

LISTA 4

18.3

$$Q = 16100 \text{ J}$$

$$W = 3700 \text{ J}$$

$$Q_c = 4,6 \cdot 10^4 \frac{\text{J}}{\text{g}}$$

A)

$$e = \frac{W}{Q} = 0,23$$

B)

$$Q_R = Q - W = 12400 \text{ J}$$

C)

$$16100 \text{ J} - m$$

$$4,6 \cdot 10^4 \text{ J} - 1 \text{ g}$$

$$m = 0,35 \text{ g}$$

D)

$$P = 60 \cdot W = 222 \text{ kW}$$

18.7

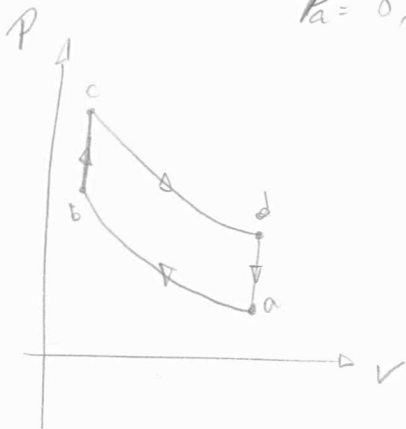
$$\gamma = 1,40$$

$$r = 9,50$$

$$T_c = 22^\circ\text{C} = 295 \text{ K}$$

$$P_a = 8,50 \cdot 10^4 \text{ Pa}$$

$\overline{AB} \rightarrow$ adiabática



$$P_a V_a^\gamma = P_b V_b^\gamma$$

$$\frac{P_b}{P_a} = \left(\frac{V_a}{V_b} \right)^\gamma = r^\gamma$$

$$P_b = P_a \cdot r^\gamma$$

$$P_b = 1,9 \cdot 10^6 \text{ Pa}$$

$$\frac{P_b}{P_a} = \frac{nRT_b}{nRT_a} \cdot \frac{V_a}{V_b} = \left(\frac{V_a}{V_b} \right)^\gamma$$

$$\frac{T_b}{T_a} = r^{\gamma-1}$$

$$T_b = T_a \cdot r^{\gamma-1}$$

$$T_b = 726 \text{ K}$$

18.10

$$T_1 = -23^\circ\text{C} = 250\text{K} \quad T_2 = -20,5^\circ\text{C} = 252,5\text{K}$$

$$Q_L = 1,60 \cdot 10^5 \text{ J/kg} \quad c_p = 485 \frac{\text{J}}{\text{kg K}} \quad K_p = 2,8 \quad m = 8 \text{ kg}$$

$$Q_c = 1,60 \cdot 10^5 \cdot 8 + 485 \cdot 8 \cdot 2,5 = 1289700 \text{ J}$$

$$K_p = \frac{|Q_c|}{|W|} \Rightarrow |W| = \frac{|Q_c|}{K_p} = 460607 \text{ J}$$

$$P = \frac{W}{3600\text{s}} = 128 \text{ W}$$

18.15

$$T_c = 273\text{K} \quad T_H = 297\text{K}$$

$$m = 85 \text{ kg}$$

$$Q_c = 85 \cdot 334 \cdot 10^3 = 2,8 \cdot 10^7 \text{ J}$$

$$K = \frac{T_c}{T_H - T_c} = 11,375$$

$$K = \frac{|Q_c|}{|Q_H| - |Q_c|} \Rightarrow |Q_H| = \frac{|Q_c| (1 + K)}{K} \quad |Q_H| = 3,05 \cdot 10^7 \text{ J}$$

$$B) \quad |W| = |Q_H| - |Q_c| = 0,25 \cdot 10^7 \text{ J}$$

18.21

$$\Delta S = \int_1^F \frac{dQ}{T} \quad dQ = mc dT$$

$$\Delta S = \int_1^2 mc \frac{dT}{T} \quad 1. c. (T_F - 20) = 2. c. (T_F - 80)$$

$$T_F = 60^\circ C = 333 K$$

$$\Delta S_1 = \int_1^F mc \frac{dT}{T} = 1.419 \cdot 10^3 \cdot \ln\left(\frac{T_F}{T_1}\right) = 0,54 \cdot 10^3 \text{ J/K}$$

$T_1 = 293 \quad T_2 = 353 K$

$$\Delta S_2 = \int_2^F mc \frac{dT}{T} = 2.419 \cdot 10^3 \ln\left(\frac{T_F}{T_2}\right) = -0,49 \cdot 10^3 \text{ J/K}$$

$$\Delta S_T = \Delta S_1 + \Delta S_2 = 50 \frac{J}{K}$$

18.33

$A = 8 m^2 \quad \epsilon_{eff} = 60\% \quad \Delta T = 40 \quad I = 150 \frac{W}{m^2}$

$V = ?$

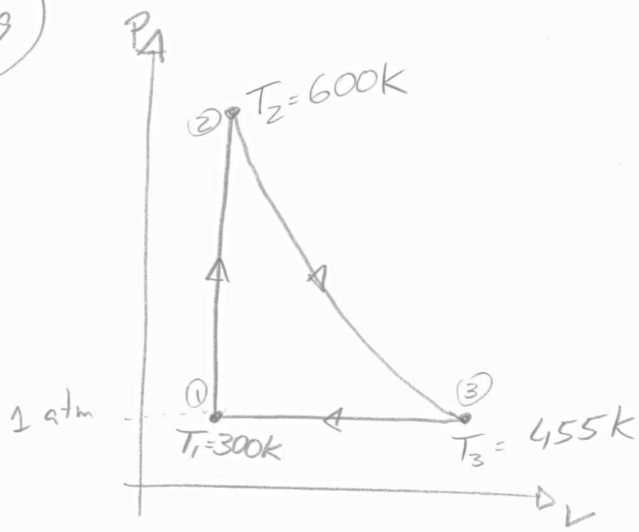
$$P = 150 \cdot 8 \cdot 0,6 = 720 W \rightarrow 2,6 \cdot 10^6 J$$

$$Q_{1e} = 1.419 \cdot 10^3 \cdot 40 = 1,7 \cdot 10^5 J$$

$1 l$	$\sim 1,7 \cdot 10^5$	$V = 15,3 l$	B)	$1,6 (8h)$
V	$\sim 2,6 \cdot 10^6$			$2,5 (12h)$

resposta do livro
5 (24h) ✓

18.39



$$n = 0,350 \quad \gamma = 1,40$$

$$P_{1,2,3} = ? \quad V_{1,2,3} = ?$$

$$PV = nRT \quad R = 0,082 \frac{\text{atm} \cdot \text{l}}{\text{mol} \cdot \text{K}}$$

$$1. V_3 = 0,082 \cdot 0,350 \cdot 455$$

$$V_3 = 13,06 \text{ l}$$

$$1. V_1 = 0,350 \cdot 0,082 \cdot 300$$

$$V_1 = 8,61 \text{ l} = V_2$$

$$P_2 \cdot 8,61 = 0,350 \cdot 0,082 \cdot 600$$

$$P_2 = 2 \text{ atm}$$

$$P_1 = 1 \text{ atm}$$

$$V_1 = 8,6 \text{ l}$$

$$P_2 = 2 \text{ atm}$$

$$V_2 = 8,6 \text{ l}$$

$$P_3 = 1 \text{ atm}$$

$$V_3 = 13,1 \text{ l}$$

$$B) \quad C_p = \frac{7R}{2} = 29,1 \text{ J/mol} \cdot \text{K}$$

$$C_v = 20,8 \text{ J/mol} \cdot \text{K}$$

$$1-2) \quad Q = n C_v \cdot \Delta T = 0,35 \cdot 20,8 \cdot 300 = 2184 \text{ J}$$

$$W = 0$$

$$\Delta U = 2184 \text{ J}$$

$$2-3) \quad Q = 0 \quad W = n C_v \Delta T = 1055 \text{ J}$$

$$\Delta U = -1055 \text{ J}$$

$$3-1) \quad W = p \Delta V = 1,013 \cdot 10^5 \cdot 4,45 \cdot 10^{-3} = -450 \text{ J}$$

$$Q = n C_p \Delta T = -1579 \text{ J}$$

$$\Delta U = -1129 \text{ J}$$

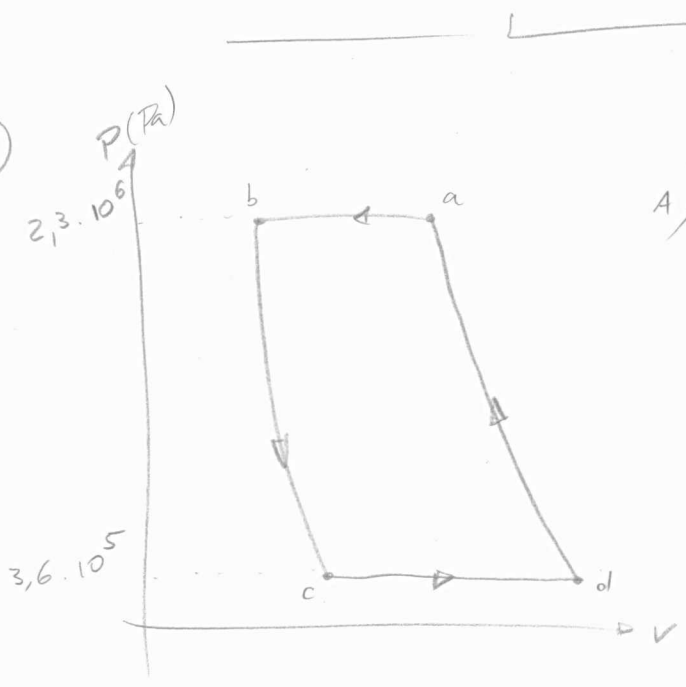
c) $W_T = 605 \text{ J}$

d) $Q_T = 605 \text{ J}$

e) $e = \frac{|W|}{|Q_H|} = \frac{605}{2184} = 0,28 = 28\%$

f) $e_c = 1 - \frac{T_C}{T_H} = 0,5 = 50\%$

18.43



A) $\Delta U_{cd} = 652 \cdot 10^3 \text{ J}$

$W_{cd} = p \Delta V = 3,6 \cdot 10^5 \cdot 0,2311 = 8,3 \cdot 10^4 \text{ J}$

$\Delta U = Q - W$

$Q = 7,35 \cdot 10^5 \text{ J}$

B) $\Delta U_{ab} = -798 \cdot 10^3 \text{ J}$ $W_{ab} = -135396 \text{ J}$ $\Delta U = Q - W$

$Q = -9,3 \cdot 10^5 \text{ J}$

c) $W_{da} = -\Delta U_{da} = -312 \cdot 10^5 \text{ J}$

$W_{bc} = 1,66 \cdot 10^5 \text{ J}$

d) $K_P = \frac{|Q_c|}{|W|} = \frac{7,35 \cdot 10^5}{1,98 \cdot 10^5} = 3,71$

18.48

$r = 8,5$ $v = 105 \text{ km/h}$

consumo: $10,62 \text{ km/l}$

$H = 4,60 \cdot 10^7 \text{ J/kg}$

$\rho = 740 \text{ g/l}$

A) $9,89 \text{ l/h}$

B) $\delta = 1,40$ $e = 1 - \frac{1}{r^{\delta-1}} = 0,57$

C) $Q_T = 9,89 \cdot 0,740 \cdot 4,60 \cdot 10^7 = 3,37 \cdot 10^8$

$0,57 = \frac{W}{3,37 \cdot 10^8}$ $W_{\downarrow \text{ hora}} = 1,92 \cdot 10^8 \text{ J}$ $P_M = 5,33 \cdot 10^4 \text{ W}$

D) $0,15 = \frac{W}{3,37 \cdot 10^8}$ $W_{\downarrow h} = 5,05 \cdot 10^7$ $P_r = 1,4 \cdot 10^4 \text{ W}$

$\frac{P_r}{P_M} = 0,26$