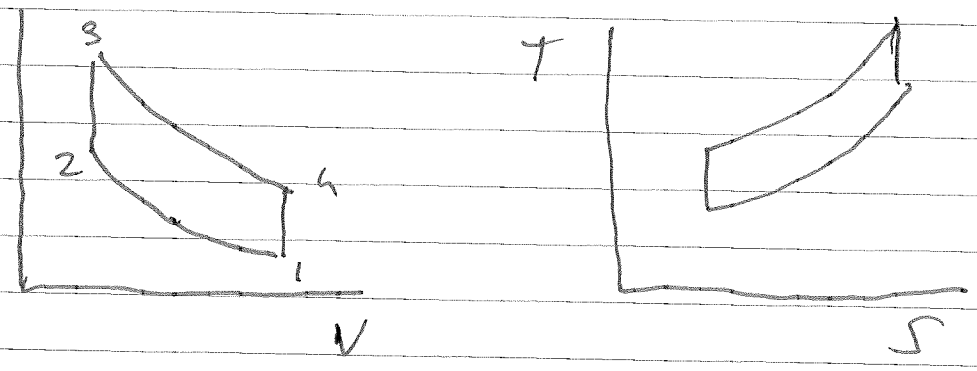
opg 2

Otto



$V_2 = 2$ liter $\quad V_1 = 12\, V_2 = \underline{24 \text{ liter}}$

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{K-1} \qquad K = \frac{c_p}{c_v} = \frac{1.0}{0,707} = 1,41$$

$$T_2 = T_1 \cdot 12^{K-1} = \underline{831\ K}$$

air standard

$v_{r_2} = 621.2 \quad v_{r_1} = 51.76 \Rightarrow \underline{T_2 \approx 780\ K}$

c) $P_3 = 2.5 \cdot P_2$

$$\frac{P_2}{T_2} = \frac{P_3}{T_3} \qquad T_3 = 2.5 \cdot T_2 = 2.5 \cdot 831 = \underline{2078\ K}$$

$$\frac{T_4}{T_3} = \left(\frac{V_3}{V_4}\right)^{K-1} \quad \{ \frac{V_4}{V_3} = \frac{V_3}{V_3} \qquad T_4 = 2078 \cdot \left(\frac{1}{12}\right)^{K-1}$$

$$T_4 = 750\ K.$$

d) $Q_{23} = m c_v (T_3 - T_2) = 88.2\ kJ$
$Q_{41} = m c_v (T_1 - T_4) = -31.8\ kJ$ $\Big\}$ $W = \underline{56.4\ kJ}$

e) $\eta = \frac{W}{Q_{23}} = 56.4 / 88.2 \approx \boxed{64\%}$

$$f \quad \frac{3 \cdot 10^6}{0,95} = 56.4 \cdot 10^3 \cdot 12 \cdot f$$

$$\underline{f = 4.66\ Hz = 280\ omw/min}$$