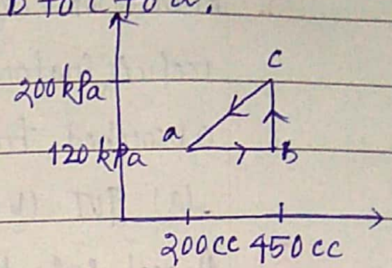
$\oint \frac{dQ}{T} \leq 0$ - Claussius Inequality

QUESTIONS

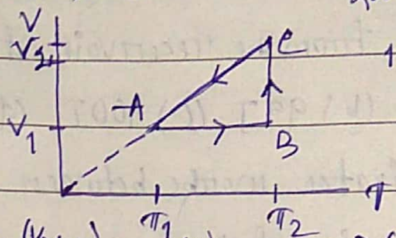
HCV

(1) Calculate work done by a gas as it is taken from the state a to b to c to a.

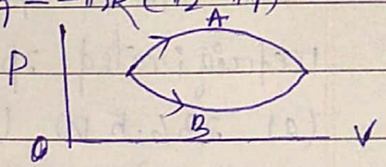
Sol.^{n} - $W_{ab} = 30J$, $W_{bc} = 0$, $W_{ca} = -40J$



(2) Process ABCA performed on an ideal gas. Find the net ~~work done~~ heat given to the system during the process. Sol.^{n} $W_{AB} = 0$, $W_{BC} = nRT_2 \ln(V_2/V_1)$, $W_{CA} = -nR(T_2 - T_1)$



(3) Two processes A & B on a system is carried. Let ΔQ_1 & ΔQ_2 be the heat given to the system in the processes A & B respectively -

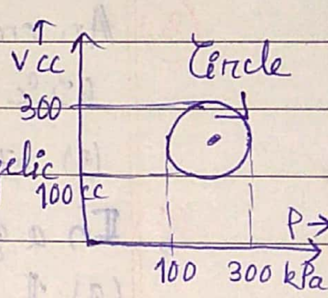


(i) (a) $\Delta Q_1 > \Delta Q_2$ (b) $\Delta Q_1 = \Delta Q_2$ (c) $\Delta Q_1 < \Delta Q_2$ (d) $\Delta Q_1 \leq \Delta Q_2$

(ii) (a) $\Delta U_1 > \Delta U_2$ (b) $\Delta U_1 = \Delta U_2$ (c) $\Delta U_1 < \Delta U_2$ (d) $\Delta U_1 \neq \Delta U_2$

(4) Calculate the heat absorbed by the system in going through the cyclic

Ans - 31.4 J

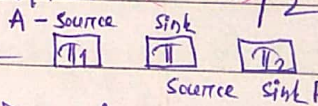


(5) Two carnot engines A & B are operated in series. Engine A receives heat at T_1 K & rejects to a reservoir at temp T K. Second engine B receives heat rejected by the first engine & rejects to a heat reservoir at T_2 K.

GBG

Calculate T if (a) Work out puts of both engines are equal. $T = (T_1 + T_2)/2$

Karnataka (NEET-2013) (b) efficiencies of both engines are equal. $T = (T_1 T_2)^{1/2}$



Calculate the minimum attainable pressure of an ideal gas during a process governed by $T = T_0 + \alpha V^2$, T_0, α + Ve const., V = Vol. of 1 mol. of gas.

Ans - $2R(\alpha T_0)^{1/2}$

In the PV diagram of a heat engine, all processes are quasi static & Cp - const. Find η. $\eta = 1 - (P_a/P_b)^{(\gamma-1)/\gamma}$