

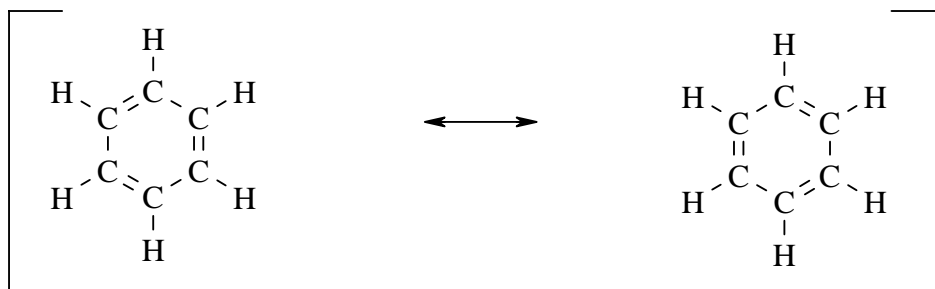
## 13.01

## Vergleich der Reaktivität von Alkanen, Alkenen und Aromaten

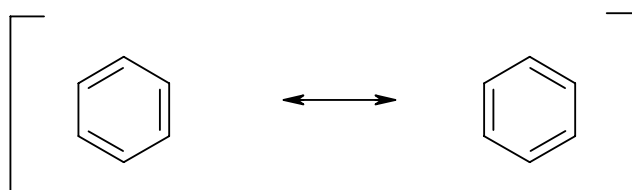
Reagenz	Alkane	Alkene	Aromaten	
H <sub>2</sub> [Kat.]	—	Addition	Addition (schwierig)	
Cl <sub>2</sub> , Br <sub>2</sub>	bei Belichtung Substitution	rasche Addition	bei Katalyse Substitution	
H <sub>2</sub> O [H <sup>+</sup> ]	—	Addition	—	
HBr, HCl	—	Addition	—	
konz. HNO <sub>3</sub>	—	Addition	Substitution (Nitrierung)	
konz. H <sub>2</sub> SO <sub>4</sub>	—	Addition	Substitution (Sulfonierung)	
Oxidations- mittel	O <sub>2</sub>	katalytische Oxidation bei hoher Temp.	langsame Autoxidation	katalytische Oxidation bei hoher Temp.
	KMnO <sub>4</sub>	—	rasche Oxidation	—
	CrO <sub>3</sub>	(in der Kälte)		(in der Kälte)
	O <sub>3</sub>	—	rasche Addition	langsame Addition

**Benzol (C<sub>6</sub>H<sub>6</sub>)**

1) Beschreibung durch "Resonanzstrukturen" ("Kekulé-Grenzstrukturen")

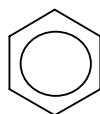


abgekürzte Schreibweise:

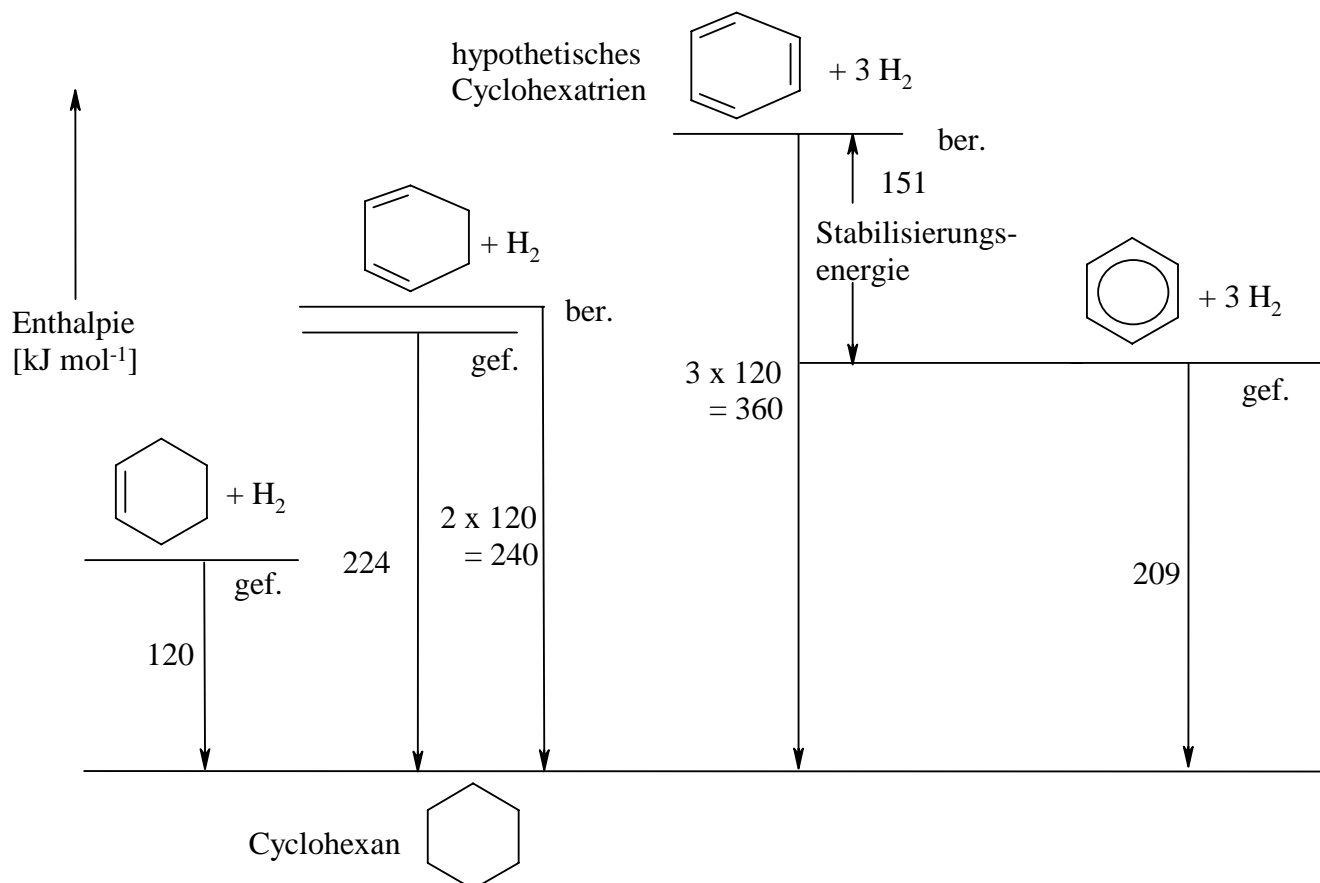


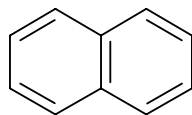
2) Beschreibung mit Hilfe eines neuen Symbols:

Kreis = 6  $\pi$ -Elektronen

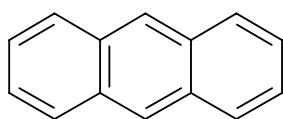


### Hydrierungsenthalpien [ $\text{kJ mol}^{-1}$ ] von Cyclohexen, 1,3-Cyclohexadien und Benzol

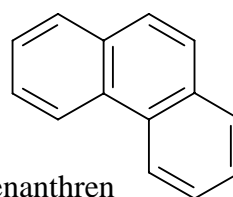


**Kondensierte Aromaten****10  $\pi$ -Elektronen**

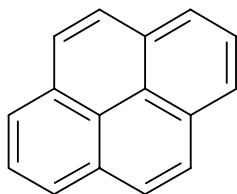
Naphthalin

**14  $\pi$ -Elektronen**

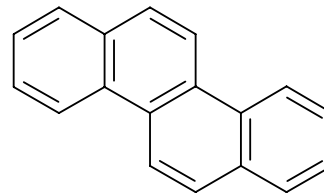
Anthracen



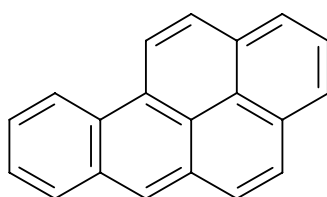
Phenanthren

**16  $\pi$ -Elektronen**

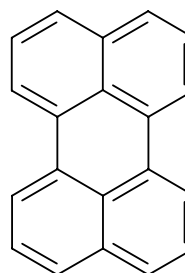
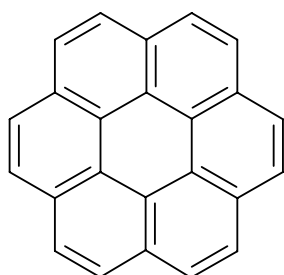
Pyren

**18  $\pi$ -Elektronen**

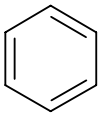
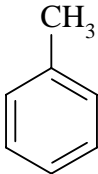
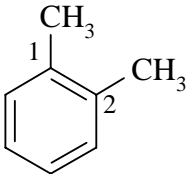
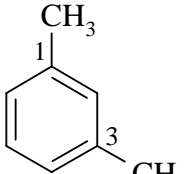
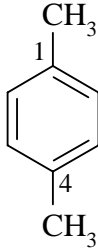
Chrysen

**20  $\pi$ -Elektronen**

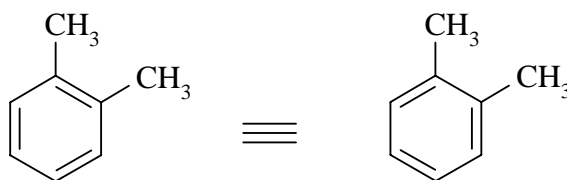
Benzpyren

**24  $\pi$ -Elektronen**

## Methylderivate des Benzols

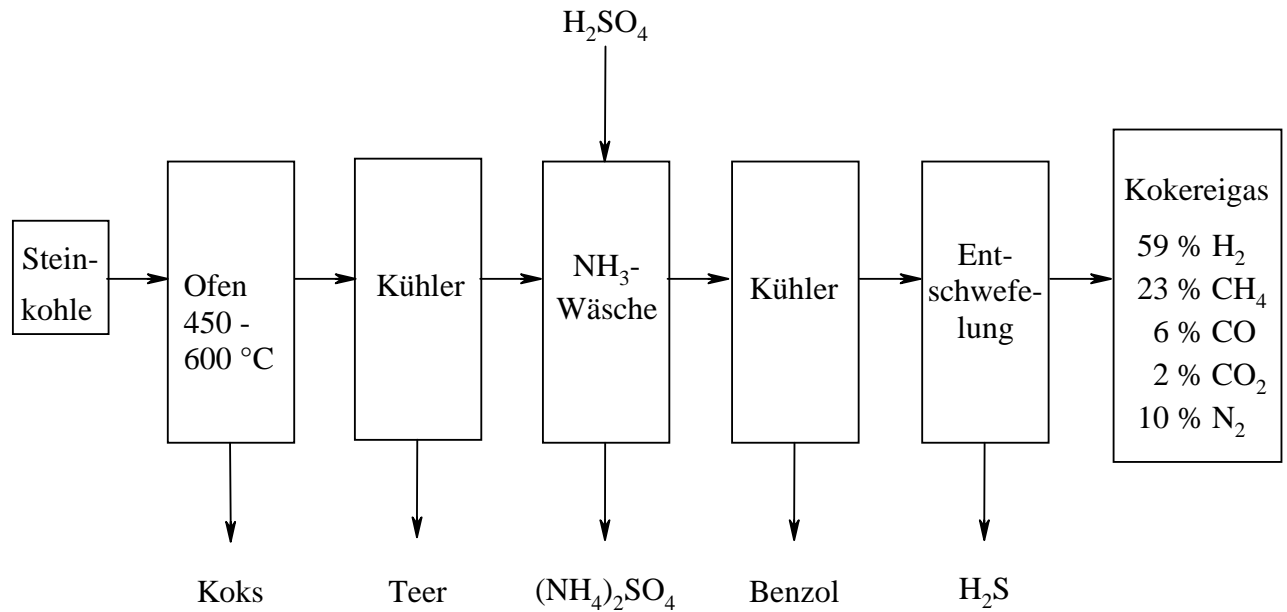
					
	Benzol Benzen	Methylbenzol (Toluol)	1,2-Dimethyl- benzol ( <i>ortho</i> -Xylol)	1,3-Dimethyl- benzol ( <i>meta</i> -Xylol)	1,4-Dimethyl- benzol ( <i>para</i> -Xylol)
Siedepunkt [°C]	80	111	144	139	138
			1,2 = <i>ortho</i>	1,3 = <i>meta</i>	1,4 = <i>para</i>

Es gibt nur drei Disubstitutionsprodukte, nicht mehr!



## 13.06

## Schwelung von Steinkohle in einer Kokerei



## 13.07

## Produkte aus Steinkohle

Produkt	Ausbeute [%]
Koks	70
Kokereigas	15
<b>Teer</b>	<b>5</b>
Benzol	1
Ammoniak	0.25
Schwefelwasserstoff	0.2
Wasser, Sonstiges	8.5

Destillation  
des Teeres →

## Fraktionen des Steinkohlenteeres

Fraktion	Siedepunkt [°C]	Ausbeute [%]
Leichtöl	80 - 170	2.5 - 6
Mittelöl	170 - 250	10 - 12
Schweröl	250 - 300	8 - 10
Anthracenöl	300 - 400	18 - 20
Rückstand: Teerpech		50 - 60