

[tex131] Idealized Stirling cycle

Consider the four steps of the idealized Stirling cycle for the classical ideal gas [$pV = Nk_B T$, $C_V = \alpha Nk_B$, $\gamma \doteq C_p/C_V = (\alpha + 1)/\alpha$].

(a) Calculate the work performance, ΔW , the heat transfer, ΔQ , and the change in internal energy, ΔU , for each step.

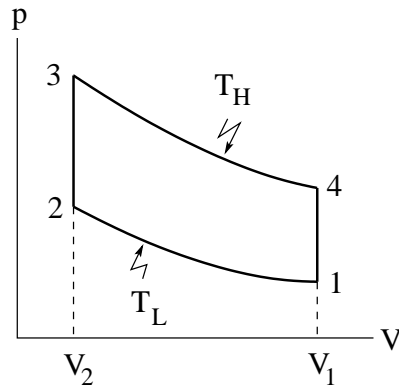
1 \rightarrow 2 isothermal compression: $T = T_L$,

2 \rightarrow 3 isochoric heating up: $V = V_2$,

3 \rightarrow 4 isothermal expansion: $T = T_H$,

4 \rightarrow 1 isochoric cooling down: $V = V_1$.

(b) Calculate the efficiency η and express it as a function of T_H and T_L .



Solution: