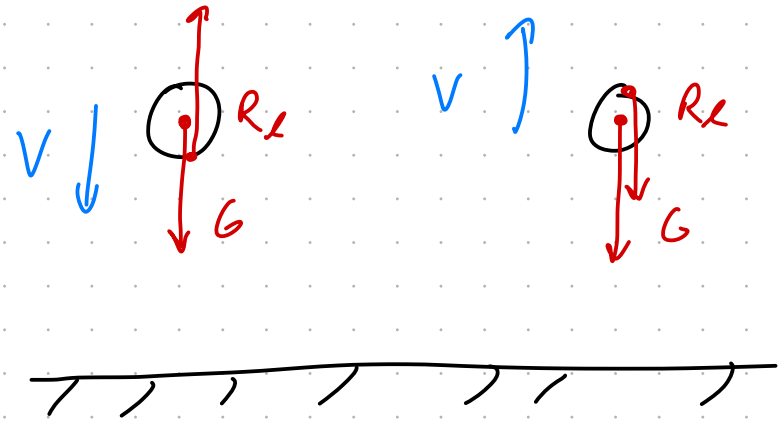
$$\left[\frac{\frac{N}{m} \cdot m^2}{kg \, \frac{m}{s^2}} \right] = [m]$$

($kg \, \frac{m}{s^2} = N$)

$$= -1{,}8\,m + 2202\,m = 2200\,m$$

Svar: b) 2,2 km

Oppgave 6



Ball på vei ned med terminalfart:

$$\Sigma F = 0 = G - R_l \quad . \quad R_l = G$$

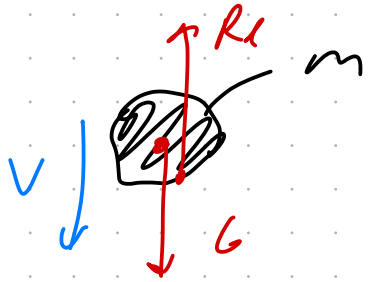
Ball på vei opp med terminalfart.

$$\Sigma F = G + R_l \quad , \quad R_l = G \quad , \quad \Sigma F = 2 \cdot G$$

Verdien av akselerasjonen = $2 \cdot g$

Svar: d) større enn g

Oppgave 7



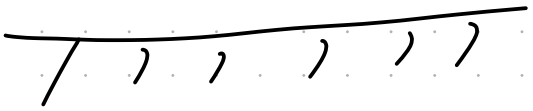
$$R_L = k v^2$$

$$k = 0{,}18\ N\frac{s^2}{m^2}$$

$$m = 8{,}5\ kg$$

Terminalfart: $G = R_L$

$$mg = kv^2$$



$$v = \sqrt{\frac{mg}{k}} = \sqrt{\frac{8{,}5\,kg \cdot 9{,}81\,\frac{m}{s^2}}{0{,}18\,N\frac{s^2}{m^2}}}$$

$$v = 21{,}5\,\frac{m}{s}$$

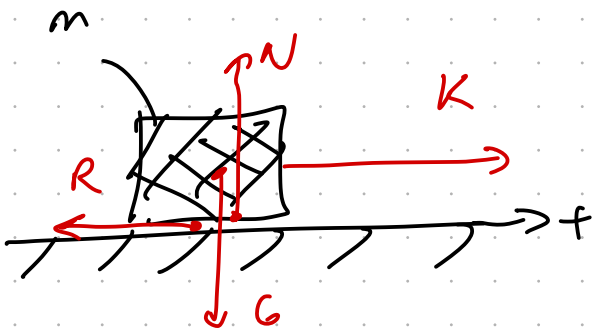
Svar: c) $22\,\frac{m}{s}$

Oppgave 8

$m = 20\,kg$

$K = 50\,N$

$\mu = 0{,}17$



a) $R = \mu N = \mu G = \mu mg$

$= 0{,}17 \cdot 20\,kg \cdot 9{,}81\,\frac{m}{s^2}$

$R = 33{,}4\,N$

Svar: c) 33 N

b) $s = 10\,m$ $\quad \Sigma F = K - R = K - \mu mg$

$\Sigma F = m \cdot a$

$a = \frac{K}{m} - \mu g$

Tidlaus formel: $v^2 - \cancel{v_0^2}^{\,0} = 2a(s - \cancel{s_0}^{\,0})$

$v = \sqrt{2as} = \sqrt{2 \cdot \left(\frac{K}{m} - \mu g\right) \cdot s}$

$= \sqrt{2 \cdot \left(\frac{50\,N}{20\,kg} - 0{,}17 \cdot 9{,}81\,\frac{m}{s^2}\right) \cdot 10\,m} = 4{,}08\,\frac{m}{s}$

Svar: a) 4,1 $\frac{m}{s}$