Récapitulatif de thermodynamique

$$\theta = T - 273{,}15 \qquad R = 8{,}314 \qquad PV = nRT \quad (GP)$$

1er principe

$$dU = \underbrace{\delta W}_{=-PdV} + \delta Q$$

$$dU = TdS - PdV$$
$$dU = C_v dT \quad (GP)$$

$$dH = C_p dT \quad (GP) \qquad H = U + PV$$

$$C_p - C_v = R \qquad \gamma = \frac{C_P}{C_v} \qquad C_x = m_\Sigma c_x = nC_{mx}$$

2ème principe

$$dS = \underbrace{\delta S^r}_{=\frac{\delta Q}{T}} + \underbrace{\delta S^p}_{\substack{=0 \text{ rev} \\ >0 \text{ irrev}}}$$

$$dS = \frac{dE - \delta W}{T}$$

$$dS = C_v \frac{dT}{T} + nR\frac{dV}{V} \quad (GP)$$

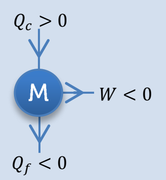
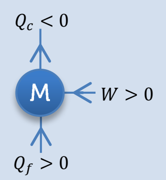
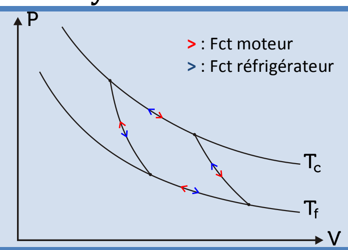
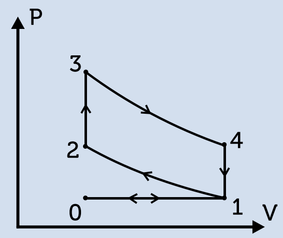
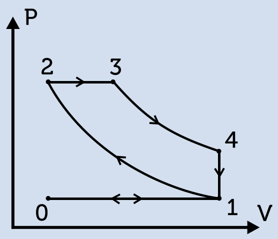
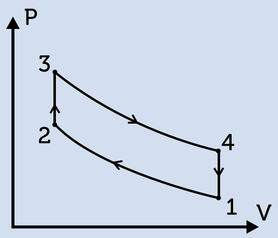
$$PV^\gamma = cte \quad (dS = 0)$$

Coefficients calorimétriques et thermoélastiques

	Forces de pression		Forces de traction
Calorimétriques	$dS = \frac{C_v}{T}dT + \frac{l}{T}dV$	$dS = \frac{C_p}{T}dT + \frac{h}{T}dP$	$dS = \frac{C_f}{T}dT + \frac{h}{T}df$
Thermoélastiques	$\frac{dV}{V} = \alpha\, dT - \chi\, dP$	$\beta = \frac{1}{P}\left(\frac{\partial P}{\partial T}\right)_V \quad \alpha = P\beta\chi$	$\frac{dL}{L} = \lambda\, dT + \frac{1}{sE}df$

Machines thermique

$$\Delta U = W + Q_c + Q_f = 0 \qquad \Delta S = S^p + \frac{Q_f}{T_f} + \frac{Q_c}{T_c} = 0$$

Fonctionnement moteur	Fonctionnement PAC/Frigo	Cycle de Carnot
		
Cycle de Beaux de Rochas	**Cycle de Diesel**	**Cycle de Stirling**
		

Systèmes ouverts

$$h = u + \frac{P}{\mu} \qquad P = \mu r T \qquad r = \frac{R}{M} \qquad D_m = \mu S v$$

$$\frac{dM}{dt} = D_{me} - D_{ms} \qquad \frac{dE}{dt} = \left(\frac{v_e^2}{2} + gz_e + h_e\right)D_{me} - \left(\frac{v_s^2}{2} + gz_s + h_s\right)D_{ms} + \mathcal{P}_u + \mathcal{P}_{th}$$

$$\frac{dS}{dt} = s_e D_{me} - s_s D_{ms} + \frac{\mathcal{P}_{th}}{T_a} + \frac{\delta S^p}{dt} \qquad \frac{d\vec{p}}{dt} = \vec{v_e} D_{me} - \vec{v_s} D_{ms} + \overrightarrow{F_{ext}}$$