

סיכום נוסחאות:

$$(1) \quad G = G^0 + nRT \ln\left(\frac{P}{P^0}\right) = G^0 + nRT \ln(a)$$

עבור גז אידיאלי:

$$(2) \quad dG = -SdT + VdP + \sum_{i=1}^N \mu_i dn_i$$

$$(3) \quad dn_i = \nu_i d\xi$$

$$(4) \quad dG = SdT + VdP + \sum_{i=1}^N \mu_i \nu_i d\xi$$

$$(5) \quad dG_{T,P} = \sum_{i=1}^N \mu_i \nu_i d\xi$$

$$(6) \quad \frac{dG}{dn_i} = \frac{dG^0}{dn_i} + \frac{d}{dn_i} (nRT \ln(a_i)) \Rightarrow \mu_i = \mu_i^0 + RT \ln(a_i)$$

$$(7) \quad \Delta_r G = \left(\frac{dG}{d\xi}\right)_{T,P} = \sum_{i=1}^N \mu_i \nu_i = \sum_{i=1}^N (\mu_i^0 + RT \ln(a_i)) \nu_i = \sum_{i=1}^N (\nu_i \mu_i^0 + \nu_i RT \ln(a_i))$$

$$(8) \quad \Rightarrow \Delta_r G = \Delta_r G^0 + RT \ln(Q)$$

$$(9) \quad \ln Q = \sum_{i=1}^N \nu_i \ln\left(\frac{P_i}{P^0}\right) = \sum_{i=1}^N \ln\left(\frac{P_i}{P^0}\right)^{\nu_i} = \sum_{i=1}^N \ln(a_i)^{\nu_i} = \ln\left(\prod_{i=1}^N a_i^{\nu_i}\right)$$

$$(10) \quad \Rightarrow Q = \prod_{i=1}^N a_i^{\nu_i} = \prod_{i=1}^N \left(\frac{P_i}{P^0}\right)^{\nu_i} = \prod_{i=1}^N \left(\frac{P_i}{P} \frac{P}{P^0}\right)^{\nu_i} = \prod_{i=1}^N \left(\frac{n_i}{n_{tot}} \frac{P}{P^0}\right)^{\nu_i} = \prod_{i=1}^N \left(\gamma_i \frac{P}{P^0}\right)^{\nu_i}$$

$$(11) \quad \Delta_r G^0 = \Delta_r H^0 - T \Delta_r S^0$$

$$(12) \quad \Delta G^0 = \Delta H^0 - T \Delta S^0$$

$$(13) \quad \Delta_r G^0 = \sum_{i=1}^N \nu_i \Delta G_{f,i}^0$$

בשיווי משקל:

$$(14) \quad \Delta_r G = \left(\frac{dG}{d\xi}\right)_{T,P} = 0 \Rightarrow \Delta_r G^0 = -RT \ln(K)$$

$$(15) \quad K = Q_{eq} = \exp\left(-\frac{\Delta_r G^0}{RT}\right)$$

$$(16) \quad \Delta_r G^0 = \overline{\Delta G^0}$$