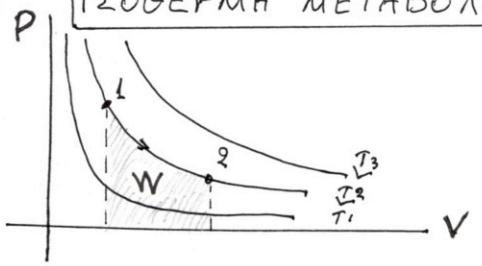
ΚΙΝΗΤΙΚΗ ΘΕΩΡΙΑ ΤΩΝ ΑΕΡΙΩΝ – ΘΕΡΜΟΔΥΝΑΜΙΚΗ.

① ΙΣΟΘΕΡΜΗ ΜΕΤΑΒΟΛΗ.

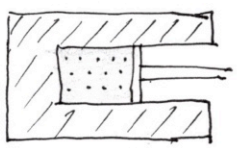
$T:$ ΣΤ $\quad P\cdot V = \text{ΣΤ}$. Boyle-Mariotte.



$\Delta U = 0 \quad Q = W \quad P_1V_1 = P_2V_2 \Big\} \Rightarrow W = nRT\ln\frac{P_1}{P_2}$

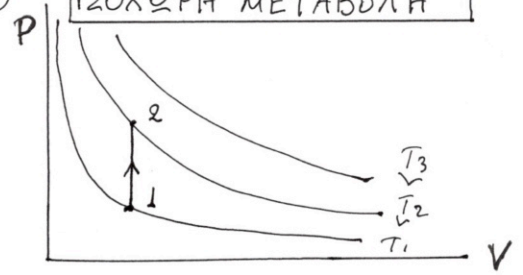
$W = nRT\ln\frac{V_2}{V_1}$

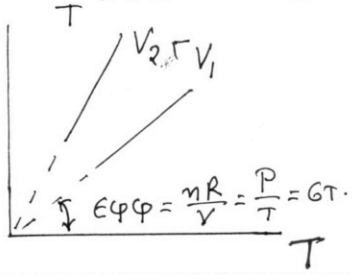
$\Delta S = \frac{Q}{T} \Big\} \Rightarrow \Delta S = nR\ln\frac{V_2}{V_1}$



② ΙΣΟΧΩΡΗ ΜΕΤΑΒΟΛΗ

$V:$ ΣΤ. $\quad \frac{P}{T} = \text{ΣΤ}$. Charles



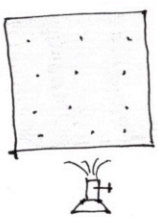


$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

$\Delta S = nC_V\ln\frac{T_2}{T_1}$

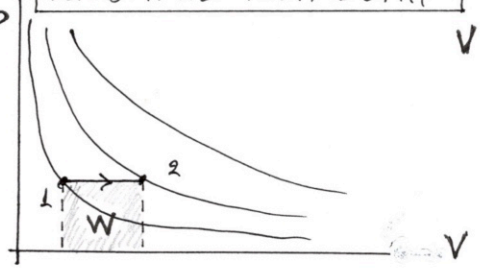
$Q = \Delta U$

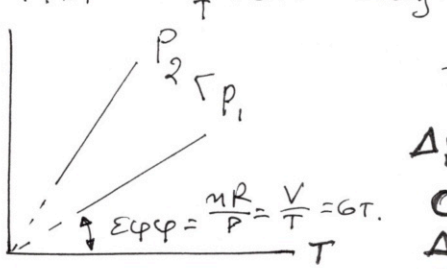
$\Delta U = nC_V\Delta T$



③ ΙΣΟΒΑΡΗΣ ΜΕΤΑΒΟΛΗ.

$P:$ ΣΤ $\quad \frac{V}{T} = \text{ΣΤ}$. Gay-Lussac





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

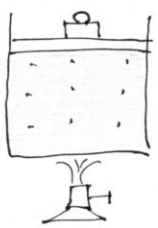
$\Delta S = nC_P\ln\frac{T_2}{T_1}$

$Q = W + \Delta U$

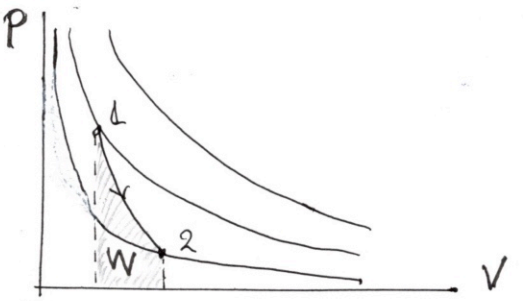
$\Delta U = nC_V\Delta T$

$Q = nC_P\Delta T$

$W = P\cdot\Delta V$



④ ΑΔΙΑΒΑΤΙΚΗ ΜΕΤΑΒΟΛΗ

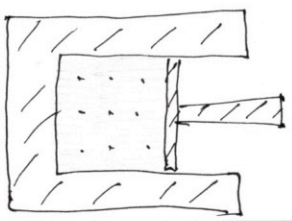


$Q = 0 \quad P\cdot V^{\gamma} = \text{ΣΤ} \quad P_1\cdot V_1^{\gamma} = P_2\cdot V_2^{\gamma}$

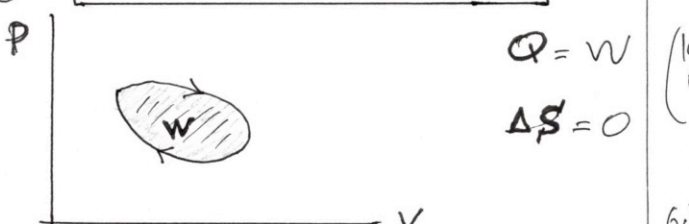
$\Delta U = -W \quad \Delta U = nC_V\Delta T$

$W = \frac{P_2V_2 - P_1V_1}{1-\gamma}$

$\Delta S = 0$



⑤ ΚΥΚΛΙΚΗ ΜΕΤΑΒΟΛΗ



$Q = W$

$\Delta S = 0$

πίεση: $P = \frac{1}{3}\frac{mol}{V}\overline{v^2} = \frac{1}{3}\frac{Nm}{V}\cdot\overline{v^2} = \frac{1}{3}d\overline{v^2}$

(κινητική ενέργεια μορίου): $\overline{E} = \frac{1}{2}m\overline{v^2} = \frac{3}{2}kT$

$v_{\varepsilon\nu} = \sqrt{\overline{v^2}} = \sqrt{\frac{3kT}{m}} = \sqrt{\frac{3RT}{M}}$

Ενέργεια αερίου: $U = \frac{3}{2}nRT$: (μόνο κινητική για ιδανικά, όχι δυναμική)

Όταν το αέριο δεν είναι μονοατομικό αντί για $f=3$ έχω $f=5$ ή $f=7$.

$C_P = C_V + R \quad C_V = \frac{f}{2}R \quad C_P = \frac{f+2}{2}R \quad \gamma = \frac{C_P}{C_V}$, $f = 3, 5, 7$.

$e = \frac{W}{Q_{\text{παίρνω}}} \qquad e_{carnot} = 1 - \frac{T_c}{T_h}$