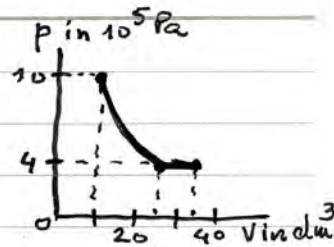


Opgave 1 - Gas

- $\frac{P_A V_A}{T_A} = \frac{P_B V_B}{T_B} \rightarrow \frac{10 \cdot V_A}{(273+100)} = \frac{4 \cdot 25}{(273+100)} \rightarrow V_A = 10 \text{ dm}^3$
- $\frac{V_B}{T_B} = \frac{V_C}{T_C} \rightarrow \frac{25}{100+273} = \frac{V_C}{240+273} \rightarrow V_C = 34 \text{ dm}^3$
- \rightarrow



Opgave 2 - Weerstandsdraad

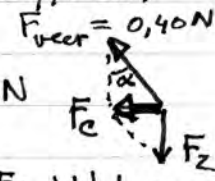
- $R_{30} = \frac{3,0}{50} \times 5,0 = 3,0 \Omega \rightarrow \frac{1}{R_V} = \frac{1}{3,0} + \frac{1}{3,0} + \frac{1}{5,0} + \frac{1}{5,0} = \frac{16}{15} \rightarrow R_V = 0,93 \Omega$
- $\frac{l}{R_{KM}} = 30 \text{ cm} \rightarrow \frac{1}{R_{V,KM}} = \frac{1}{3,0} + \frac{1}{3,0} = \frac{1}{1,5} \rightarrow R_V = 1,5 \Omega \rightarrow R_{\text{tot.}} = 2,0 + 1,5 + 2,0 = 5,5 \Omega$
- $V_{KM} = IR_V = 0,27 \times 1,5 = 0,41 \text{ V} \rightarrow I = \frac{V}{R} = \frac{1,5}{5,5} = 0,27 \text{ A}$
 $\rightarrow V_{NM} = \frac{1}{3} \times 0,41 = 0,14 \text{ V} - V_{MD} = IR = 0,27 \times 2,0 = 0,54 \text{ V} \rightarrow V_{CD} = V_{ND} = 0,14 + 0,54 = 0,68 \text{ V}$

Opgave 3 - Golf

- $T = 6,5 \cdot 10^{-3} - 0,5 \cdot 10^{-3} = 6,0 \cdot 10^{-3} \text{ s}$
- $\lambda = 15 \text{ cm} \rightarrow v = f \cdot \lambda = \frac{\lambda}{T} = \frac{0,15}{6,0 \cdot 10^{-3}} = 25 \text{ m/s}$
- A is op 't punt door evenw. stand onhoog te gaem $\rightarrow t = 4,0 \cdot 10^{-3} \text{ s}$
- $\Delta x = 18 \text{ cm} = \frac{18}{15} \lambda = 1 \frac{1}{5} \lambda \rightarrow \varphi_C = \varphi_A - \frac{1}{5} = 4 \frac{4}{5} - \frac{1}{5} = 3 \frac{3}{5} \rightarrow \varphi_{\text{gered}} = \frac{3}{5}$

Opgave 4 - Draaiw

- $u = \frac{F}{C} = \frac{23,0 \cdot 10^{-3} \times 9,81}{10,0} = 0,0226 \text{ m} \rightarrow \text{ lengte} = 15,0 + 2,26 = 17,3 \text{ cm}$
- $F_{\text{veer}} \text{ en } F_2$
- $F_{\text{result}} = F_{\text{centrip.}}; F_{\text{veer}} = C \cdot u = 10,0 (19,0 - 15,0) \cdot 10^{-2} = 0,40 \text{ N}$
 $F_2 = 23,0 \cdot 10^{-3} \times 9,81 = 0,226 \text{ N} \rightarrow F_c = \sqrt{0,40^2 - 0,226^2} = 0,33 \text{ N}$
- Veer even lang $\rightarrow F_{\text{veer}}$ onveranderd - F_2 is groter $\rightarrow \alpha = \text{bg} \cos \frac{F_2}{F_{\text{veer}}}$ kleiner.



Opgave 5 - Heteluchtverwarming

- $A = \pi r^2 \rightarrow 0,031 = \pi \cdot r^2 \rightarrow r = 0,0993 \text{ m} \rightarrow d = 2 \cdot r = 0,20 \text{ m}$
- $l = \frac{V}{A} = \frac{75}{0,031} = 2419 \text{ m} \rightarrow v = \frac{l}{t} = \frac{2419}{3600} = 0,67 \text{ m/s}$
- $1,1 \cdot 10^8 \text{ J} = 78\% \text{ van } 1,41 \cdot 10^8 \text{ J} \rightarrow \text{noodig } \frac{1,1 \cdot 10^8}{32 \cdot 10^6} = 4,4 \text{ m}^3 \text{ aardgas}$
- $\Delta t = \frac{1,1 \cdot 10^8}{0,25 \cdot 10^3} = 13333 \text{ s} \rightarrow \text{percentage} = \frac{13333}{(23-7) \cdot 3600} = 0,23 = 23\%$

Opgave 6 - Beeldbuis

- Kwordt heter \rightarrow meer vrijkomende elektr. \rightarrow stip helderder.
- $U_k = q \cdot \Delta V \rightarrow \Delta V = \frac{U_k}{q} = \frac{\frac{1}{2} m v^2}{q} = \frac{\frac{1}{2} \cdot 9,1 \cdot 10^{-31} \cdot (9,3 \cdot 10^6)^2}{1,60 \cdot 10^{-19}} = \frac{3,935 \cdot 10^{-17}}{1,60 \cdot 10^{-19}} = 246 \text{ V}$
- $\Delta t = \frac{s}{v} = \frac{0,040}{9,3 \cdot 10^6} = 4,3 \cdot 10^{-9} \text{ s}$
- $y = \frac{1}{2} a t^2 \rightarrow a = \frac{y}{\frac{1}{2} t^2} = \frac{\frac{1}{2} \times 1,5 \cdot 10^{-2}}{\frac{1}{2} \cdot (4,3 \cdot 10^{-9})^2} = 8,1 \cdot 10^{14} \text{ m/s}^2 \rightarrow v_y = a \cdot t = 8,1 \cdot 10^{14} \cdot 4,3 \cdot 10^{-9} = 3,5 \cdot 10^6 \text{ m/s}$
- $\Delta U_k = W_{\text{op}} = F \cdot y = m \cdot a \cdot y = 9,1 \cdot 10^{-31} \cdot 8,1 \cdot 10^{14} \cdot 1,5 \cdot 10^{-2} = 1,1 \cdot 10^{-18} \text{ J}$
- $E_e = q \cdot E = q \cdot \frac{V}{d} \rightarrow V = \frac{F \cdot d}{q} = \frac{2 \times 5,5 \cdot 10^{18}}{1,60 \cdot 10^{-19}} = 69 \text{ V}$

Opgave 7 - Variac

- $N_s = \frac{V_s}{V_p} \cdot N_p \rightarrow N_{s,1} = \frac{6,0}{220} \cdot 440 = 12 \text{ en } N_{s,2} = \frac{260}{220} \cdot 440 = 520$
- $I_p = \frac{V_s}{V_p} \cdot I_s \rightarrow I_p = \frac{6,0}{220} \cdot 0,50 = 0,014 \text{ A}$
- V_s neemt toe $\rightarrow N_s$ neemt toe $\rightarrow S$ naar boven.
- \rightarrow
- Bij $P_p \approx 31 \text{ W}$ is $P_s \approx 25 \text{ W} \rightarrow \text{rendement} = \frac{25}{31} \times 100\% = 80,6\%$

