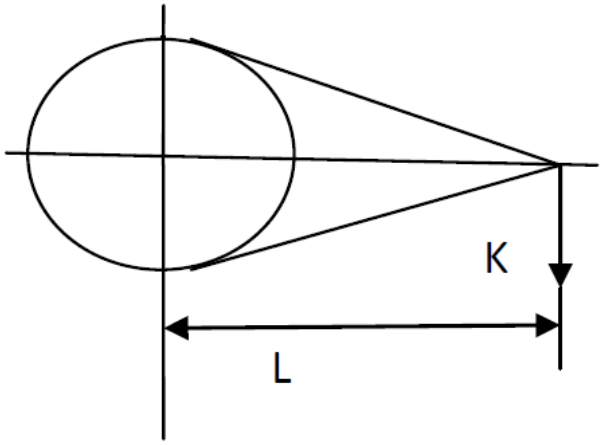
Thermodynamics list 3

1. Calculate specific volume and density of a nitrogen with parameters of: p=2MPa and T=400K
2. Calculate specific volume under standard conditions of a mixture with following molar composition 15% CH_4, 18% CO_2, 67%N_2
3. A tank with volume of $V = 0{,}3m^3$ is inflated with oxygen under overpressure of $p_m = 25MPa$ and at the temperature of T=300K. The ambient pressure is $p_o = 0{,}1MPa$. Find the amount of oxygen within the tank.
4. Calculate power of the engine using data obtained during measurement conducted by means of load brake: length of the lever arm L=0,4m; the force occurring due to loading the lever K=80N; rotational speed n=3000rpm.



5. Calculate the amount of fuel consumed by a turbine with power of N=25MW knowing that the calorific value (CV) of the fuel is $W_d = 33850\,{}^{kJ}/_{kg}$, and the turbine efficiency $\eta = 35\%$.
6. A gas engine with power of N=10KW consumes $V = 5um^3$ of a coke-oven gas within an hour. The calorific value (CV) of this gas is $W = 4900\,{}^{kJ}/_{um^3}$. Find the efficiency of the engine.
7. Calculate the amount of heat required to warm up m=20kg of lubricating oil from $t_1 = 12$℃ up to $t_2 = 37$℃ knowing that specific heat is c= $0{,}16\,{}^{kJ}/_{kgK}$.
8. The volume of an ideal gas with temperature of 500K is $V_1 = 0{,}25m^3$. Calculate the volume of the gas after heating it to temperature $T_2 = 700K$ (p=idem).
9. Calculate volume of a tank inflated with m=500kg of nitrogen at the temperature of $t = 20$℃ under manaometric pressure of $p_m = 9bar$. The ambient pressure is $p_o = 1bar$.
10. Calculate the density of hydrogen at the temperature of $t = 20$℃ under absolute pressure of $p = 0{,}5MPa$.