	Poma Patel
	Reading Assignment b
	Roma Patel Reading Assignment b 5.12: Using The fact that S is a state function to determine the dependence of S on V and T dS = T du + T dV Blow 1/2 and Pl T are an easter than the entropy of a system increase
	$dS = \frac{1}{7}du + \frac{p}{7}dV$
	with the internal energy at constant volume + incheases with the volume
	at constant internal energy 19-4 = U model 1 son more constant.
	$\frac{1}{2} \frac{1}{2} \frac{1}$
	- We first write me total differential ds in terms of me partial derivatives
	with respect to V+The 1851 17 1851
	05 - (8T) val + (8V) 7 aV
TANG	- To evaluate (= 13T), and (= 13T) + for as:
	with respect to $V+T$ $dS = \left(\frac{\partial S}{\partial T}\right)_{V}dT + \left(\frac{\partial S}{\partial V}\right)_{T}dV$ $-To evaluate \left(\frac{\partial S}{\partial T}\right)_{V} and \left(\frac{\partial S}{\partial V}\right)_{T} for dS: dS = \overline{T}\left[C_{V}dT + \left(\frac{\partial U}{\partial V}\right)_{T}dV\right] + \overline{T}dV = \frac{C_{V}}{T}dT + \overline{T}\left[P + \left(\frac{\partial U}{\partial V}\right)_{T}\right]dV$
7	$\left(\frac{\partial S}{\partial T}\right)_{V} = \frac{CV}{T}$ and $\left(\frac{\partial S}{\partial T}\right)_{T} = \frac{1}{T}\left[P + \left(\frac{\partial V}{\partial V}\right)_{T}\right]$
)	- The expressions for (85/84), is not a form mat allows for a direct
	companson with experiment to be made no new to a level
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ele angle College on State College Col	$\left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) = \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) + \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) = \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) + \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) = \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) + \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) = \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) + \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) = \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) + \left(\frac{\partial}{\partial t} \left(\frac{\partial S}{\partial t}\right)\right) = 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	- Taking the mixed second derivative
	There muced partial of (1/6) (6) 1/4 (1/6) (5)
	$\left(\frac{\partial f}{\partial r}\left(\frac{\partial g}{\partial r}\right)^{\frac{1}{2}}\right)^{\frac{1}{2}} = \frac{1}{2}\left[\left(\frac{\partial f}{\partial r}\right)^{\frac{1}{2}}\right]^{\frac{1}{2}} \left[\left(\frac{\partial f}{\partial r}\right)^{\frac{1}{2}}\right]^{\frac{1}{2}} \left[\left(\frac{\partial f}{\partial r}\right)^{\frac{1}{2}}\right]^{\frac{1}{2}} \left[\left(\frac{\partial f}{\partial r}\right)^{\frac{1}{2}}\right]^{\frac{1}{2}}$
	V 1197 J 1 9 77 9 77 95 / 76/2 7 91 1 9 5 / 76
H6 Y	Simplify: $P + (\frac{\partial U}{\partial V})_{\tau} = \tau \cdot (\frac{\partial P}{\partial T})_{V} + \frac{\partial P}{\partial T} = \frac{\partial P}{\partial T} $
7624	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Ligações and reprisentativos et desirante d ^a te relati	ptions.
J-	I practical equation is obtained for the dependance of entropy
0	n volume under construct temp conditions:
	1251 1881 = 1881 1261
	$(\frac{\partial S}{\partial V})_{T} = (\frac{\partial P}{\partial T})_{V} = (\frac{\partial V}{\partial V})_{T} = \frac{B}{X}$
10	he result of those considerations is must distant be expressed
	terms of at and dy as: 1989 more of distance who permanages
1	Controlling to the

$$dS = \int_{T}^{V} dT + \sum_{x}^{y} dy$$

$$\Delta S = \int_{T_{1}}^{T_{2}} \sum_{x}^{y} dT + \int_{y_{1}}^{V} \sum_{x}^{y} dy$$
5.13: The dependence of S on T and P

The total differential ds is written in me form
$$dS = \begin{pmatrix} 0S \\ T \end{pmatrix}_{p} dT + \begin{pmatrix} 0S \\ SP \end{pmatrix}_{p} dP$$
- starting from me relation $U = H - Py$ total differential dU :
$$dU = TdS - PdY = AH - PdY - ydP$$

$$dA = \begin{bmatrix} 1 \\ 2H \\ 2H \end{bmatrix}_{p} dT + \begin{bmatrix} 0H \\ 2H \\ 2H \end{bmatrix}_{p} dP = CpdT + \begin{bmatrix} 0H \\ 2H \\ 2H \end{bmatrix}_{p} dT + \begin{bmatrix} 0S \\ 2H \\ 2H \end{bmatrix}_{p} dP$$

$$dS = CP dT + T \begin{bmatrix} 0H \\ 2H \\ 2H \end{bmatrix}_{p} - V \end{bmatrix} dP = \begin{bmatrix} 0S \\ 2H \\ 2H \end{bmatrix}_{p} dT + \begin{bmatrix} 0S \\ 2H \\ 2H \end{bmatrix}_{p} dT + \begin{bmatrix} 0S \\ 2H \\ 2H \end{bmatrix}_{p} dT + \begin{bmatrix} 0S \\ 2H \\ 2H \end{bmatrix}_{p} dP$$
The coefficiant of dT and dP musi be same on born sides:
$$\begin{pmatrix} 0S \\ 2H \\ 2H \end{pmatrix}_{p} = T \text{ and } \begin{pmatrix} 0S \\ 2H \\ 2H \end{pmatrix}_{T} - V \end{bmatrix}$$
Thust as mour evaluation of $(SS | 2H)_{T}$ since equate the mixed scand partial derivatives of $(SS | 2H)_{T}$ p and $(SS | 2H)_{T}$; since equate the mixed scand partial derivatives of $(SS | 2H)_{T}$ p and $(SS | 2H)_{T}$ p $(SS | 2H)_{T$

Using mese results, the total differential ds can be written in terms of experimentally accessible parameter as:

integrating both sides: $\Delta s = \int_{-T}^{T} dT - \int_{-T}^{P_f} V B A P$
integrating born sides:
S = (" TdT - VBAP
3.06. 1. 4. NO NO. 10 S. 3. 1 (5.000, 030, 031, 0.0. 0.)
6.1 The Gibbs Energy and the Helmholtz Energy
The fundamental expression governing spontaneity is the clausius inequality,
written in the form which $Tas \ge dq$
The quality is satisfied only for a neversible process Blc da = du-dw
Tas = dv-tw for -du+ tw + Tas = 0
Its useful to distinguish between expansion work, in which work anses
from a volume change in system nonexpansion work
- dy - Pexternal dy + awnonexpansion + Tds ≥0
For isomermal processes, Tds = d (Ts)
-du + Tds ≥ - the xpansion - two nexpansion or
d (U-Ts) ≤ awexpansion + awnonexpansion
The combination of state function U-Ts, which has the units of energy, defines
a new state function mat we call the felminate energy abbreviated t.
$dA = \overline{J}wexpansion - \overline{d}wnonexpansion \leq 0$
Tw+otal = Tw expansion + Tw nonexpansion ≥ dA
If nonexpansion work also is not possible in the tranformation awnonexpansion =
a wexpansion = 0 the condition mut defines spontaneity and equilibrium becomes
dan≤10° 34 suns 210 desertable Lottet grundlich 2.7°
using the relation H = U+PV Vb9 - 267 = Ub
$d(U+PV-TS)=d(H-TS)\leq \overline{d}$ two nonexpansion
The combination of state functions H-Ts, which has the units of energy, define
a new state function called the hibbs energy is
d6 - dw nonex pansion 50
A CONTRACTOR OF THE CONTRACTOR
Clausius inequality
Clausius inequality $ds - \frac{\partial a}{\partial x} \ge 0$
ds + ds surroundings > 0
The state of the s

For macroscopic changes at constant Pand I in which no nonexpansion work is possible, the condition for spontaneity is AGR < 0 where: AGR = OHR-TOSR · The entropic contribution to some is greater for higher temp · the chemical transformation is always spontaneous if latter < 0 + DSP > 0 · The chemical transformation is always nonspontaneous if AHR>O + ASR < O . The relative magnitudes of Lity + TASP, determine if chemical trans is spontaneous · If me chemical reaction is not spontaneous, then me reverse process is sportaneous is the at the real at the . If BGR = 0, we reaction mixture is at equilibrium , + neither direction of A is spontaneous · For macroscopic changes at constant VTT in which no nonexpansion work is pussible, me condition for spontcity is box < 0 where LAR - AUR + TASP 19 10 - 16/11 Manager B. Constant Mark 2 135 911. 10.2: The differential forms of U.H.A. and G - Differential forms are essential in calculating how U.H.A. a vary with state vanable such as P and T. staring from the definitions: 1 H=Ut PVanh - no marshit = porms en and and a F all Tr. Tosy was story of a Direction of G = H-TS = U+PV-TS The following total differentials can be formed: du = Tds - PdV 19 + 10 x ports de dH = Tds - PdV + PdV + VdP = Tds + VdP dd = Tas - BODPAY - Tas - sat = -sat -Pap Pdy dG = Tds +VdP - Tds - gat = - sat +vdP Almough other combinations variables can be used these natural variables are a used ble me afferential expression are compact d) = Tas - Pay = (ds) y ds + (ty) cdv $\begin{pmatrix} \frac{\partial V}{\partial s} \end{pmatrix}_{p} = T \text{ and } \begin{pmatrix} \frac{\partial W}{\partial v} \end{pmatrix}_{s} = V$ $\begin{pmatrix} \frac{\partial H}{\partial s} \end{pmatrix}_{p} = T \text{ and } \begin{pmatrix} \frac{\partial H}{\partial p} \end{pmatrix}_{s} = V$

Maximum nonexpansion work: can be produced by a unemical transformations

$$\left(\frac{\partial A}{\partial T}\right)_{V} = -s$$
 and $\left(\frac{\partial A}{\partial V}\right)_{T} = -p$

$$\left(\frac{\partial B}{\partial T}\right)_{P} = -s$$
 and $\left(\frac{\partial B}{\partial P}\right)_{T} = V$
These expressions states how U, H, A and G vary with their natural variables