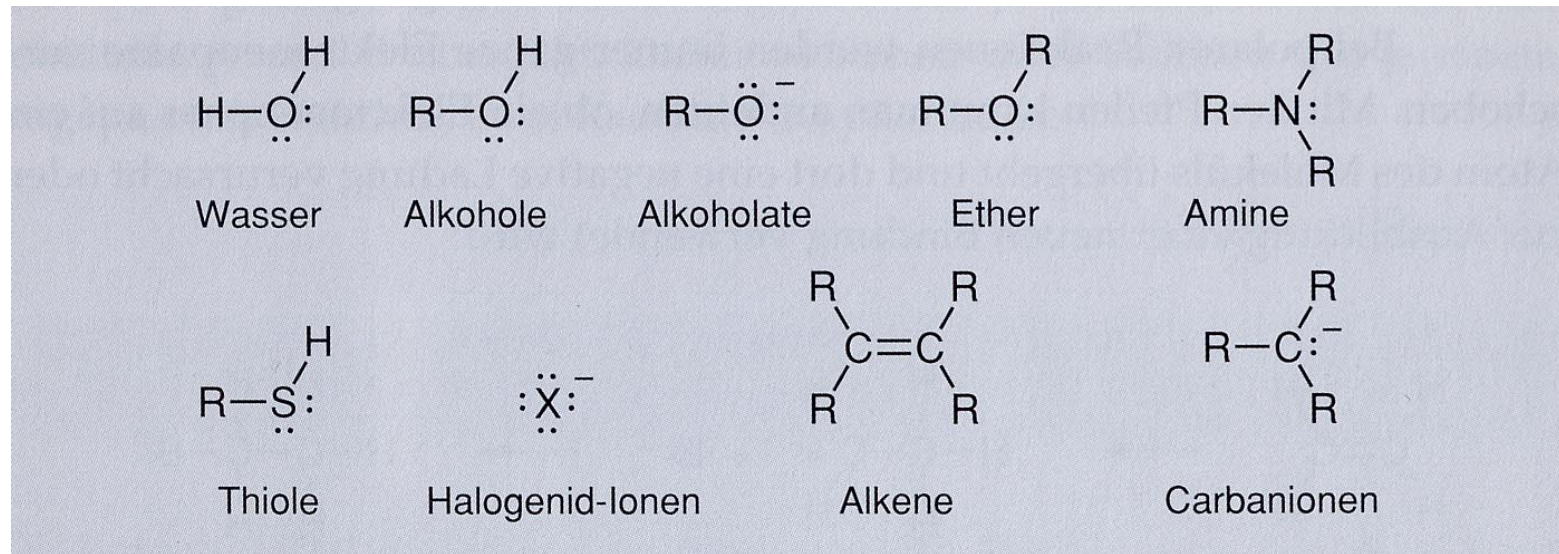
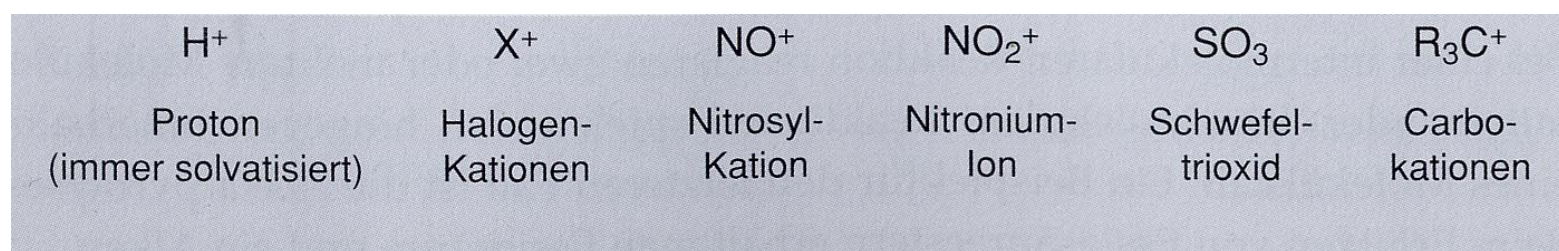


4.1.3 Nucleophile und elektrophile Reagenzien

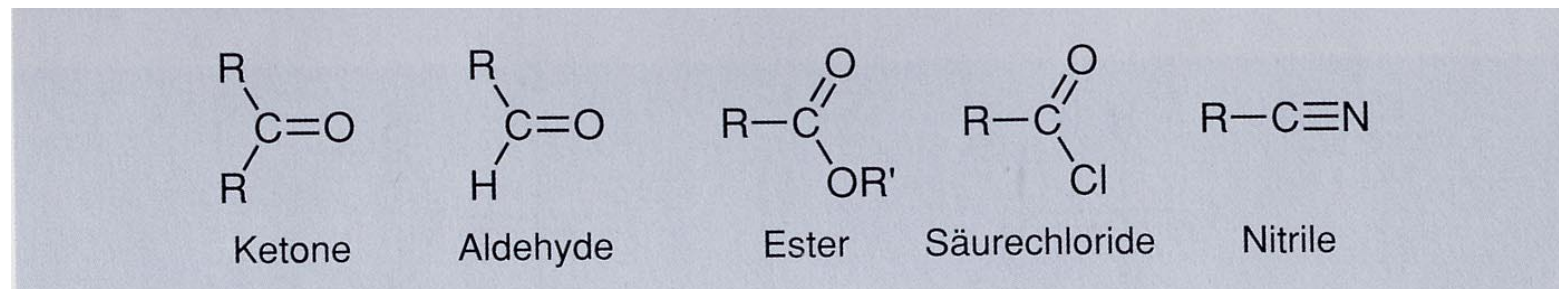
Nucleophile:



Elektrophile:

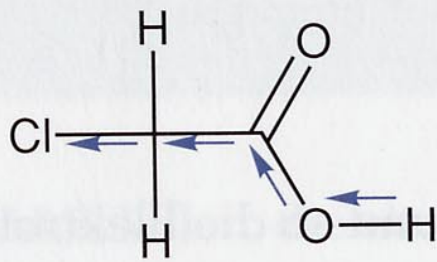


Elektrophile Kohlenstoffatome in folgenden Verbindungen:



4.1.4 Substituenteneinflüsse: Induktive und mesomere Effekte

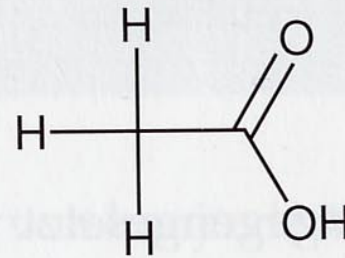
Induktiver Effekt:



Chloressigsäure

$$K_a = 1,41 \cdot 10^{-3} \text{ M}$$

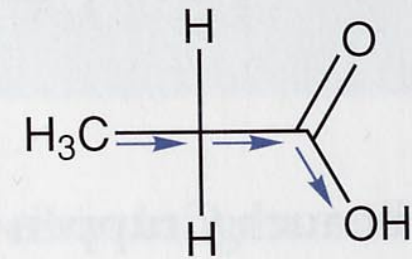
$$\text{p}K_a = 2,85$$



Essigsäure

$$K_a = 1,74 \cdot 10^{-5} \text{ M}$$

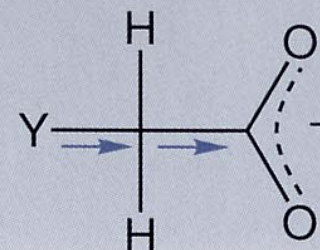
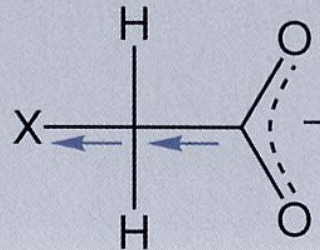
$$\text{p}K_a = 4,76$$



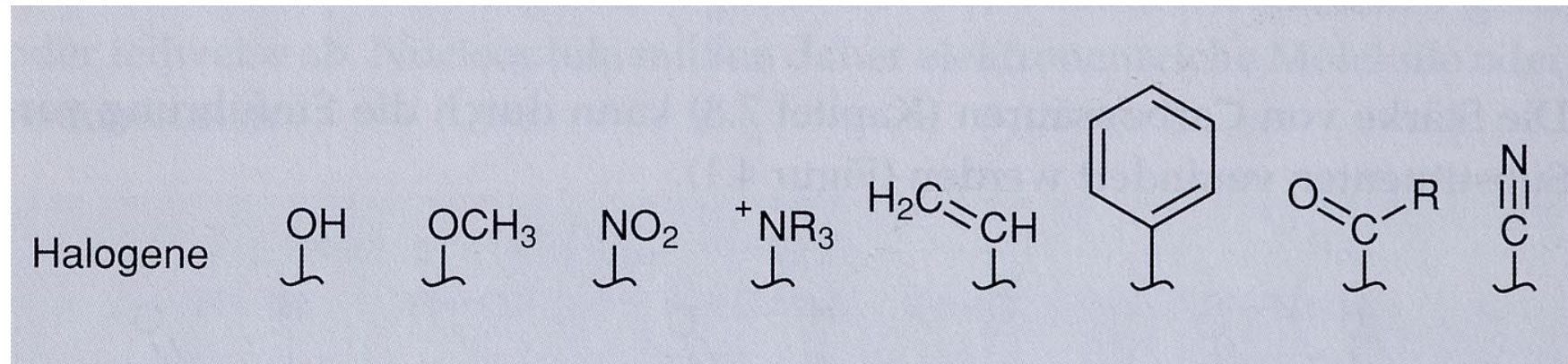
Propionsäure

$$K_a = 1,38 \cdot 10^{-5} \text{ M}$$

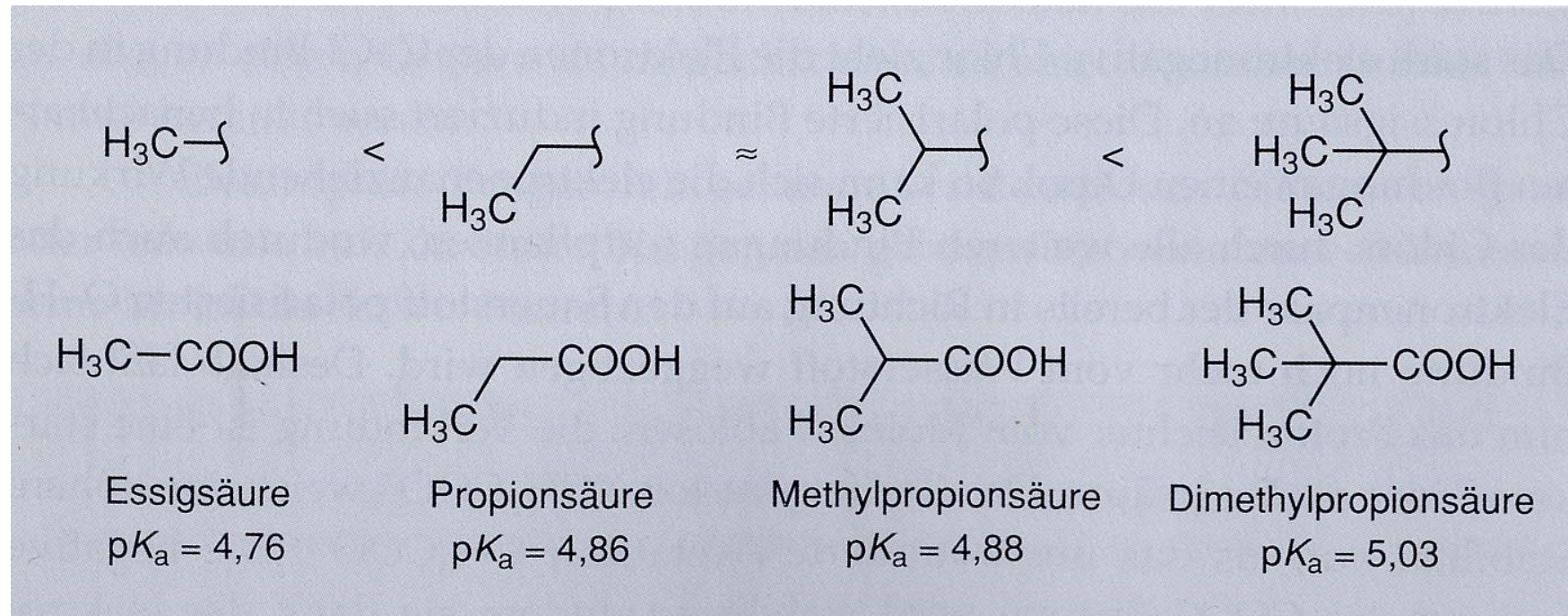
$$\text{p}K_a = 4,86$$



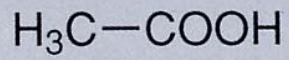
-I-Effekt:



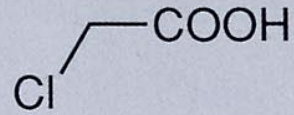
+I-Effekt:



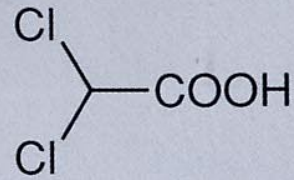
Beispiele:



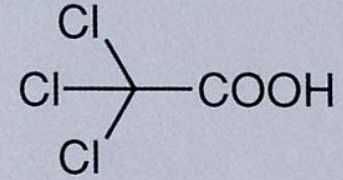
Essigsäure
 $\text{p}K_{\text{a}} = 4,76$



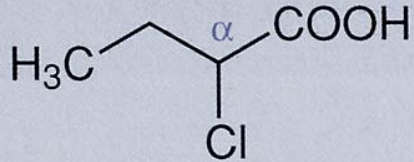
Chloressigsäure
 $\text{p}K_{\text{a}} = 2,85$



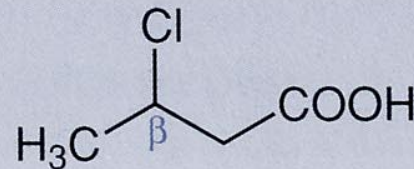
Dichloressigsäure
 $\text{p}K_{\text{a}} = 1,48$



Trichloressigsäure
 $\text{p}K_{\text{a}} = 0,70$



α -Chlorbuttersäure
 $\text{p}K_{\text{a}} = 2,86$



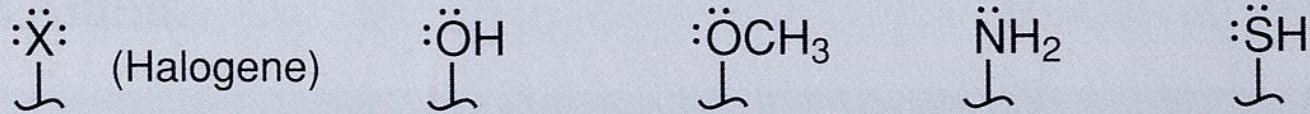
β -Chlorbuttersäure
 $\text{p}K_{\text{a}} = 4,05$



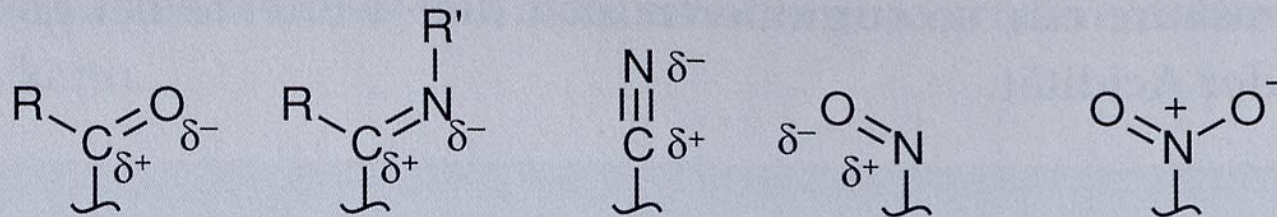
γ -Chlorbuttersäure
 $\text{p}K_{\text{a}} = 4,52$

Mesomerer Effekt: wirkt auf die π -Bindungssysteme; Veränderung der π -Elektronendichte

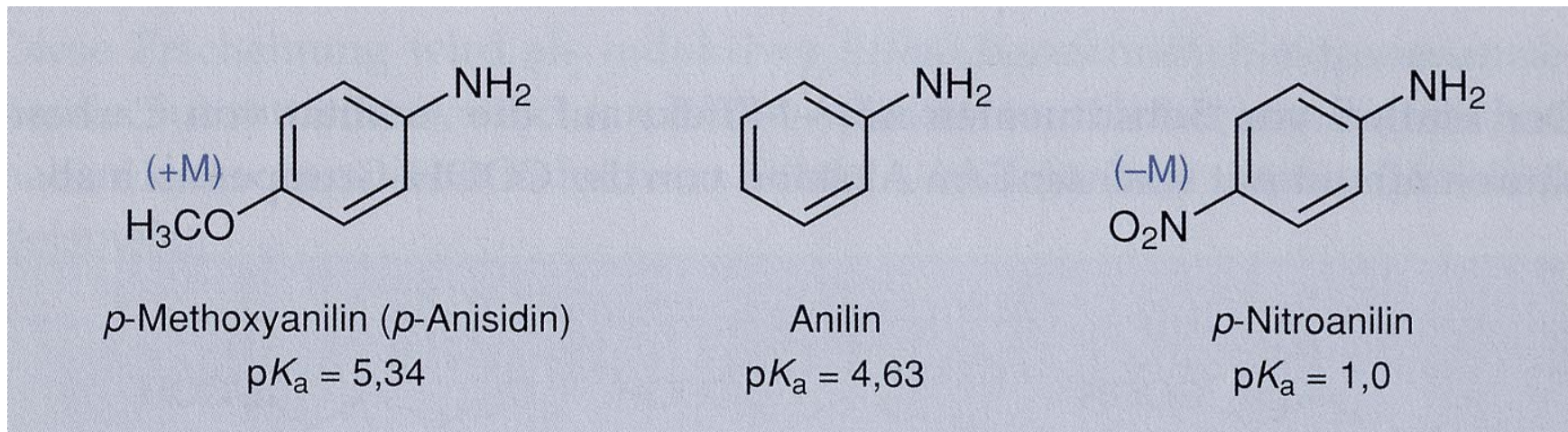
+M-Effekt:



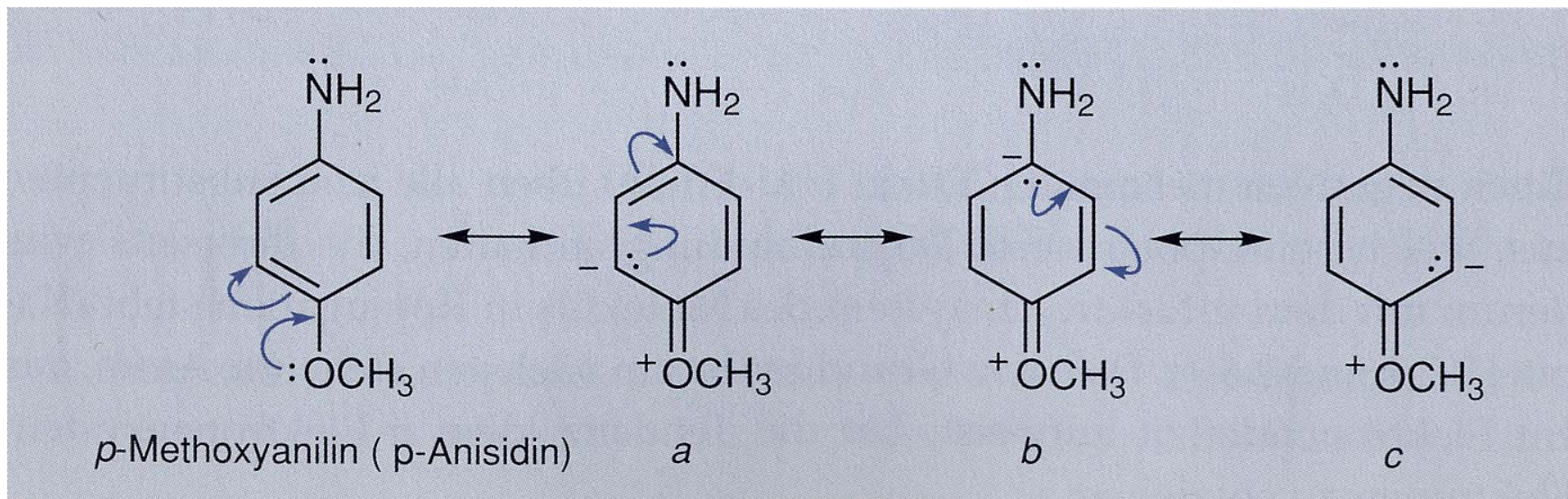
-M-Effekt:



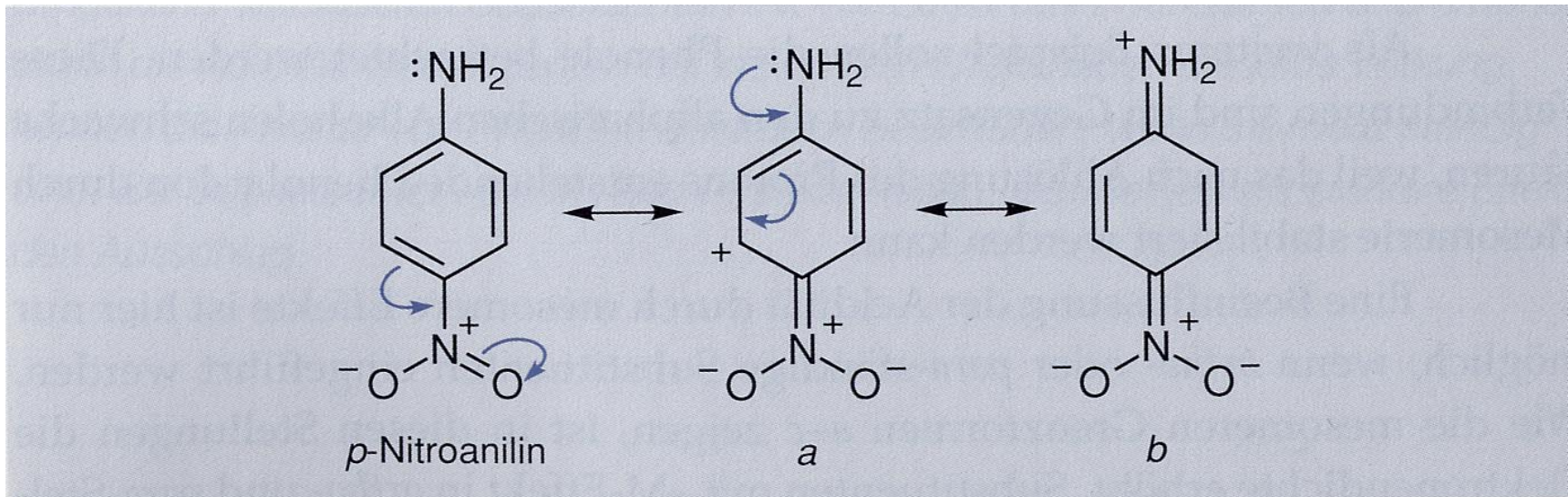
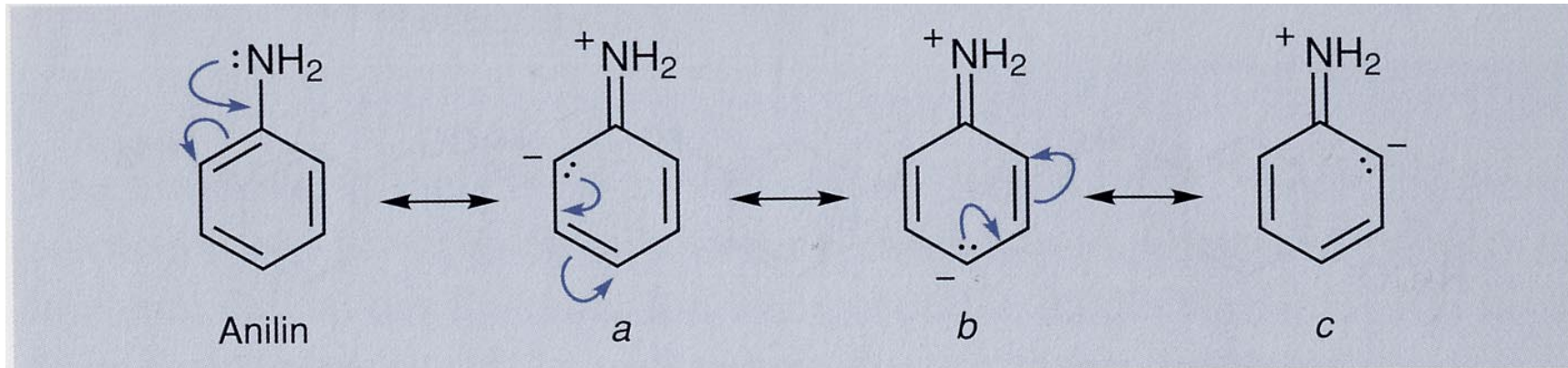
Unterschiedliche Basizität von Anilinderivaten:



Begründung:

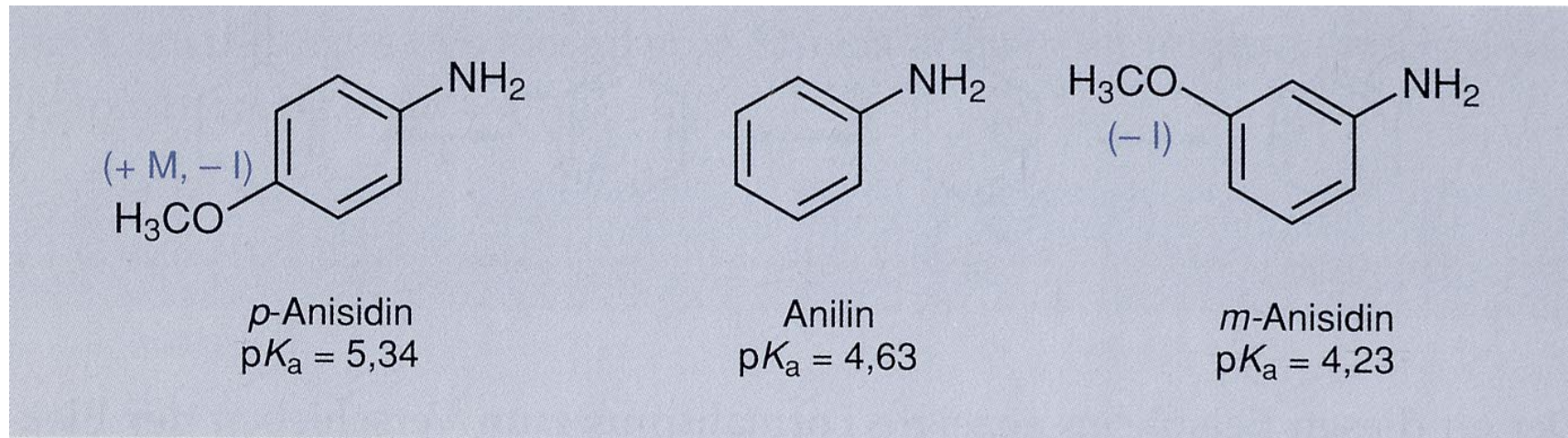


Anilin: Das freie N-Elektronenpaar wird teilweise durch Mesomerie mit dem aromatischen Kern beansprucht

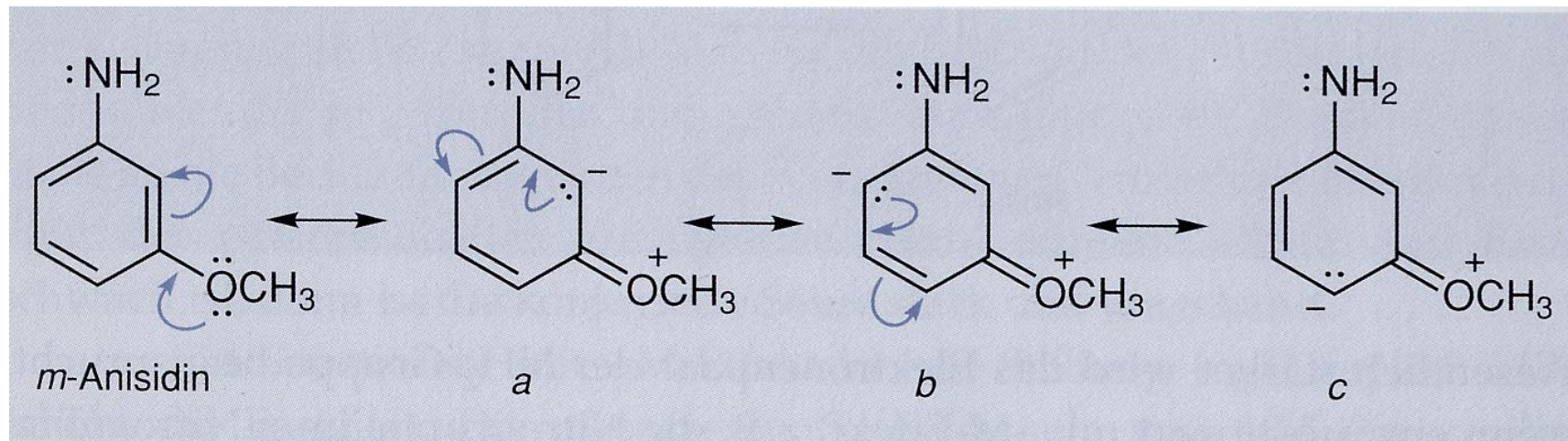


Grenzstruktur **b verdeutlicht, warum *p*-Nitroanilin weniger basisch als Anilin ist**

Aber:



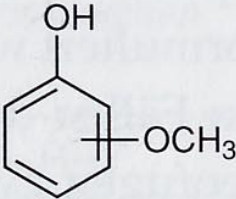
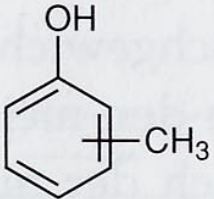
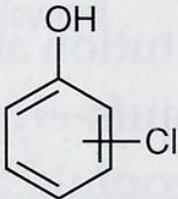
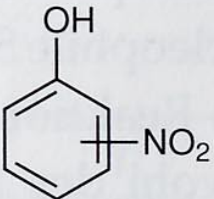
Der +M-Effekt kann nur aus der *ortho*- oder *para*-Stellung heraus wirken; nicht aus der *meta*-Stellung:



pK_a-Werte:

Aliphatischer Alkohol:

Phenol:

Verbindung					
	Methoxyphenol	Kresol	Chlorphenol	Nitrophenol	
Substituenten- effekt(e)	+M > -I	+I	-I > +M	-M, -I	
pK _a -Werte	<i>ortho</i> -	9,98	10,20	8,49	7,17
	<i>meta</i> -	9,65	10,01	8,85	8,28
	<i>para</i> -	10,20	10,17	9,18	7,15