$$\left(\frac{\partial H}{\partial T}\right)_P = C_P$$

$H(T, P)$

$$\left(\frac{\partial H}{\partial P}\right)_T = -\mu_{JT} C_P$$

$H(T V)$

$$dH = C_P dT - C_P \mu_{JT} dP$$

$$= \left(\frac{\partial H}{\partial T}\right)_V dT + \left(\frac{\partial H}{\partial V}\right)_T dV$$

$$dV = \left(\frac{\partial V}{\partial T}\right)_P dT + \left(\frac{\partial V}{\partial P}\right)_T dP$$

$$\left(\frac{\partial H}{\partial T}\right)_V + \left(\frac{\partial H}{\partial V}\right)_T \left(\frac{\partial V}{\partial T}\right) = C_P$$

$$\left(\frac{\partial H}{\partial V}\right)_T \left(\frac{\partial V}{\partial P}\right)_T = -C_P \mu_{JT}$$

$$\boxed{\left(\frac{\partial H}{\partial V}\right)_T = + \frac{C_P \mu_{JT}}{V \kappa}}$$

$$\boxed{\left(\frac{\partial H}{\partial T}\right)_V = C_P \left[1 - \frac{\alpha}{\kappa} \mu_{JT}\right]}$$

EXTENSION TO n-DIMENSIONS

$$dF = \nabla F \cdot d\underset{\sim}{r}$$

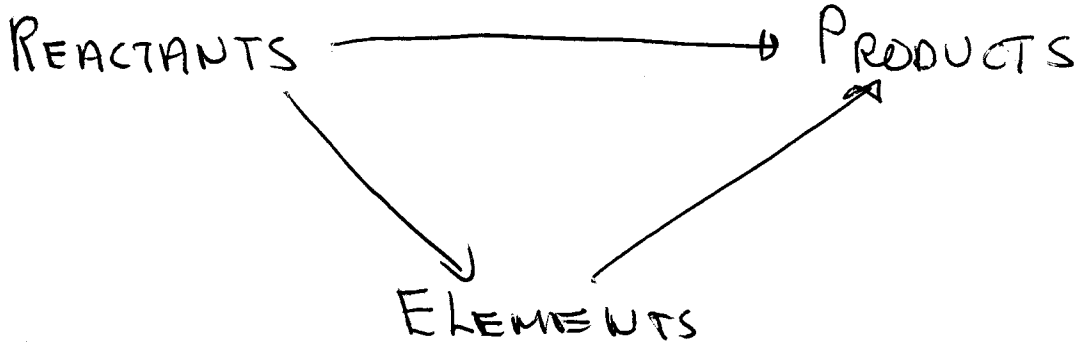
$$F(\underset{\sim}{r}) = F(x, y, z, \ldots)$$

$$(\nabla F)_i = \left(\frac{\partial F}{\partial x_i}\right)_{x_j,\ j \neq i}$$

$$dF = \sum_{i=1}^{n} \left(\frac{\partial F}{\partial x_i}\right)_{x_j,\ j \neq i} dx_i$$

$$\left(\frac{\partial^2 F}{\partial x_j\, \partial x_i}\right) = \left(\frac{\partial^2 F}{\partial x_i\, \partial x_j}\right)$$

$$\nabla \times \nabla F = 0$$



ELEMENTS AT THEIR NATURAL STATE AT 1 ATM. ≡ STANDARD STATE

USUALLY WE PICK $T = 25^{\circ}C$ AS A REFERENCE TEMPERATURA

DEFINE FORMATION ENTHALPIES AS ~~THE~~ ENTHALPIES ASSOCIATED WITH RXN BETWEEN ELEMENT AT THEIR STANDARD STATE

q_p $\quad 2H_2(g) + O_2(g) \rightarrow 2H_2O(l) \quad \Delta H_f^{\circ}[H_2O(l)]$

SINCE WE CAN ONLY MEASURE DIFFERENCES IN ENTHALPY, ΔH, WE CAN SET A REFERENCE POINT.

$$\Delta H_f^\circ[\text{Elem}] = 0 \qquad \text{AT } T = 25^\circ C$$

$$q_p = \Delta H_f^\circ[H_2O(l)] - 2\Delta H_f^\circ[H_2(g)] - \Delta H_f^\circ[O_2(g)]$$

THEREFORE MEASURING THE HEAT EXCHANGE IN RXN INVOLVING ELEMENTS WE CAN CONSTRUCT A TABLE OF ENTHALPIES OF FORMATION

NOW WE CAN CALCULATE ENTHALPIES OF REACTIONS AS:

$$\Delta H_{rxn}^\circ = \sum_p \nu_p \Delta H_f^\circ[\text{PRO}] - \sum_l \nu_l \Delta H_f^\circ[\text{REAC}]$$