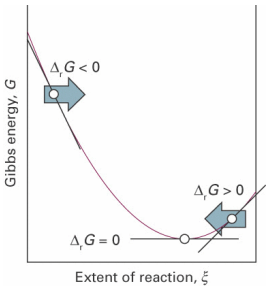
Reakcijska Gibbsova energija

$$\Delta_r G = \left(\frac{\partial G}{\partial \xi}\right)_{p,T}$$

$$\Delta_r G = \mu_B - \mu_A$$

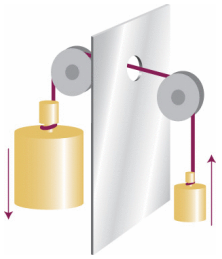


Egzergone i endergone reakcije

Egzergone reakcije: $\Delta_r G < 0$

Endergone reakcije: $\Delta_r G > 0$

Ravnoteža: $\Delta_r G = 0$

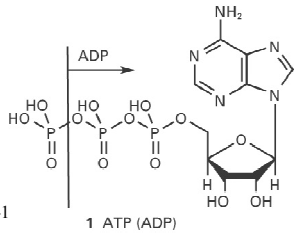


ATP u fiziološkim uvijetima

$$\Delta_r G^{\oplus} = -31 \text{ kJ mol}^{-1}$$

$$\Delta_r H^{\oplus} = -20 \text{ kJ mol}^{-1}$$

$$\Delta_r S^{\oplus} = +34 \text{ J K}^{-1} \text{ mol}^{-1}$$



Kemijska ravnoteža

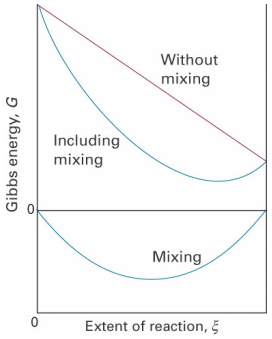
$$\Delta_r G = \Delta_r G^{\ominus} + RT \ln Q$$

$$Q = \prod_J a_J^{V_J}$$

U ravnoteži: $\Delta_r G = 0$

$$\Delta_r G^{\ominus} = -RT \ln K$$

$$K = \prod_J a_J^{V_J}$$



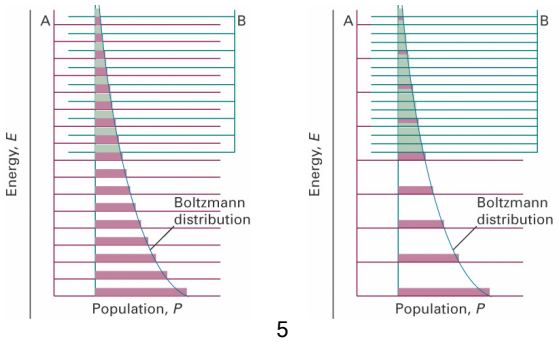
Kemijska ravnoteža

A + B ⇌ C + D

$$K = \frac{\gamma_C \gamma_D}{\gamma_A \gamma_B} \frac{b_C b_D}{b_A b_B} = K_\gamma K_b$$

Molekulska interpretacija ravnoteže

$$K = e^{-\Delta_r H^{\ominus}/RT} \cdot e^{\Delta_r S^{\ominus}/R}$$



Ravnoteža u biološkim sustavima

Biološko standardno stanje pri pH=7:

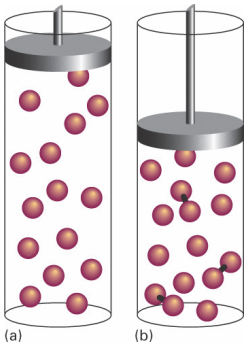
$$R + \nu H^+_{(aq)} \rightarrow P$$

$$\Delta_r G^{\oplus} = \Delta_r G^{\ominus} + 7\nu RT \ln 10$$

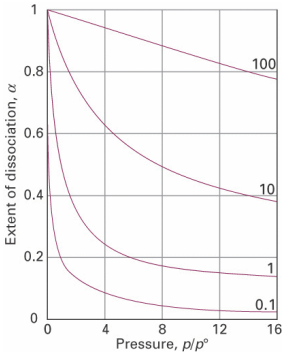
Ovisnost ravnoteže o tlaku

LeChatelierov princip:

Ako se sustavu u ravnoteži nametne neka promjena, sustav se prilagodi tako da učinak te promjene bude sveden na najmanju moguću mjeru.



Ovisnost ravnoteže o tlaku



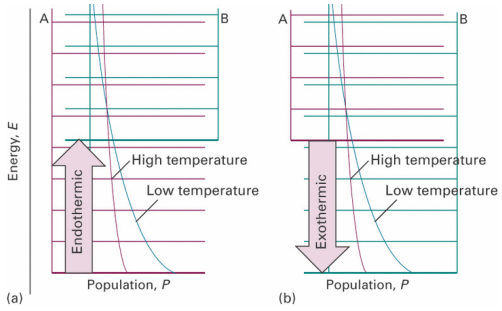
Ovisnost ravnoteže o temperaturi

van't Hoffova jednadžba:

$$\frac{d \ln K}{dT} = \frac{\Delta_r H^{\ominus}}{RT^2}$$

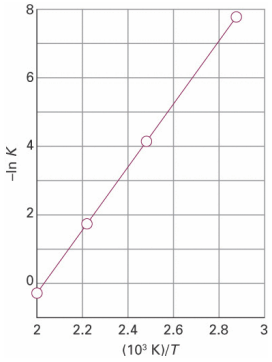
$$\frac{d \ln K}{d(1/T)} = -\frac{\Delta_r H^{\ominus}}{R}$$

Ovisnost ravnoteže o temperaturi



Mjerenje reakcijske entalpije

$$\frac{d \ln K}{d(1/T)} = -\frac{\Delta_r H^{\ominus}}{R}$$



Ovisnost ravnoteže o temperaturi

$$\ln K_2 - \ln K_1 = -\frac{\Delta_r H^\ominus}{\mathrm{R}} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$