

Series N°6

Exercise N° 1:

Consider 3 moles of an ideal gas (O_2 a diatomic gas) are introduced into a cylinder closed by a movable piston.

State A is defined by $p_A = 1 \text{ atm}$; $T_A = 298 \text{ K}$.

- The system is reversibly and isothermally compressed, receiving work of 3500 cal (state B).
- The system is heated at constant pressure to temperature $T_C = 450 \text{ K}$ (state C).
- The system is then insulated and the piston reversibly released against atmospheric pressure (adiabatic transformation) (state D).
- Finally, at constant pressure, the system is allowed to return to room temperature ($T_A=298 \text{ K}$).

1. Calculate the parameters V , p and T for each state.
2. Plot these 4 transformations in a Clapeyron diagram (p, V).
3. For each stage of the cycle and for the cycle as a whole, calculate the work and heat exchanged, the change in internal energy U , and the change in enthalpy ΔH .

Data: $R = 8.31 \text{ J.mol}^{-1} .\text{K}^{-1} = 0.082 \text{ L.atm.mol}^{-1} .\text{K}^{-1}$; $1 \text{ cal} = 4.18 \text{ J}$. $\gamma = 1.4$.

Doctor: Bougueria Hassiba.