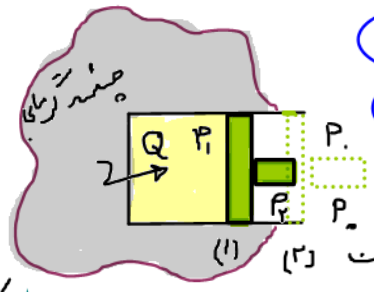
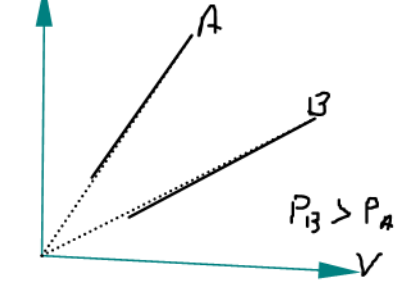
انبساط هم فشار

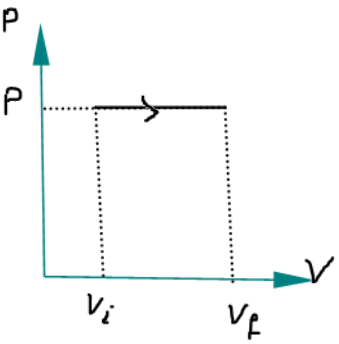


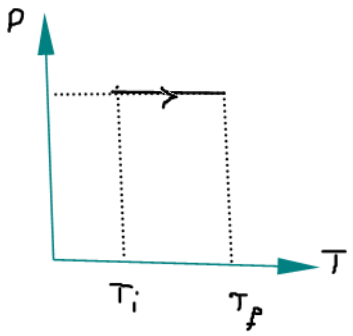
$W<0$ گاز منبسط شده
$Q>0$ گرما گرفته

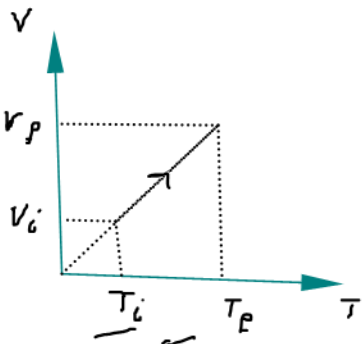
$\Rightarrow \Delta U = Q + W$ $\quad >0 \quad >0 \quad <0$

$|Q|>|W|$







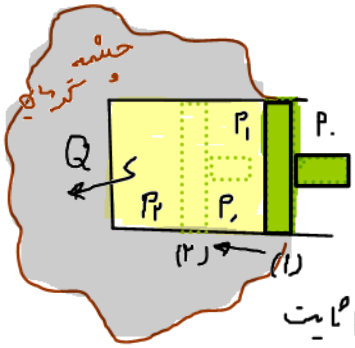


$PV = nRT \Rightarrow V = \frac{nR}{P} T$

رابطه‌ای شارل گیلوساک

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

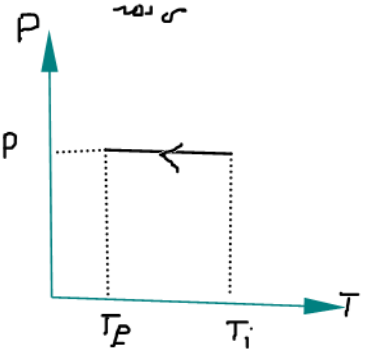
تراکم هم فشار

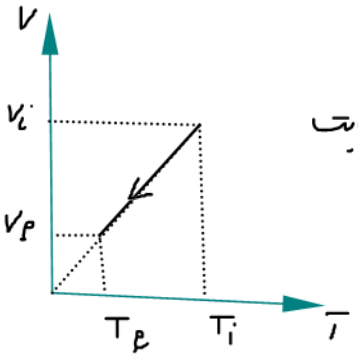


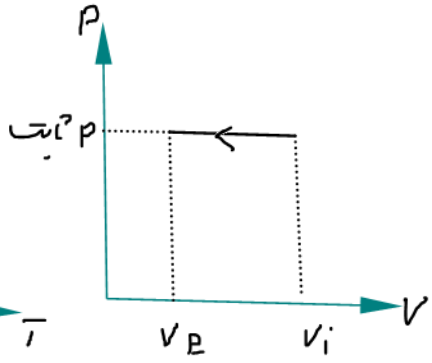
$W>0$ گاز تراکم
$Q<0$ گاز از دست می‌دهد

$\Rightarrow \Delta U = Q + W$ $\quad <0 \quad <0 \quad >0$

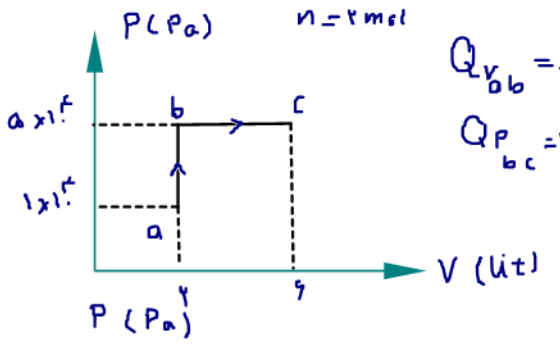
$\Delta T<0 \rightarrow T_f < T_i$ $\quad |Q| > |W|$







جواب سؤال صفحه ۲۵



$n = 2\,mol$

$Q_{ab} = +200\,J$

$Q_{bc} = +500\,J$

الف)

$\Delta U_{ab} = Q_V = +200\,J$

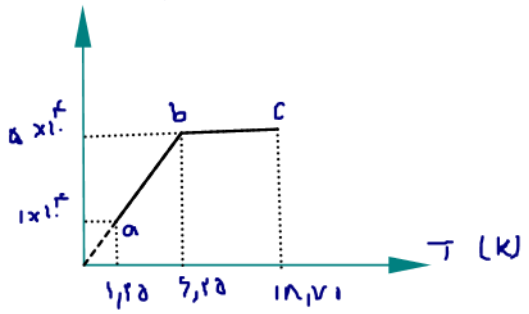
$W_{ab} = 0$

ب)

$W_{bc}^{P} = -P\Delta V = -5\times10^{4}(6-2)\times10^{-3} = -200\,J$

$\Delta U_{bc} = Q_{bc} + W_{bc} = 500 + (-200) = 300\,J$

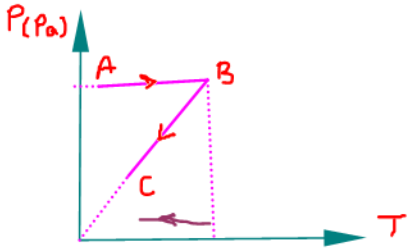
$\Delta U_{abc} = \Delta U_{ab} + \Delta U_{bc} = 200 + 300 = 500\,J$



$P_a V_a = nRT_a \Rightarrow T_A = \frac{P_a V_a}{nR} = \frac{10^5\times2\times10^{-3}}{2\times8} = \frac{20}{16} = 1,25\,K$

$\frac{P_a}{T_a} = \frac{P_b}{T_b} \Rightarrow \frac{10^5}{1,25} = \frac{5\times10^5}{T_B} \Rightarrow T_B = 6,25\,K$

$\frac{V_c}{T_c} = \frac{V_b}{T_b} \Rightarrow \frac{4}{T_C} = \frac{1}{6,25} \Rightarrow T_C = 18,75\,K$



فرآیند \ کمیت	W	Q	ΔU
A → B	منفی	مثبت	مثبت
B → C	صفر	منفی	منفی

$\Delta U = Q + W$

+ ⊕ −

− − 0

$V = 1\,Cm^3$

$\theta = 100^\circ C$

آب → بخار

100 → 100

$V_f = 2\times10^3\,Cm^3$

$L_V = 2,26\times10^3\,J/g$

$L_V = 2,26\times10^3\,J/g$

$P_{هوا} = 10^5\,Pa$

$\rho_w = 1\,g/Cm^3$

$m = \rho V = 1\times1 = 1\,g$

الف) $Q = mL_V = 1\times2,26\times10^3 = 2260\,J$

ب) $W = -P\Delta V = -10^5(2000-1)\times10^{-6} = -10^{-1}\times1994$

$= -199,9\,J$

پ) $\Delta U = Q_T - W \Rightarrow \Delta U = 2260 - 199,9 =$

$\Delta U = 2060,1\,J$

$L = 10\,Cm$

$\theta_1 = 20^\circ C$

$\theta_2 = 120^\circ C$

$P_0 = 10^5\,Pa$

$W = ?\,J$

$\alpha_{AL} = 25\times10^{-5}\,1/K$

$W = -P\Delta V$

$\Delta V = V_1(3\alpha)\Delta\theta$

$\Delta V = 10^3(3\times25\times10^{-5})(120-20)$

$\Delta V = 7,5\,Cm^3 = 7,5\times10^{-6}\,m^3$

$W = -P_0\Delta V$

$= -10^5(7,5\times10^{-6})$

$= -0,75\,J$

(۱۴)