5 12 - Using the Fad that Sig a Istate Function to Determine the pependance of J on V & T ds = (25) dT + (25) dV ds - 1 [C dT . (20) dv] 1 P dv - Cv dT + 1 [P 1 (20)]
T T T [V (2V)] $\begin{pmatrix} \partial S \\ \partial T \end{pmatrix} = \begin{pmatrix} C_V \\ E \end{pmatrix} \begin{pmatrix} \partial S \\ \partial V \end{pmatrix}_T = \begin{pmatrix} P_1 \begin{pmatrix} \partial U \\ \partial V \end{pmatrix}_T \end{pmatrix}$ $\left(\frac{\partial}{\partial V}\left(\frac{\partial S}{\partial V}\right)\right) = \frac{1}{T}\left(\frac{\partial}{\partial V}\left(\frac{\partial U}{\partial V}\right)\right)$ (2 (25) - 1 (2F) - 1 (2V) 7 (2T (2V)) internal pressure P + (2U) = T (2P)=> ds = Cv dT + B dv AS = ITS CV ST + (SB SV

513 The Dependence of
$$S$$
 on $T \in P$

$$dS = \begin{pmatrix} 3S \\ 3T \end{pmatrix}_{P} dT \cdot \begin{pmatrix} 3S \\ 3P \end{pmatrix}_{T} dP$$

$$dS = J dH - V dP$$

$$T T T$$

$$dH = \begin{pmatrix} 3H \\ 3T \end{pmatrix}_{P} dT \cdot \begin{pmatrix} 3H \\ 3P \end{pmatrix}_{T} dP = \begin{pmatrix} 2G \\ 2P \end{pmatrix}_{T} dP$$

$$dS = \begin{pmatrix} CP \\ 4T \end{pmatrix}_{P} dT \cdot \begin{pmatrix} 2H \\ 3P \end{pmatrix}_{T} - V dP = \begin{pmatrix} 2S \\ 3T \end{pmatrix}_{P} dP + \begin{pmatrix} 2S \\ 3T \end{pmatrix}_{P} dP$$

$$\begin{pmatrix} 3S \\ 3T \end{pmatrix}_{P} - \begin{pmatrix} 2P \\ 3P \end{pmatrix}_{T} - V dP = \begin{pmatrix} 3S \\ 3P \end{pmatrix}_{T} - V dP$$

$$\begin{pmatrix} 3S \\ 3P \end{pmatrix}_{T} - V \begin{pmatrix} 3P \\ 3P \end{pmatrix}_{T} - V \begin{pmatrix} 3P \\ 3P \end{pmatrix}_{T} - V dP$$

$$\begin{pmatrix} 3S \\ 3P \end{pmatrix}_{T} - V \begin{pmatrix} 3P \\ 3P \end{pmatrix}_{T} - V dP$$

$$\begin{pmatrix} 3S \\ 3P \end{pmatrix}_{T} - V \begin{pmatrix} 3P \\ 3P \end{pmatrix}_{T} - V dP$$

$$\begin{pmatrix} 3S \\ 3P \end{pmatrix}_{T} - V dP$$

$$dS = \begin{pmatrix} 2P \\ 3T \end{pmatrix}_{P} - V dP$$

$$dS = \begin{pmatrix} 1S \\ 2P \end{pmatrix}_{T} - V dP$$

$$dS = \begin{pmatrix} 1S \\ 2P \end{pmatrix}_{T} - V dP$$

	+ Spantan cous Process:
	$\frac{dS}{dS} \ge \frac{dQ}{dS}$
	T IN WILL AND THE
	-du + dw total + Tds >0
	O < 2bT + dwnonexp + dwnonexp + Ub =
	-du - Pext dv + dwnonexp + Ids 30
1 . \	since w=0, du=0(isolated system) => ds>0
174	TdS = d(TS) (isolated system)
	- du + Tdl > - dwexp - dwnonexp
	d(U-TS) & dwexp + dwnonexp
	CIE DE LA CONTRACTOR DE
T	Helmholtz Free Energy
en //K	dt o dA & dwexp + dwnonexp - SdT
3 / 16	dA < dwexp + dwnonexp
	It is constant, Helmhaltz energy is a measure
	of the maximum amount of work that can be produced
	by the system Only equal for reversible work
	dwnonexp - dwexp - 0
	d A < 0
	Since H - U+PV
	d(U+PV -TS) = d(H-TS) < dwnonexp
	dG <0
	$\frac{ds}{T} \gtrsim 0$

.

adepends on concentrations of readants & products
AGR - AHR - TASR
Spontaneous: DHR < 0 & DSR > 0
Mever spontaneous: AH, >0.8 AS, <0
At constant V & T , DAR <0
DAR - AUR - TOCK
6.2 The Differential Farms of U, H, A, & G
H-U+PV
A - U - TS G - H - TS - U + PV - TS
du - Ids - PdV
dH = Tds - PdV + PdV + VdP = Td3 + VdP
dA = TdS - PdV - TdS - SdT = -SdT - PdV
dG = TdS + VdP - TdS - SdT = - SdT + VdP
du - Ids - Pdv - 120 ds / 120 dv
Vb (V6), 2b (26) - Vb9 - 2bT - Vb
(3U) = Te (3U) = -P
192 / 19N / 2N / 2
12H - T 8 (2H) - V
(25)
() A \ - S & () A \ - P
1 or), lov /
1261 = -5 2 (26) = 1
1/95/6 /36/2
$\begin{pmatrix} (v,z)uc \\ s \end{pmatrix} = \begin{pmatrix} (v,z)uc \\ sc \end{pmatrix} = \begin{pmatrix} (v,z)uc \\ $

a to the property of the book property of the second secon
Maxwell relations. (2T) - (2P)
$\begin{pmatrix} VG \\ QG \end{pmatrix} = \begin{pmatrix} TG \\ QG \end{pmatrix}$
$\frac{\partial}{\partial x} = \frac{\partial}{\partial x} = \frac{\partial}$
$\frac{\partial S}{\partial P} = \frac{\partial V}{\partial T} = \frac{\partial V}{\partial T} = \frac{\partial V}{\partial P}$
63 The Dependence of the Gibbs & Helmholtz Energies
on P, V, and T
$ \frac{(2A)}{(2V)} = \frac{AC}{(2V)} = -P $
191/V (51/L
$ \begin{pmatrix} 3G \\ 3T \end{pmatrix}_{\rho} = -G \begin{pmatrix} 8 \\ 3P \end{pmatrix}_{T} $ $ \int_{0^{\circ}} dG - G(T,P) - G^{\circ}(T,P^{\circ}) - \int_{0^{\circ}} VdP' $
[dc - C-(T-0) - C-(T-0) (111P'
) po 04 = 01,1) = 001
G(T,P)=G°(T,P°)+ (VdP'2G°(T,P°)+V(P-P°)
G(T, P) - G'(T) + VdP' - G'(T) + PRT dP' - G'(T) + NRT(n P)
Gibbs - $\left(\frac{\partial \left(\frac{G}{T}\right)}{\partial T}\right) = \frac{1}{\sqrt{\partial G}} \left(\frac{\partial G}{\partial T}\right)$ Helmholtz $\left(\frac{\partial T}{\partial T}\right)_{p} = \frac{1}{\sqrt{\partial T}} \left(\frac{\partial G}{\partial T}\right)$ equation
equation $ \frac{1}{T} \left(\frac{\partial G}{\partial T} \right)_{\rho} \frac{G}{T'} = \frac{S}{T} \frac{G}{T'} \frac{G}{T^2} \frac{-H}{T^2} $
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
dT T2

$= > \left(\frac{3\left(\frac{G}{T}\right)}{3\left(\frac{1}{T}\right)} \right) = \left(\frac{3\left(\frac{G}{T}\right)}{3T} \right) = \left(\frac{dT}{d\left(\frac{1}{T}\right)} \right) = \frac{H}{T^2} \left(-1' \right) = H$ $\int_{-T}^{T} d\left(\frac{\Delta G}{T} \right) = \int_{-T}^{T} \Delta H d\left(\frac{1}{T} \right)$
$\frac{\Delta G(T_{L})}{T_{Z}} = \frac{\Delta G(T_{I})}{T_{I}} + \Delta H(T_{I}) \left(\frac{1}{T_{L}} - \frac{1}{T_{I}}\right)$