Cours :

1- travail : W

$\delta W = -P dV$ δW : travail élémentaire

$W = \int \delta W = -\int P dV$

2- Quantité de chaleur : Q

$$\delta Q = \begin{cases} C_V dT + \ell dV \\ C_P dT + h d\ell \\ \lambda d\ell + \eta dV \end{cases}$$

$\ell = T \left(\frac{\partial P}{\partial T}\right)_V$ $h = -T \left(\frac{\partial V}{\partial T}\right)_P$

$\lambda = C_V \left(\frac{\partial T}{\partial \ell}\right)_V$ $\eta = C_P \left(\frac{\partial T}{\partial V}\right)_\ell$

$Q = \int \delta Q$

3- Variation d'énergie interne : ΔU

$$\left.\begin{array}{l} dU = \delta W + \delta Q \\ \Delta U = W + Q \end{array}\right\} \text{1er principe}$$

$\Delta U = C_V \Delta T$

4- Variation de l'enthalpie : ΔH

$\Delta H = C_P \Delta T$

5- Variation d'entropie : ΔS

$\Delta S = \int \frac{\delta Q}{T}$

* Relation de Mayer :

$C_P - C_V = nR$

$C_V = \frac{nR}{\gamma - 1}$ $C_P = \frac{nR\gamma}{\gamma - 1}$

6- Transformations d'un gaz parfait :

6-1- transformation isochore : V = cste

$W = -\int P dV$ ↳ V = cte, dV = 0

$W = 0$

$\delta Q = C_V dT + \ell dV$ ($\ell dV = 0$)

$Q = C_V \Delta T$

6-2- transformation isobare : P = cste

$W = -\int P dV$

$W = -P \int_i^f dV$ ↳ P = cte, dP = 0

$W = -P(V_f - V_i)$

$\delta Q = C_P dT + h d\ell$ ($h d\ell = 0$)

$Q = C_P \Delta T$

6-3- transformation isobherme : T = cste

$W = -\int P dV$

$W = -\int \frac{nRT}{V} dV$

$W = -nRT \int_i^f \frac{dV}{V}$

$W = -nRT \ln \frac{V_f}{V_i}$

$\Delta U = C_V \Delta T = W + Q$ ($\Delta T = 0$)

$Q = -W$

$Q = nRT \ln \frac{V_f}{V_i}$

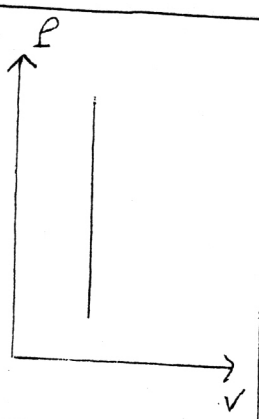
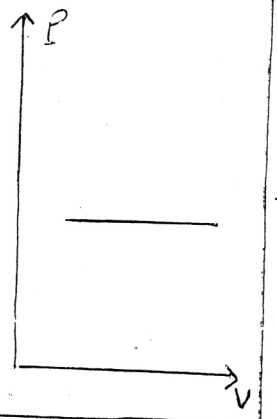
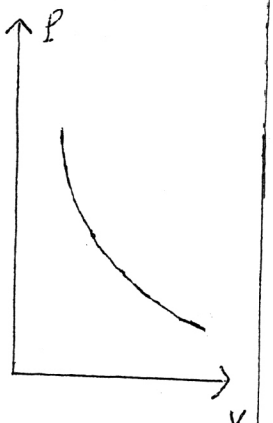
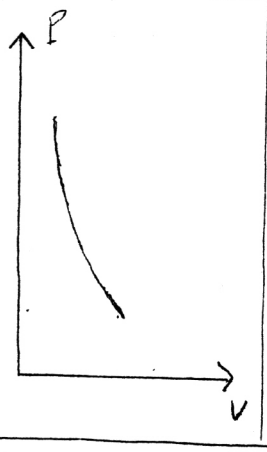
6-4- transformation adiabatique : Q = 0

$\Delta U = W + Q$ ($Q = 0$)

$W = \Delta U$

$W = C_V \Delta T$

Cours :

transformation	$P = f(V)$	$A.B = cte$	W	Q	ΔU
isochore $V = cte$		$\frac{T}{P} = cte$	$W = 0$	$Q = C_v (T_2 - T_1)$ $C_v = \frac{nR}{\gamma - 1}$	$\Delta U = C_v (T_2 - T_1)$
isobare $P = cte$		$\frac{T}{V} = cte$	$W = -P_1 (V_2 - V_1)$	$Q = C_p (T_2 - T_1)$ $C_p = \frac{n\gamma R}{\gamma - 1}$	$\Delta U = C_v (T_2 - T_1)$
isotherme $T = cte$		$PV = cte$	$W = -nRT_1 \ln \frac{V_2}{V_1}$	$Q = nRT_1 \ln \frac{V_2}{V_1}$	$\Delta U = 0$
adiabatique $Q = 0$		$PV^{\gamma} = cte$ $TV^{\gamma-1} = cte$ $TP^{\frac{1-\gamma}{\gamma}} = cte$	$W = C_v (T_2 - T_1)$	$Q = 0$	$\Delta U = C_v (T_2 - T_1)$