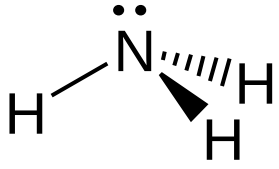
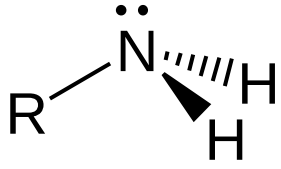
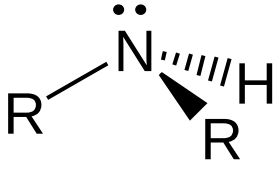
Amine



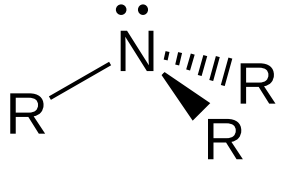
Ammoniak



primäres Amin



sekundäres Amin

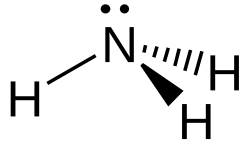


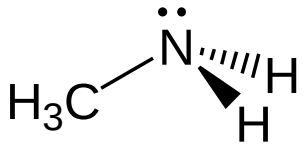
tertiäres Amin

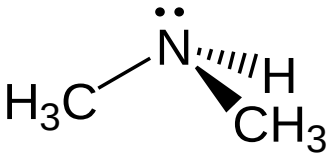
Basizität der Amine

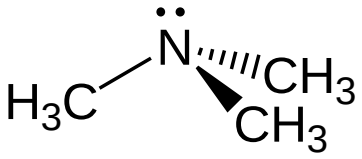
$$K_B = \frac{[\mathrm{R_3NH^+}]\cdot[\mathrm{OH^-}]}{[\mathrm{R_3N}]}$$

$$pK_B = -\log K_B$$

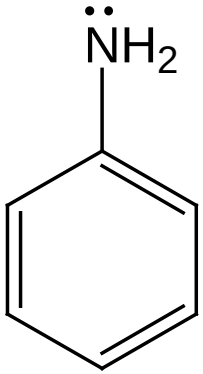


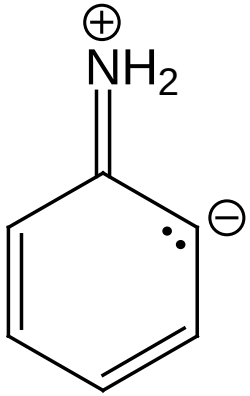


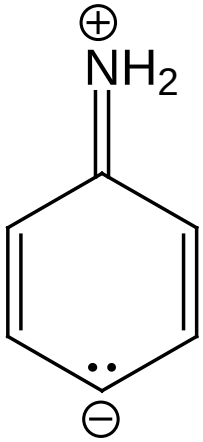


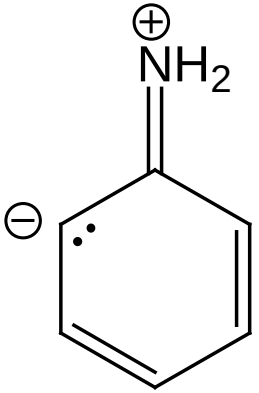


pK_B: 4.70 3.36 3.27 4.21



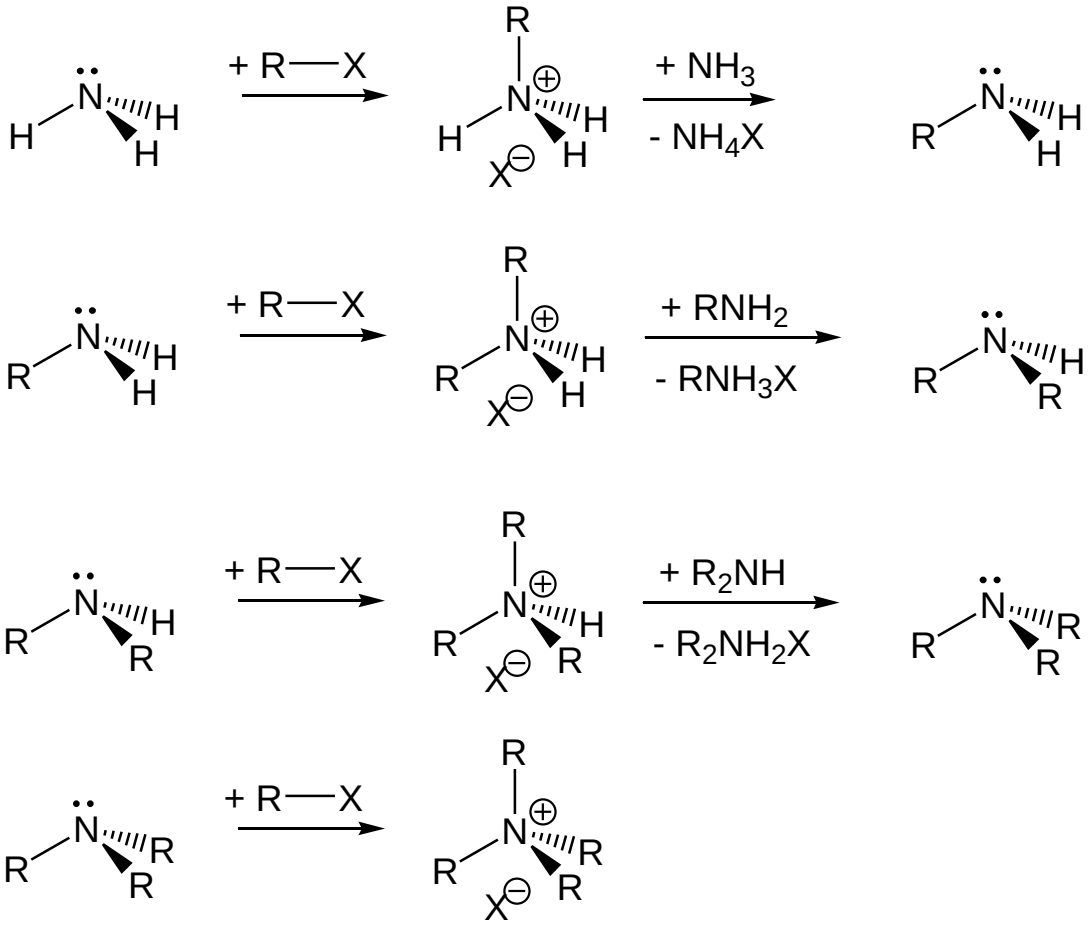




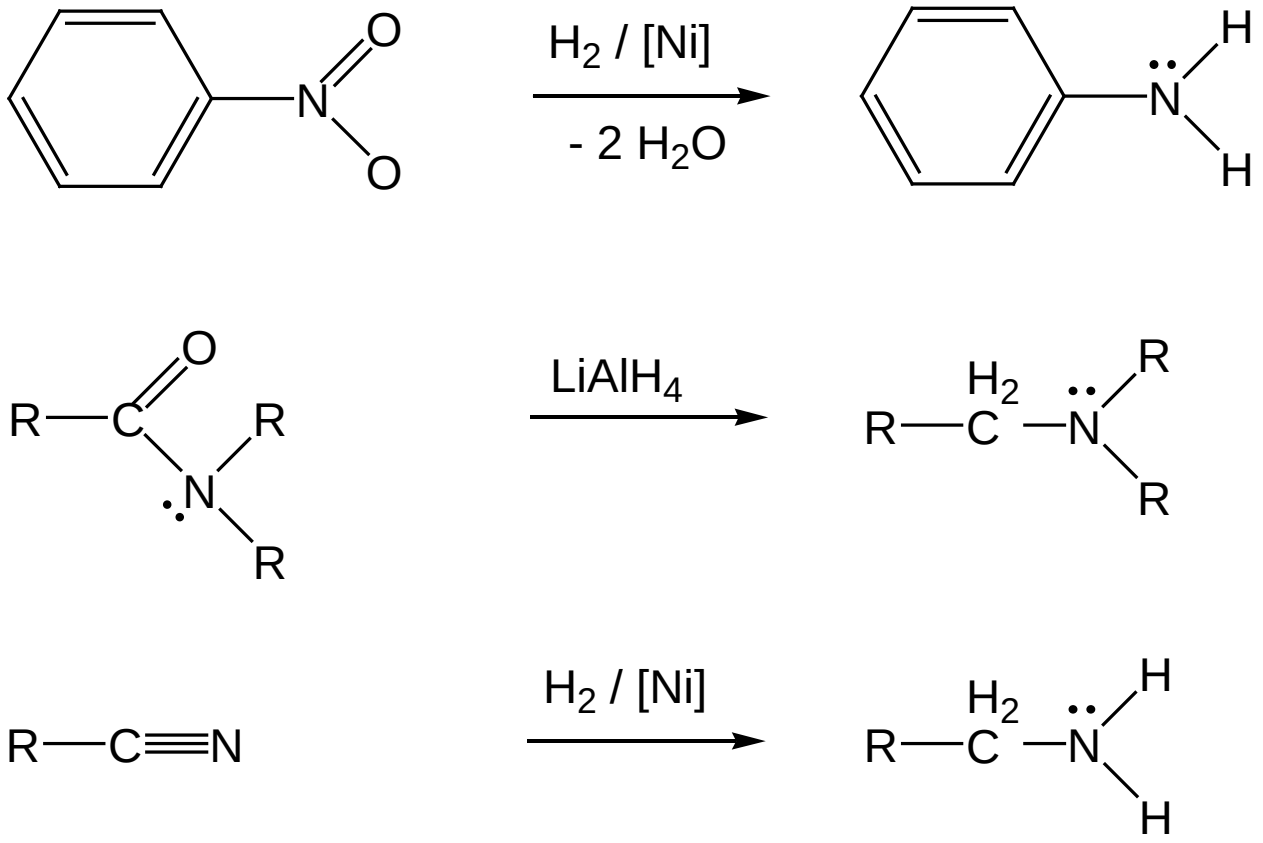


pK_B: 9.38

Aminsynthesen

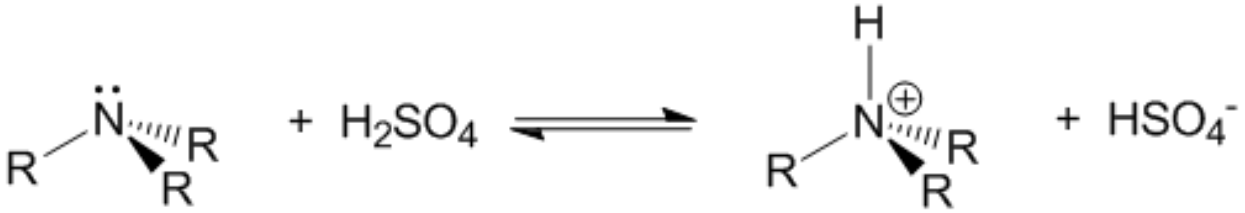


Darstellung von Aminen aus anderen Stickstoffverbindungen

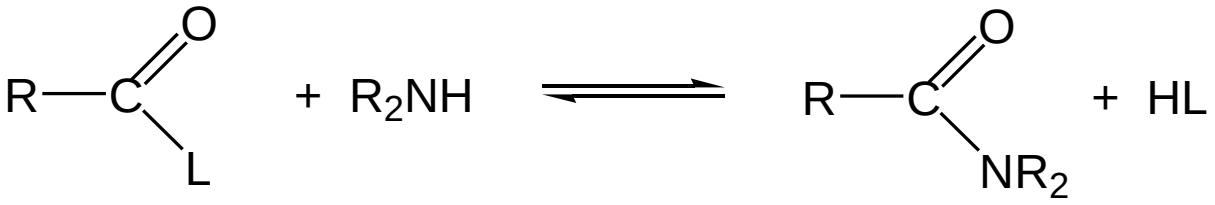


Reaktionen der Amine

a) Salzbildung mit starken Säuren

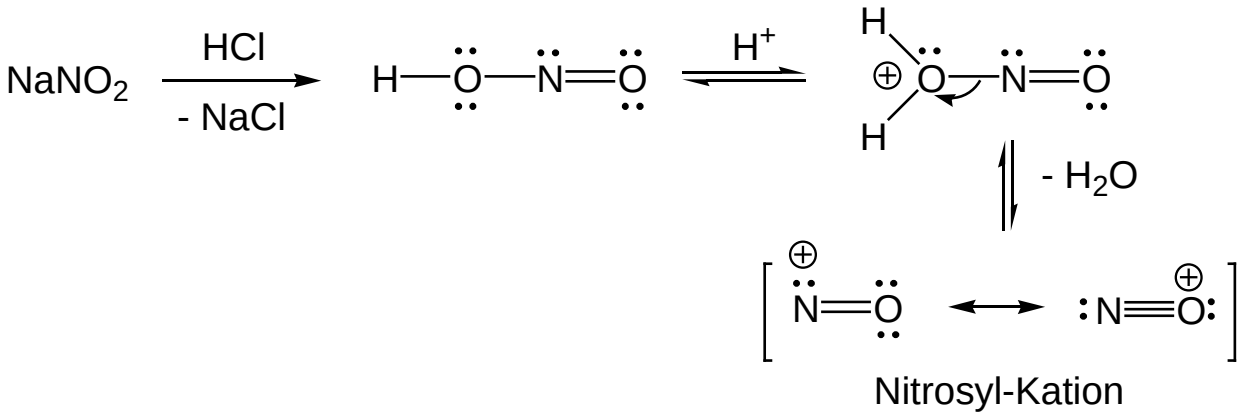


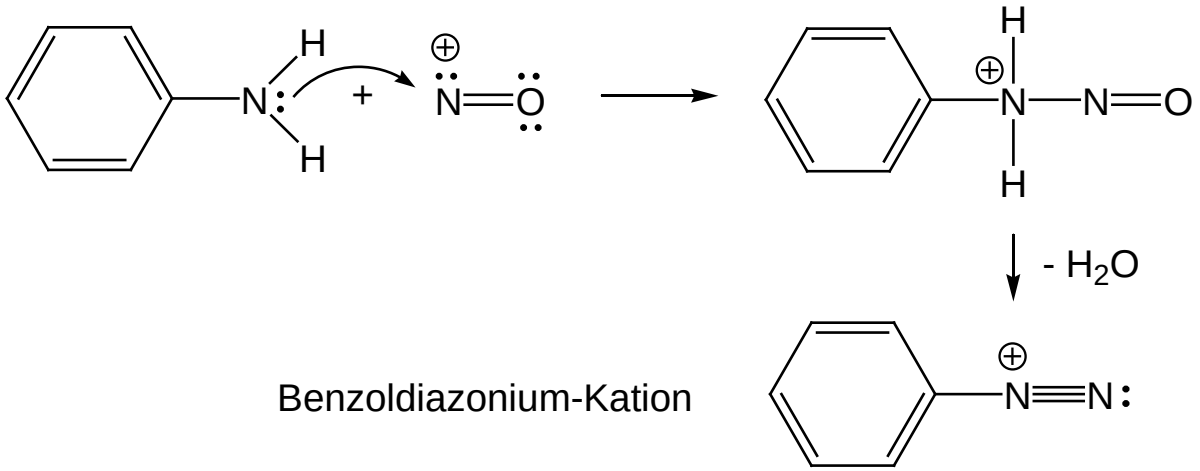
b) Reaktionen mit Carbonsäurederivaten zu Amiden



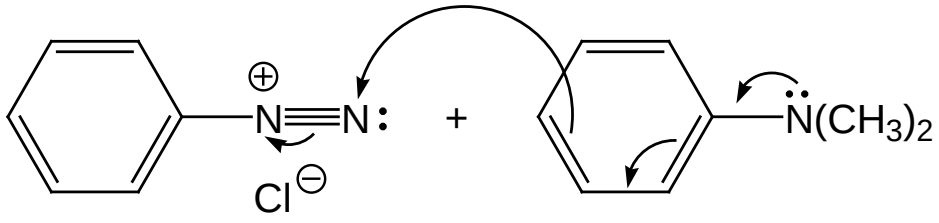
L = Cl, RCOO, OR

c) Bildung von Diazoniumsalzen

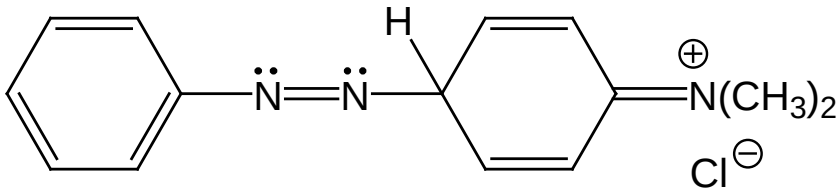




d) Azokupplung



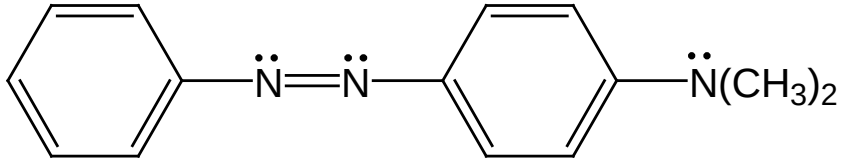
Benzoldiazonium-Kationen
sind Elektrophile



rot

pH < 3

pH > 4
- HCl

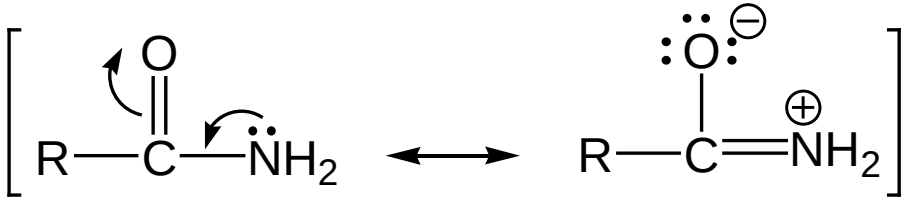


gelb

"Buttergelb"

Vergleich Amin – Amid

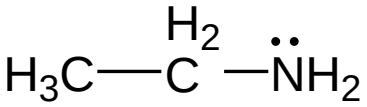
Basizität



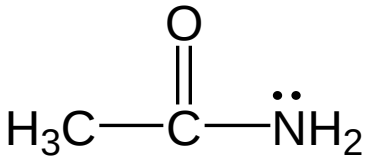
EP lokalisiert
leicht protonierbar

EP delokalisiert
schwer protonierbar

Beispiele:

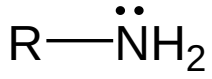


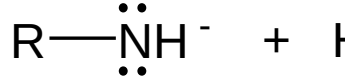
K_b: 4×10^{-4}



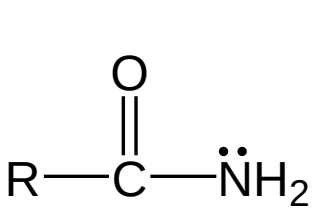
K_b: 3×10^{-15}

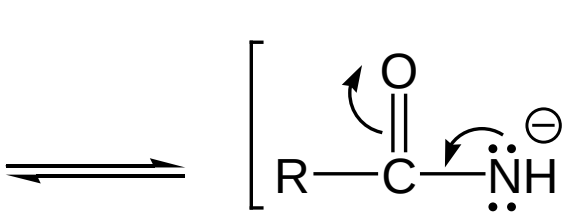
Acidität

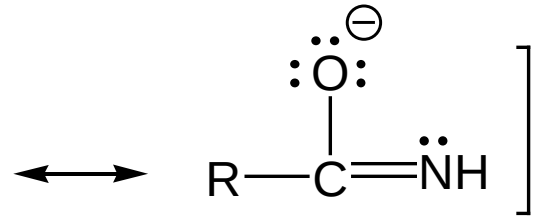




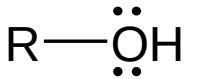
$K_a: 10^{-40}$

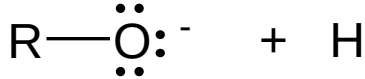






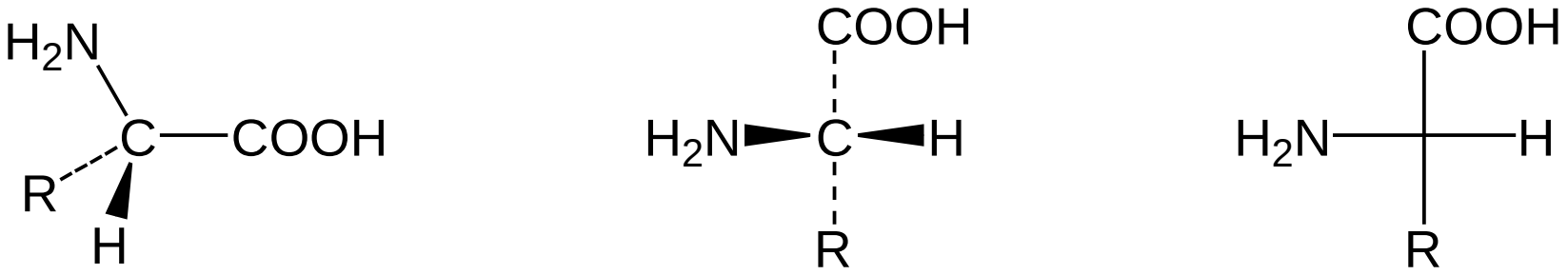
$K_a: 10^{-15}$





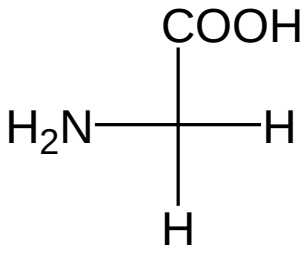
$K_a: 10^{-16}$

Aminosäuren

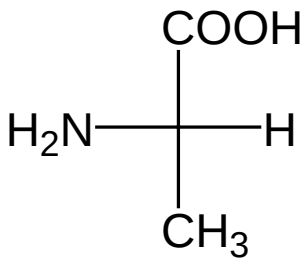


Natürliche Aminosäuren sind α-Aminosäuren in S-Konfiguration.
Sie werden auch als L-Aminosäuren bezeichnet.

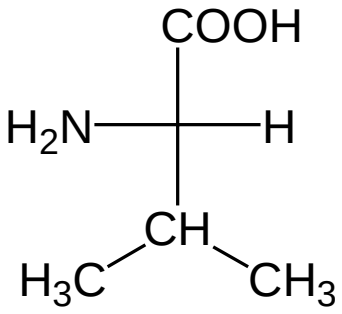
S (*sinester*, lat.: links); R (*rectus*, lat.: rechts)
L (*laevo*, links); D (*dextro*, rechts)



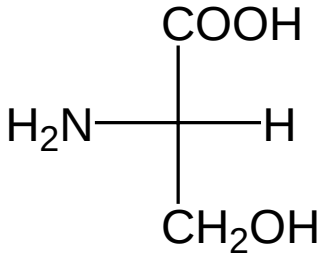
Glycin (Gly)



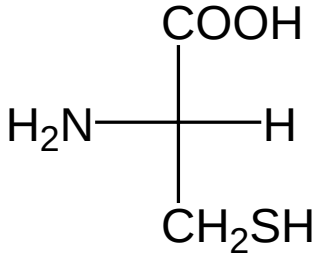
Alanin (Ala)



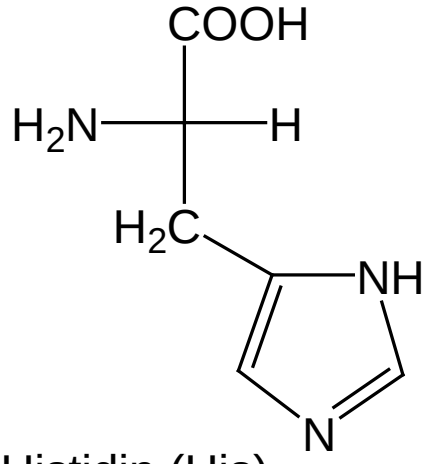
Valin (Val)



Serin (Ser)

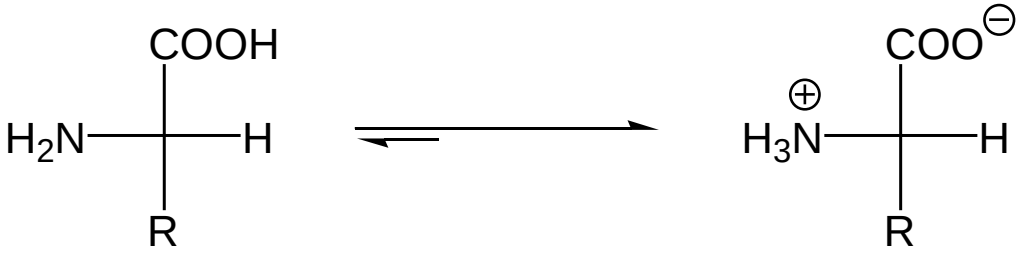


Cystein (Cys)



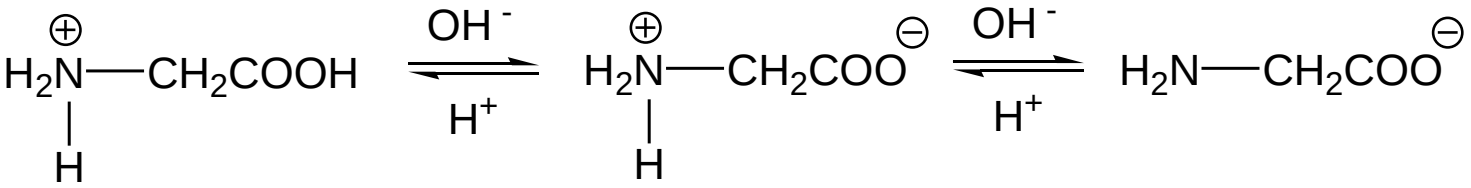
Histidin (His)

Der isoelektrische Punkt

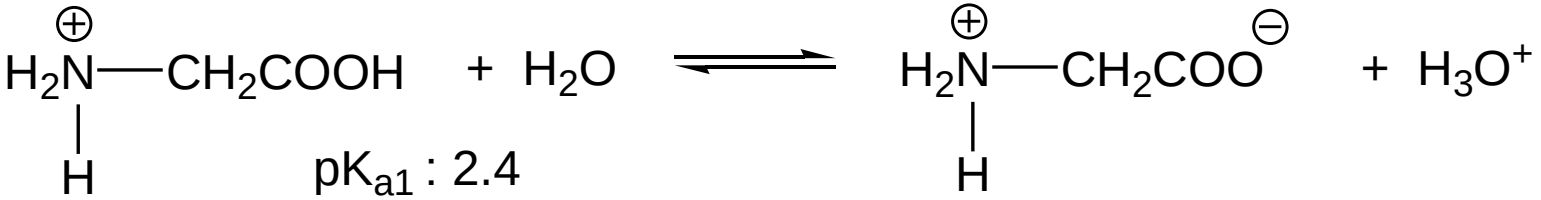


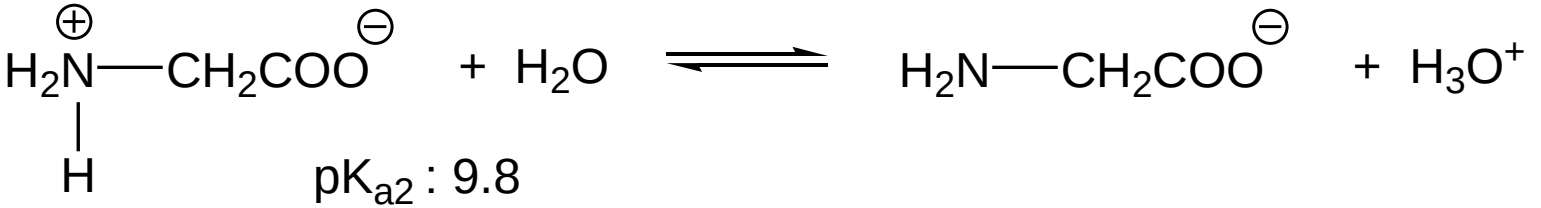
Zwitterion

Aminosäuren reagieren sauer und basisch.



überwiegt bei pH 1 | überwiegt bei pH 6 | überwiegt bei pH 12





$$K_{a1} = \frac{[H_3N^+CH_2COO^-]\cdot[H_3O^+]}{[H_3N^+CH_2COOH]} = 10^{-2.4}$$

$$K_{a2} = \frac{[H_2NCH_2COO^-]\cdot[H_3O^+]}{[H_3N^+CH_2COO^-]} = 10^{-9.8}$$

$$[H_3N^+CH_2COO^-] = \frac{[H_3N^+CH_2COOH] \cdot 10^{-2.4}}{[H_3O^+]}$$

$$[H_3N^+CH_2COO^-] = \frac{[H_2NCH_2COO^-] \cdot [H_3O^+]}{10^{-9.8}}$$

$$\frac{[H_3N^+CH_2COOH] \cdot 10^{-2.4}}{[H_3O^+]} = \frac{[H_2NCH_2COO^-] \cdot [H_3O^+]}{10^{-9.8}}$$

$$\frac{[H_3N^+CH_2COOH]\cdot 10^{-12.2}}{[H_2NCH_2COO^-]} = [H_3O^+]^2$$

Am isoelektrischen Punkt gilt:

$$[H_3N^+CH_2COOH] = [H_2NCH_2COO^-]$$

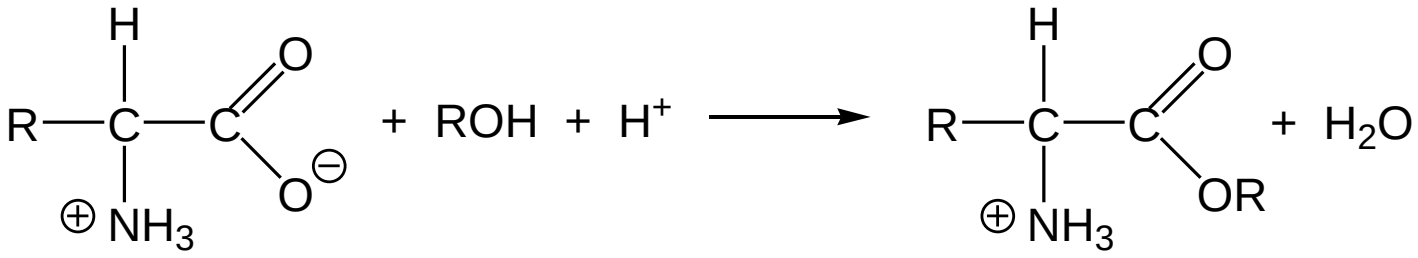
$$10^{-12.2} = [H_3O^+]^2$$

$$10^{-6.1} = [H_3O^+]$$

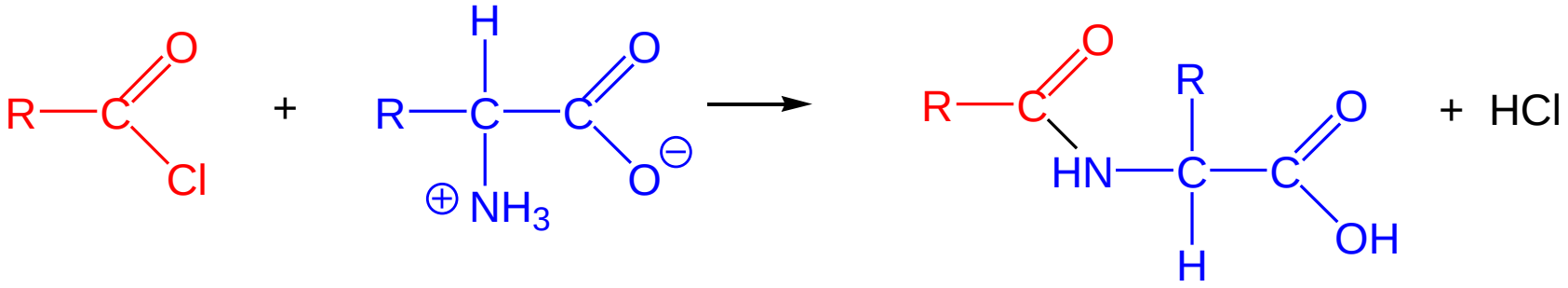
$$pH = pI = 6.1 \qquad pI = \frac{pK_{a1} + pK_{a2}}{2}$$

Reaktionsverhalten der Aminosäuren

Aminosäuren reagieren wie Carbonsäuren:

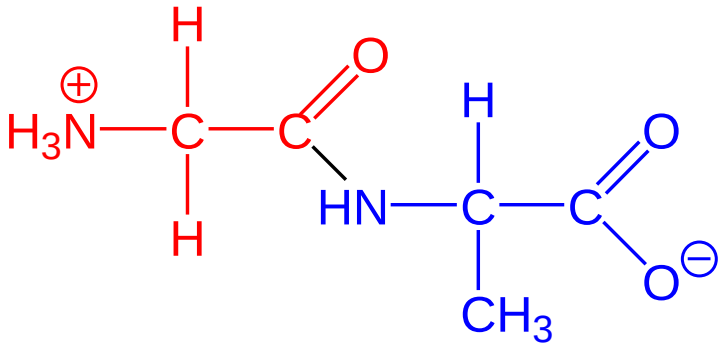


Aminosäuren reagieren wie Amine

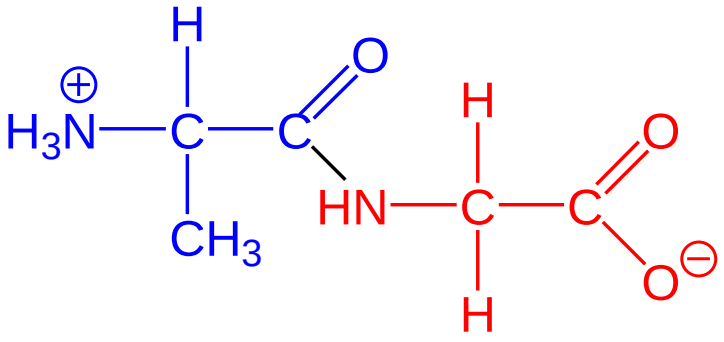


Peptide

Peptide sind amidartig verknüpfte Aminosäuren

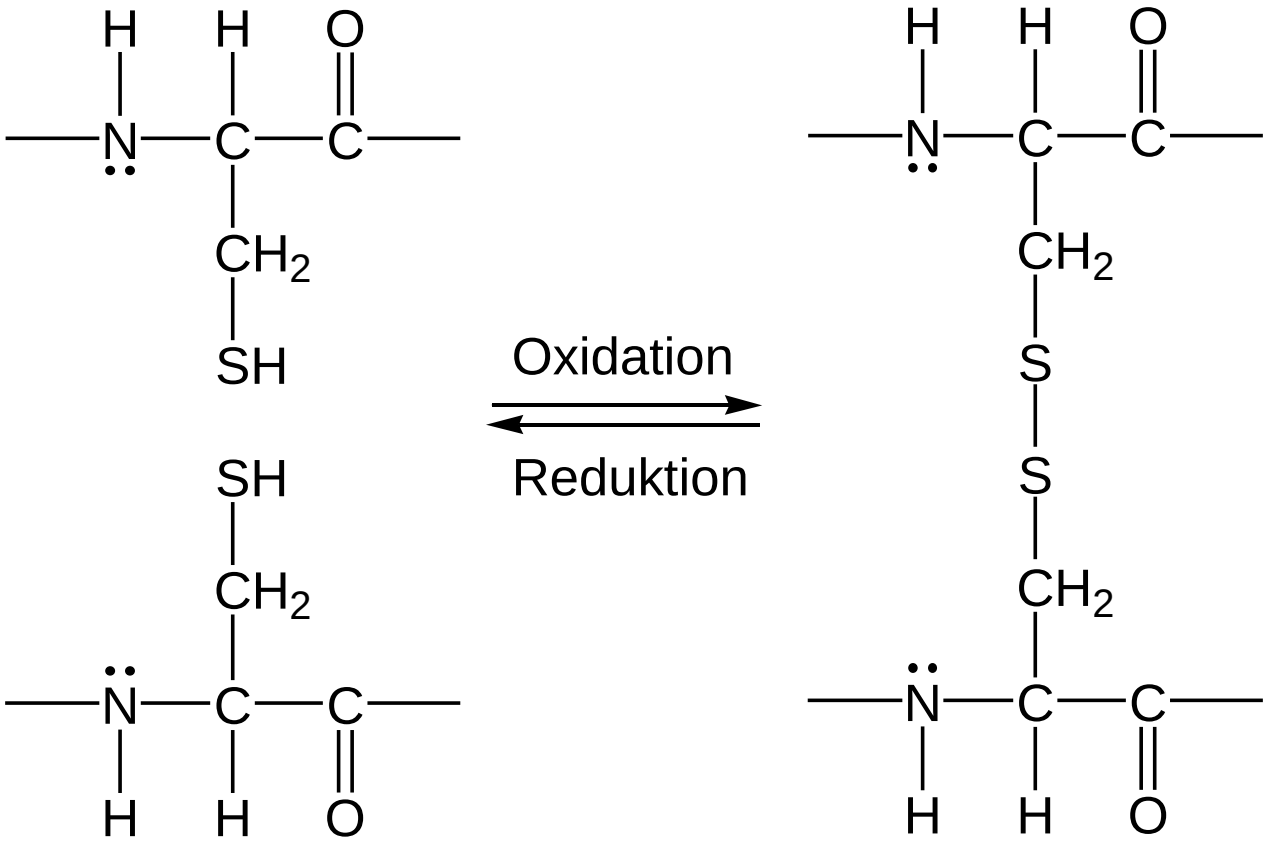


Dipeptid: Glycylalanin Gly-Ala

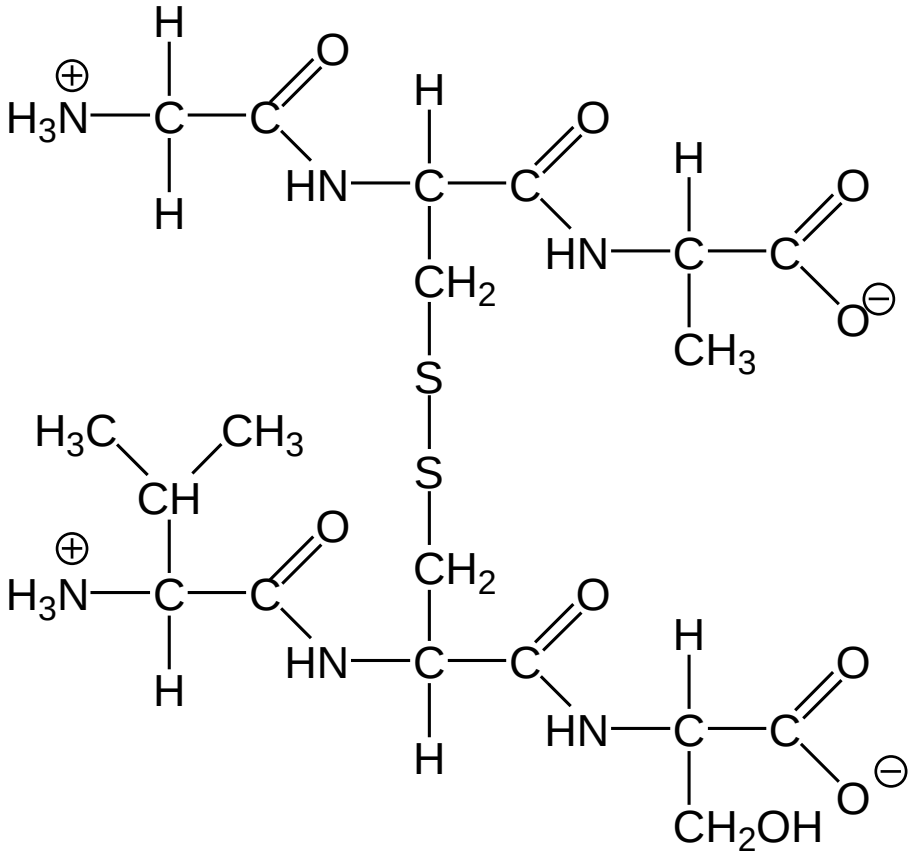


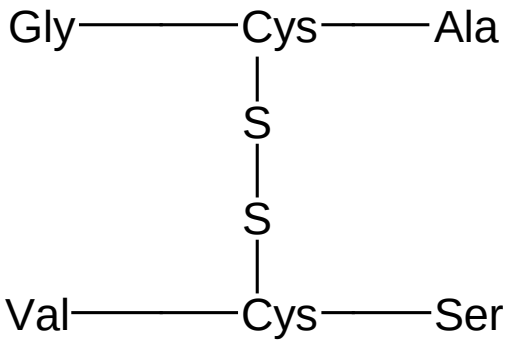
Dipeptid: Alanylglycin Ala-Gly

Disulfidbrücken in Peptiden



Disulfidverbrückte Peptidketten

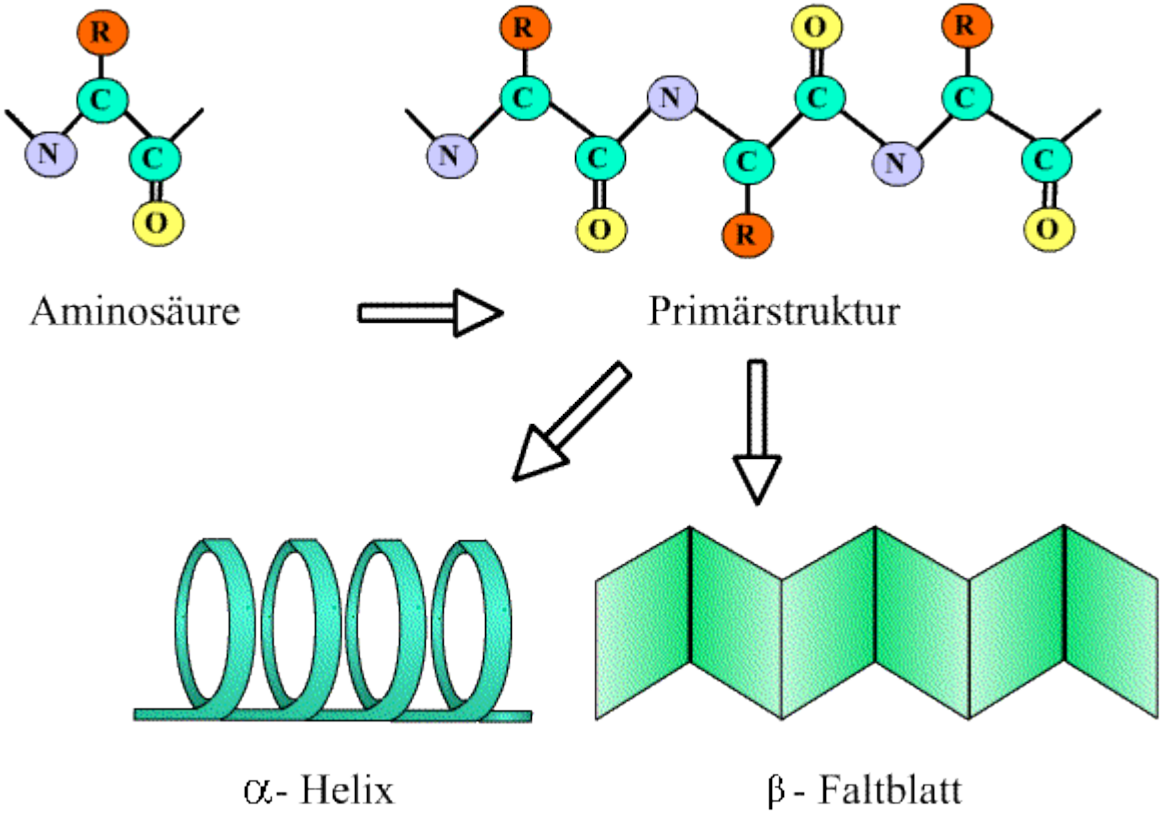


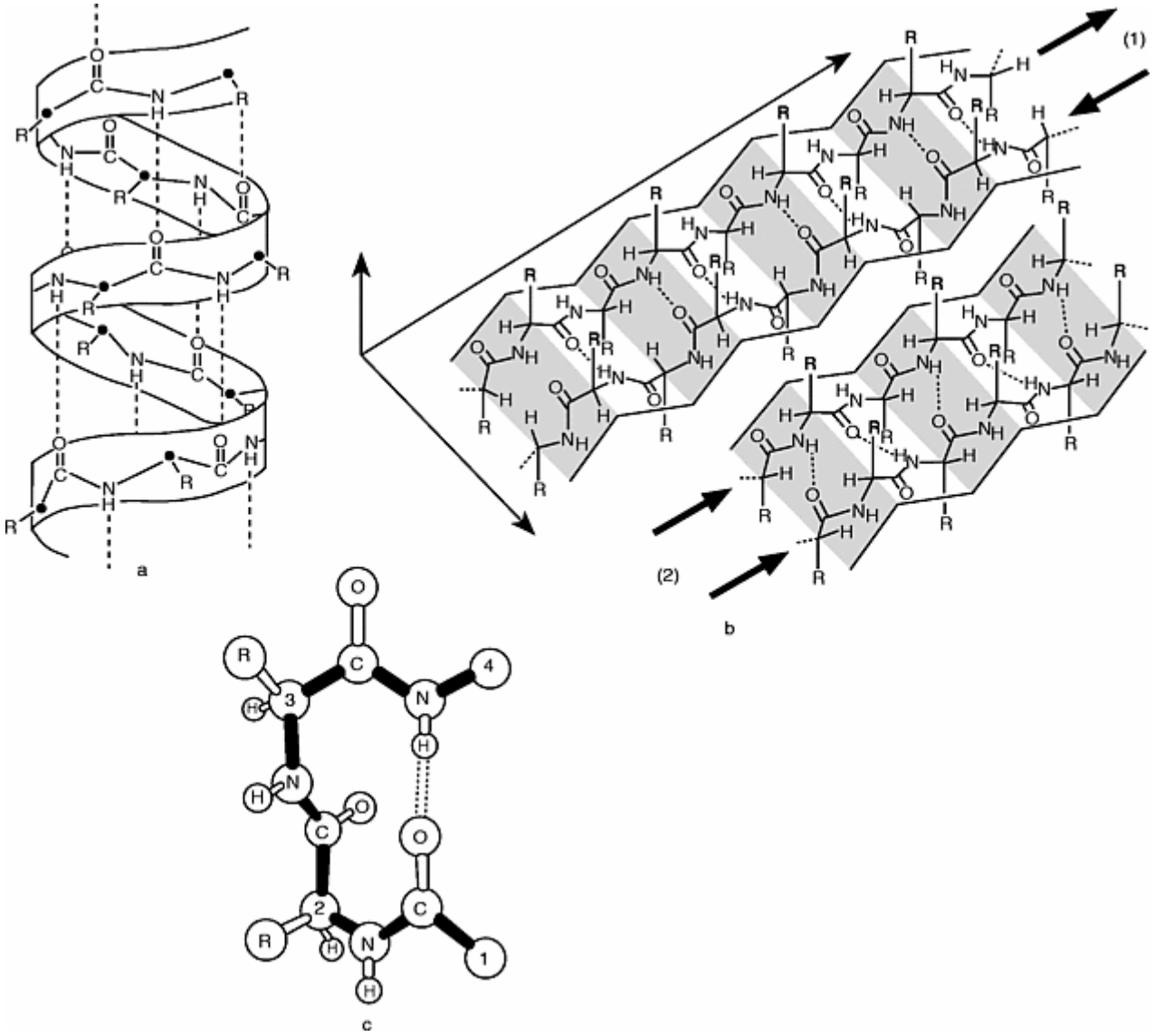


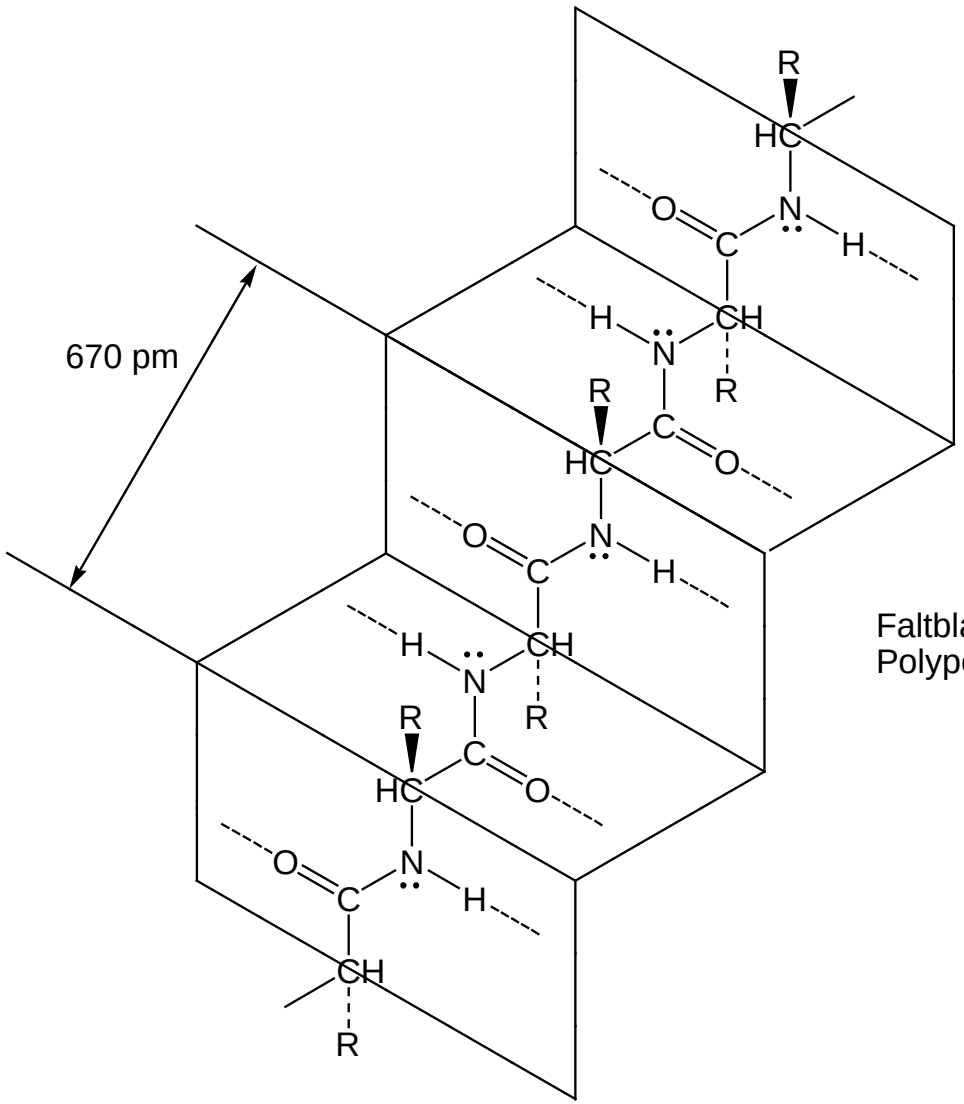
Proteine

- ✓ **Proteine sind langkettige natürliche Polypeptide**
- ✓ **Proteine können bis zu 8000 Aminosäureeinheiten enthalten**
- ✓ **Proteine wirken in vielen chemischen Prozessen in der Natur als Katalysatoren**
- ✓ **Beispiele: Hämoglobin, Rhodopsin, Ferritin, Insulin**
- ✓ **Proteine sind aus 20 natürlichen Aminosäuren aufgebaut.**
- ✓ **Alle natürlichen Aminosäuren ausser Glycin sind S-Isomere (L).**
- ✓ **Der erwachsene Mensch kann acht der 20 Aminosäuren nicht selbst synthetisieren.**
- ✓ **Diese 8 „essentiellen“ Aminosäuren müssen mit der Nahrung aufgenommen werden (Val, Leu, Ile, Phe, Thr, Lys, Trp, Met).**

Die Sekundärstruktur der Peptide



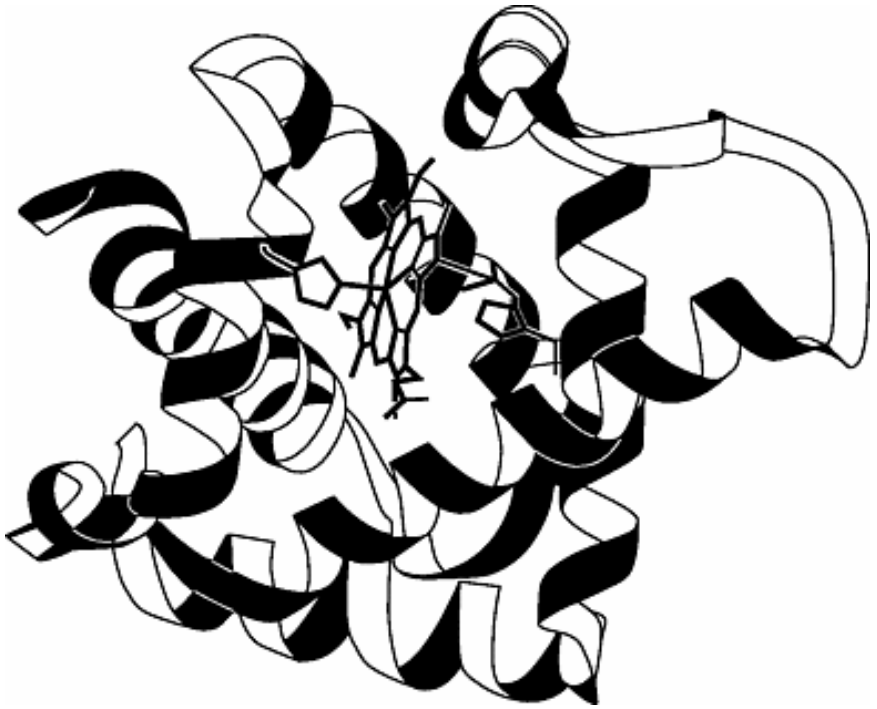

a
(1)
(2)
b
c

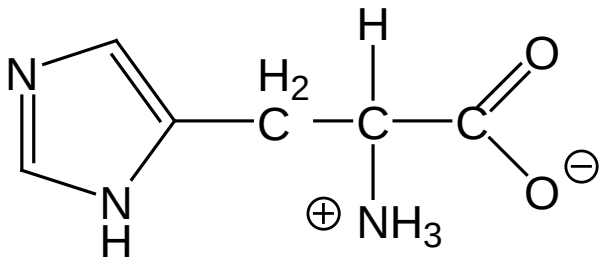


Faltblattstruktur eines Polypeptids

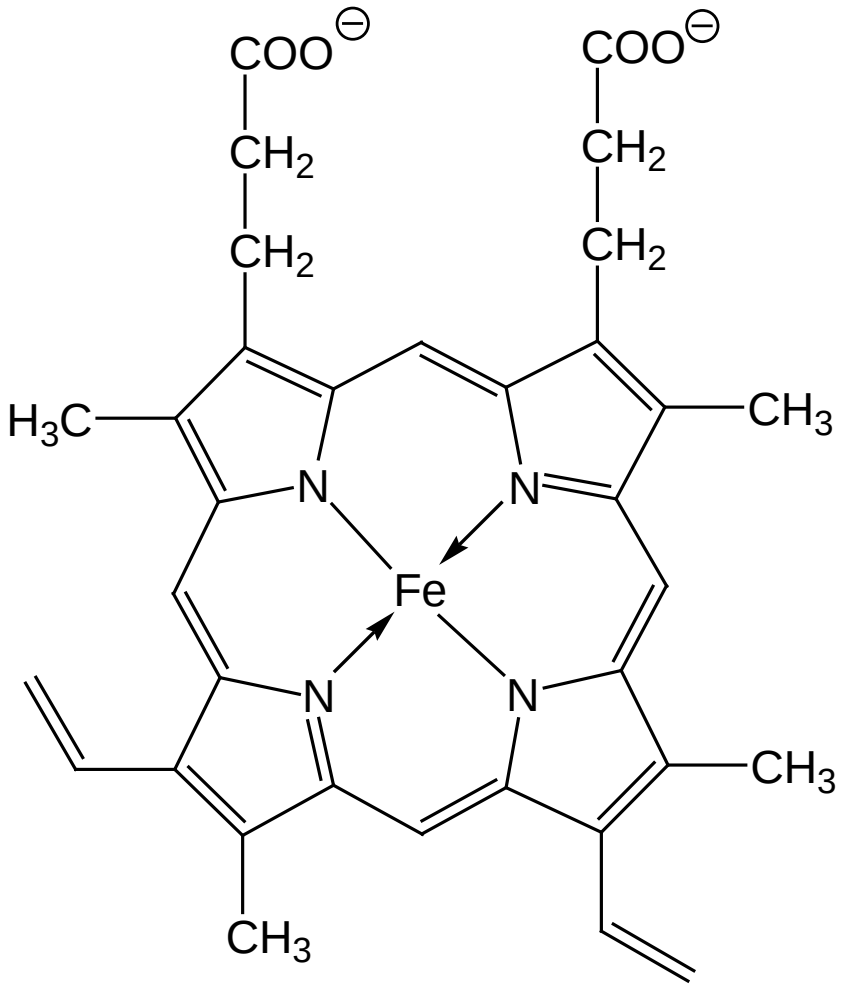
Myoglobin als Sauerstoffträger im Blut

Tertiärstruktur des Proteins





Histidin



Häm

Aktives Zentrum des Myoglobins