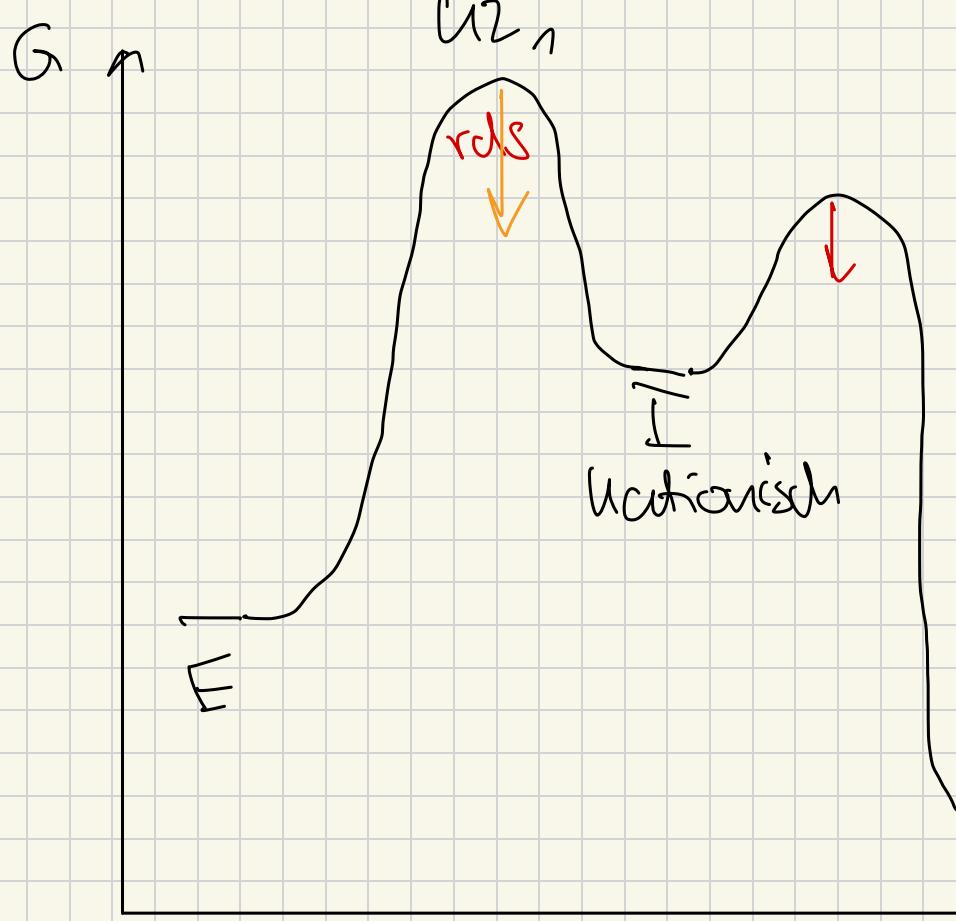
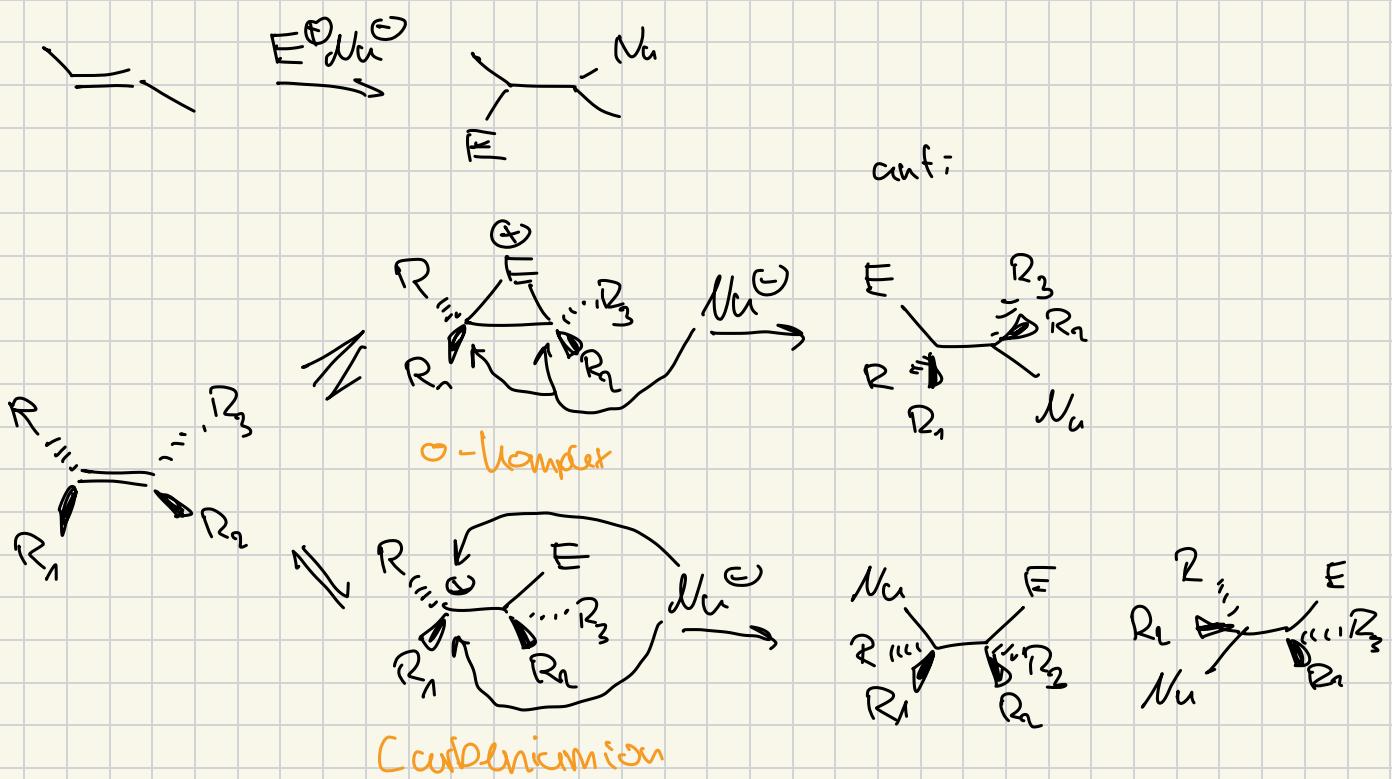


# ACOC II PUK Tag 2

## Electrophilic Addition



$\sigma$ -Komplex

Carbenium ion

$\circ$  Halogene

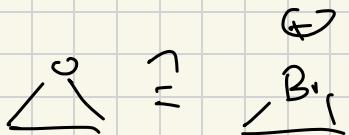
CM

asym.

polar

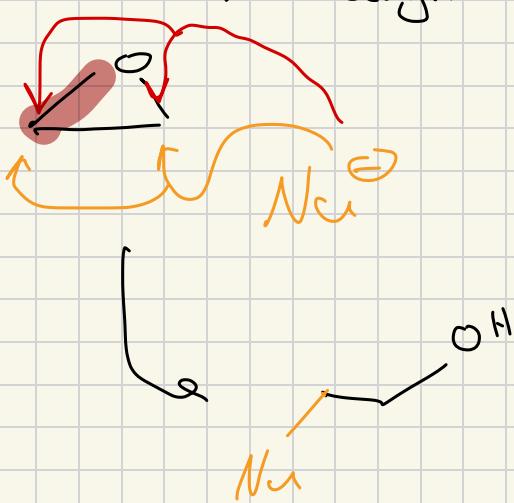
$\sigma$ -Komplex offener

$\circ$  auch gültig für Epoxide



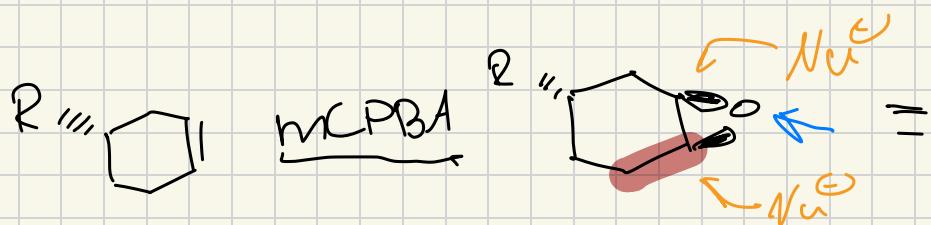
frei

anti angreif



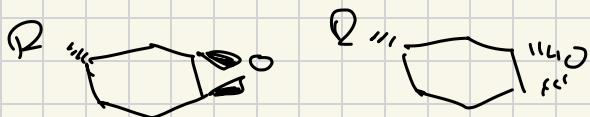
oligomer anti angreif

$\sigma$ -Komplex am 6 Ringe: Fixstelle



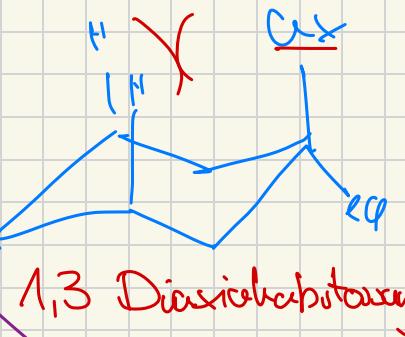
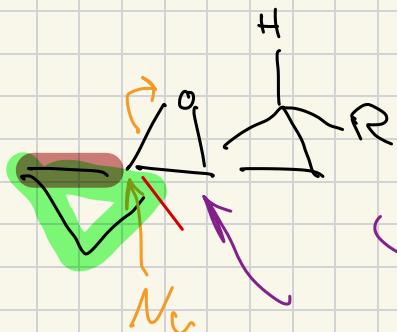
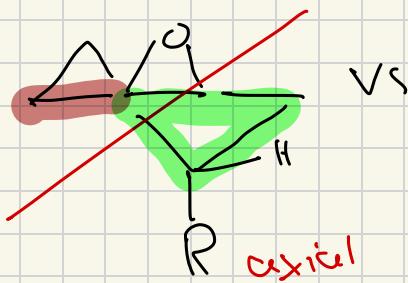
oben unten

=> von oben



berezeugt aufgrund der Stere

## Fürst plünder

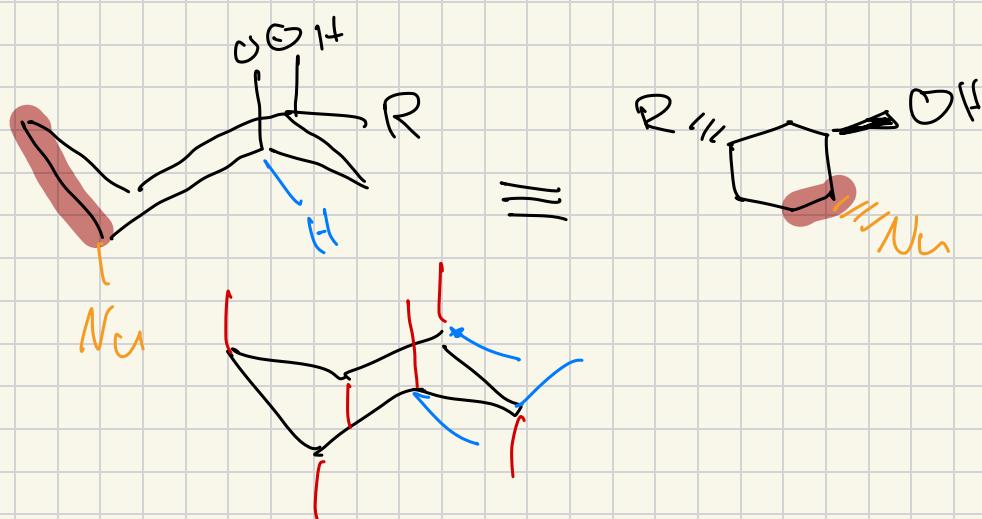


1) Welches Maßssziel ist am Statistisch?

- links auf der Seite = schrekt.

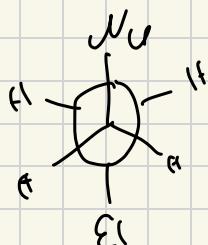
## 2) Angriff über den Berg

8) wie kommen zurück zur 2D Darstellung

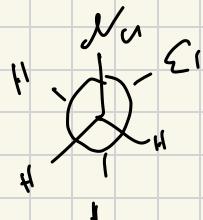


## Sym & anti

- ## • Newman

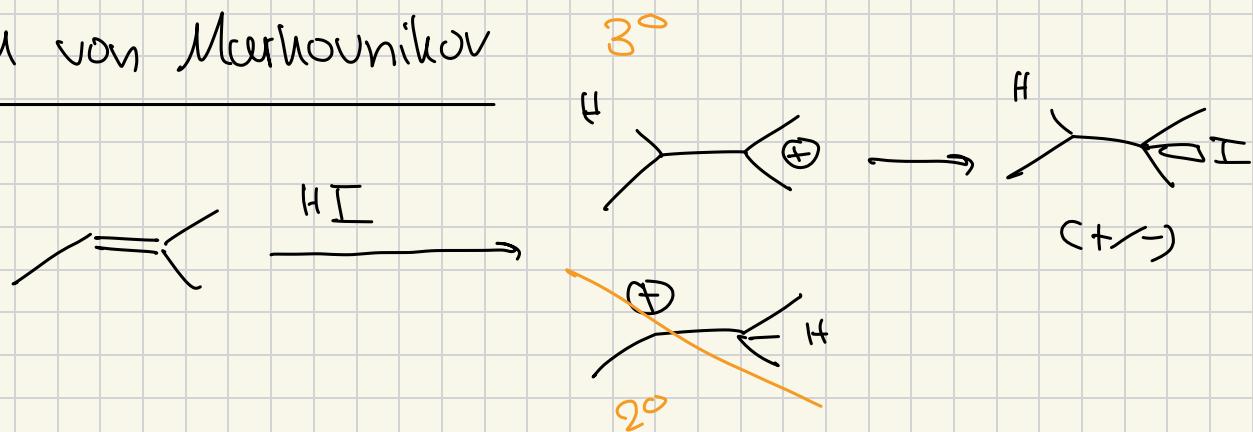


int;



sign

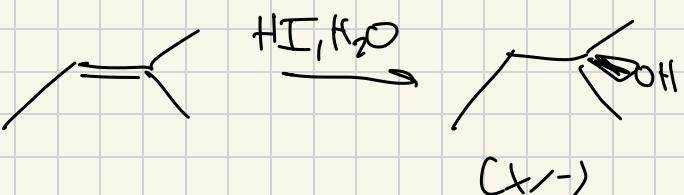
## Regel von Markownikow



- So argumenten, dass das stabileste Produkt entsteht

## Lösungsmitteneinfluss

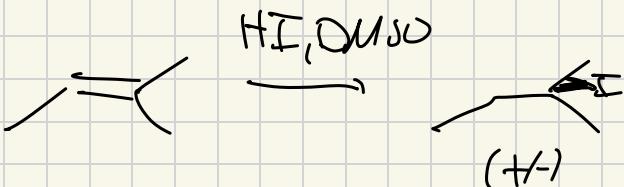
- LM ein Nukleophil ist



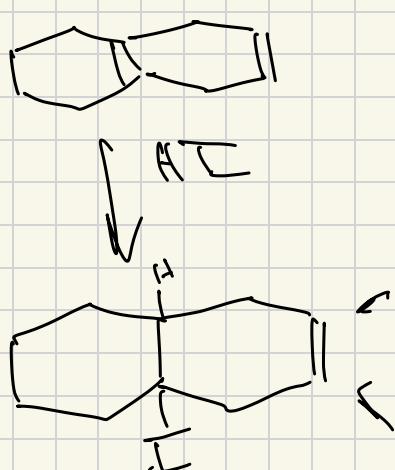
- Problem 2 Nukleophile

- $\text{I}^-$  stärker

- $\text{H}_2\text{O}$  mehr vorhanden



## Regioselektivität



- klassischer Elektrophilerische Addition:

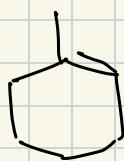
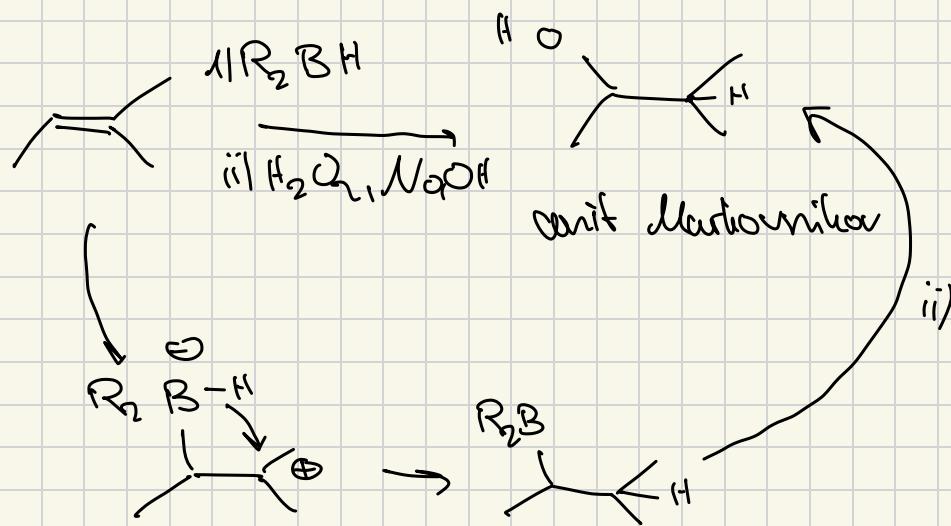
- höher Substituierte DB
- reagiert schneller

# Anti Markownikow

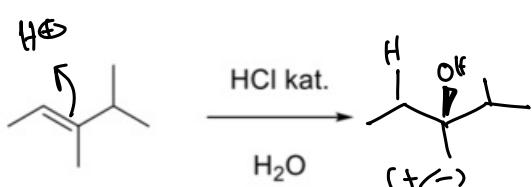
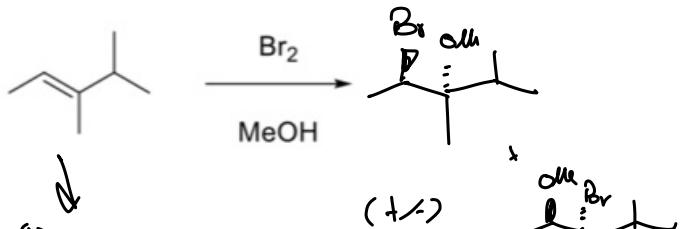
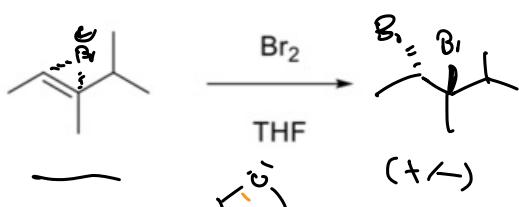
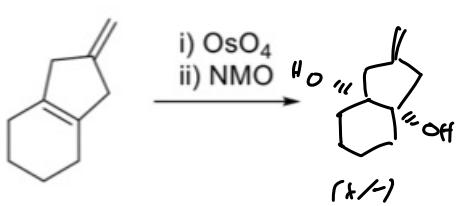
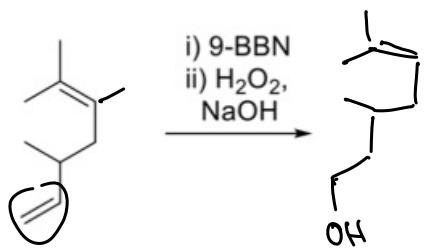
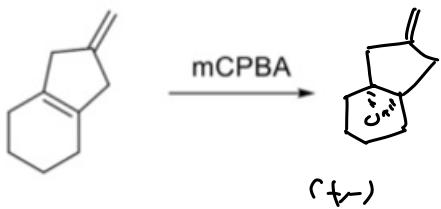
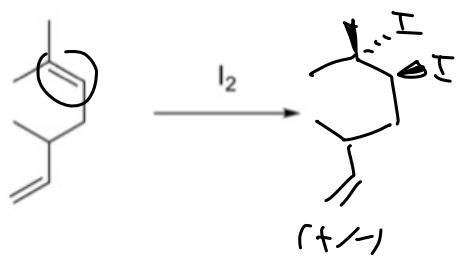
- c-weg elektrofe Regioselektivität:

- Radikalische Reaktionen

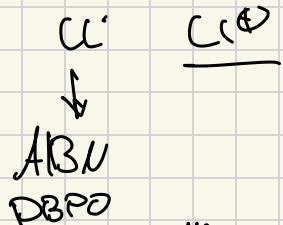
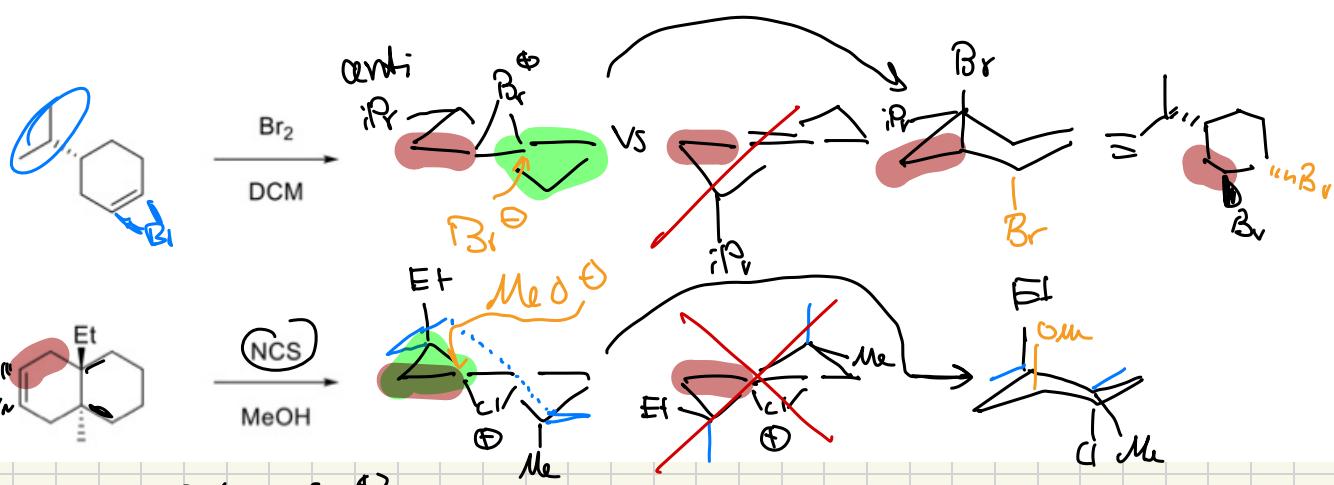
- Hydroborierung



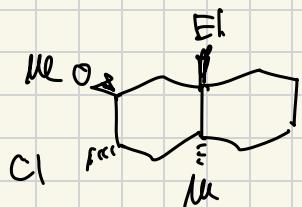
| Reaktion           | Bedingungen   | Produkte | Bemerkungen                           |
|--------------------|---|----------|---------------------------------------|
| Halogenierung      | $X_2$   |          | Evens - addition                      |
| Hydrohalogenierung | HX  |          | Markownikov                           |
| Hydrierung         | $H^+$ , $H_2O$  |          | Markownikov                           |
| Hydroborierung     | 1) $HBR_2$ , THF<br>2) $H_2O_2$ , $NaOH$  |          | canti Markownikov                     |
| Dihydroxilierung   | $O_2Cu$ , $H_2S/NaO$<br>$KMnO_4$ , $NaOH$   |          | cis/syn                               |
| Epoxydierung       | mCPBA   |          | anti Öffnung<br>Evens/canti           |
| Ozonolyse          | 1) $O_3$ , DCM, $-78^\circ$<br>2) Aufarbeitung<br>a) $H_2O_2$ , $NaOH$<br>(oxidativ)<br>b) $Zn$ , $AcOH$<br>(reduktiv)<br>c) $NaBH_4$<br>(reduktiv) |          | w Cr $O_3$<br>b) $MgS$ / $H_2$ , $Pt$ |



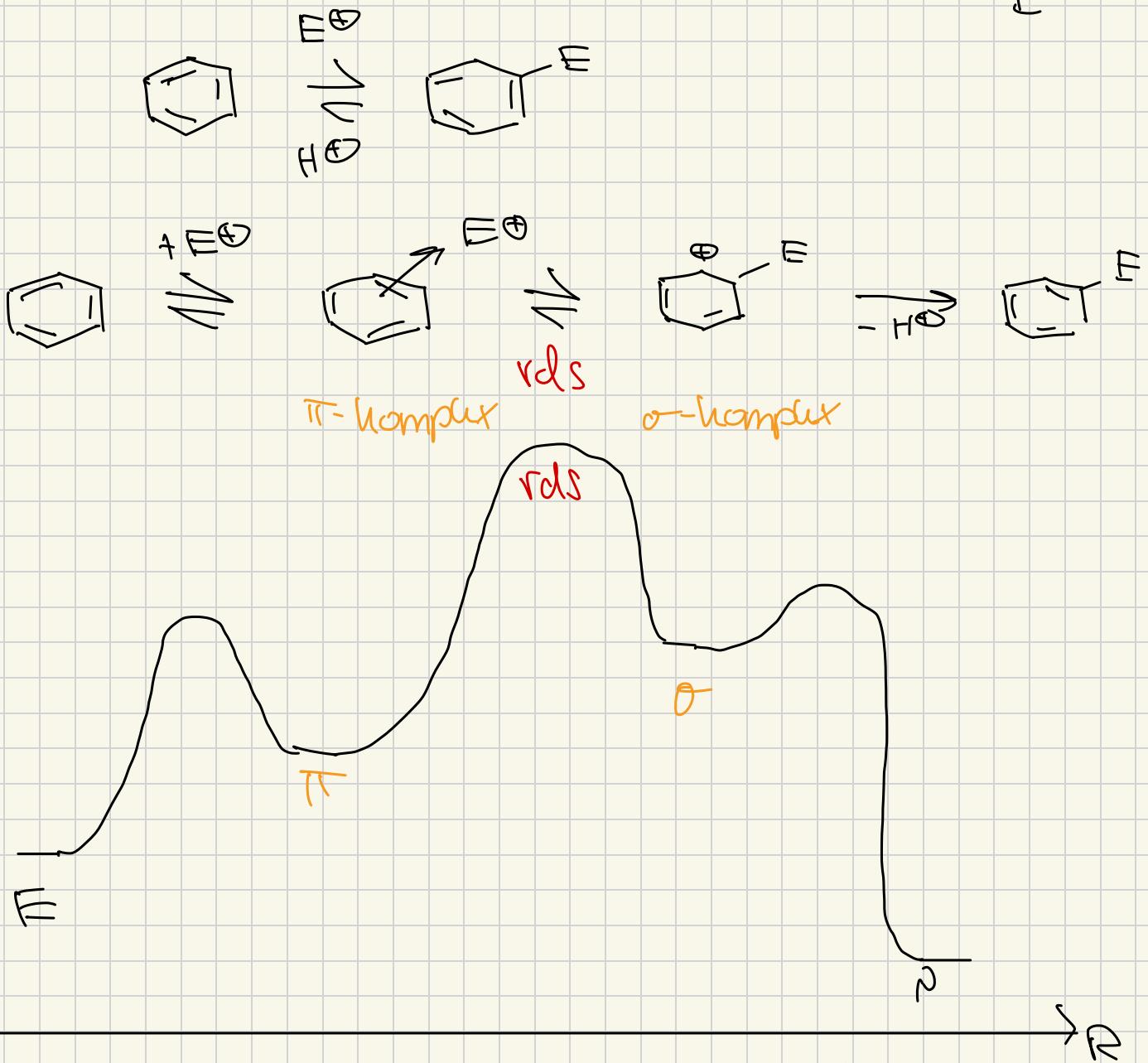
(+/-)



• Größerer Substituent muss äquatorial!

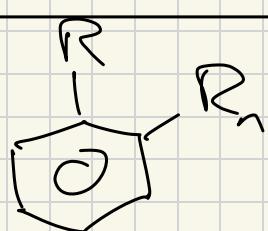


# Elektrophile Aromatische Substitution ( $S_E^A r$ )

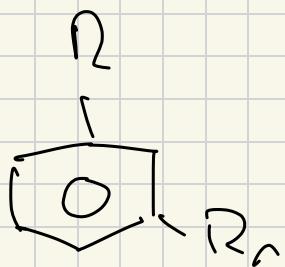


Regiospezifität

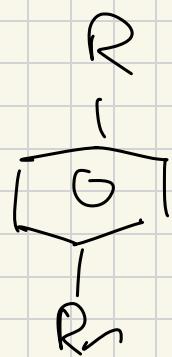
Nomenklatur



ortho



meta

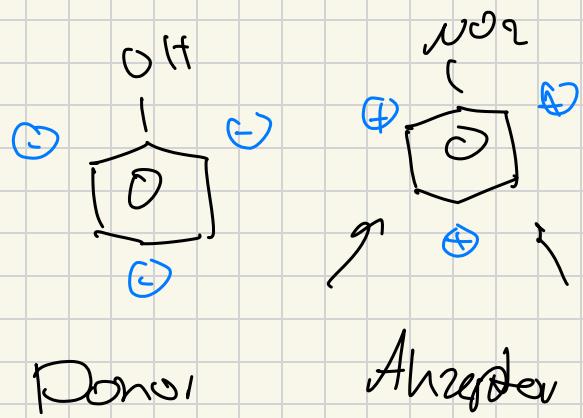


para

## Zweitsubstitution

### Regioselektivität

- Donor: ortho/para
- Akzeptoren: meta
- $\pi \rightarrow \sigma$
- Halogenen
  - Desaktivierend
  - $\sigma/\rho$
- Donatoren



2 x ortho

statisch  
benutzt

1 + para

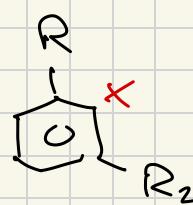
sterisch  
benutzt

Me und  
größer

$\Rightarrow$

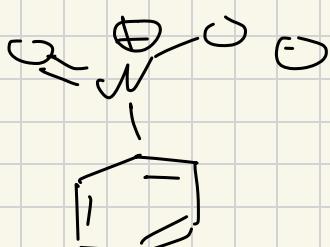
## Drittsubstitution

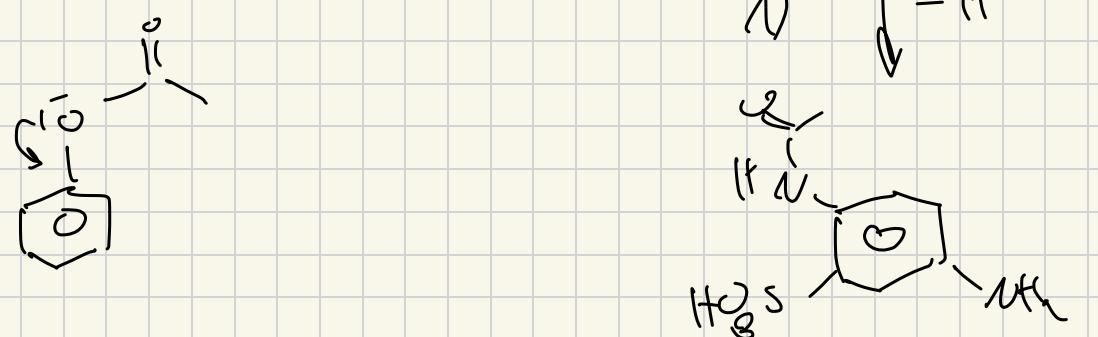
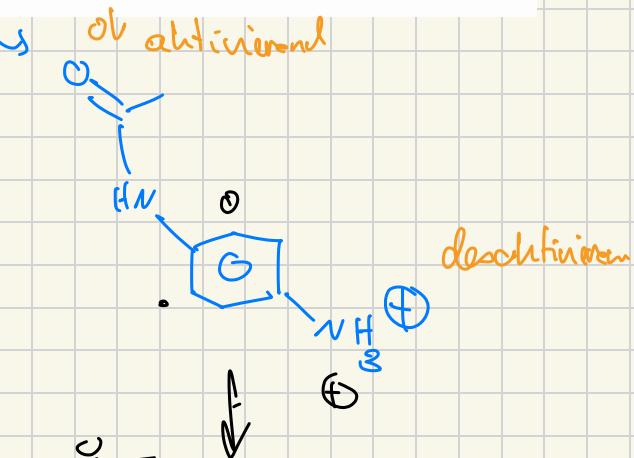
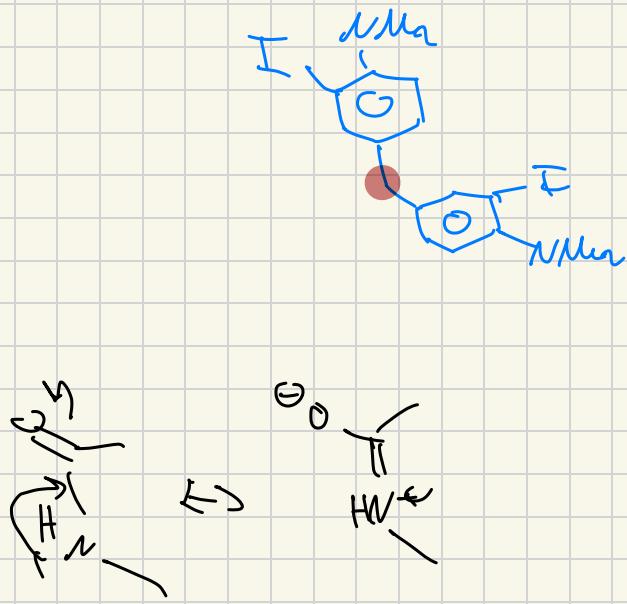
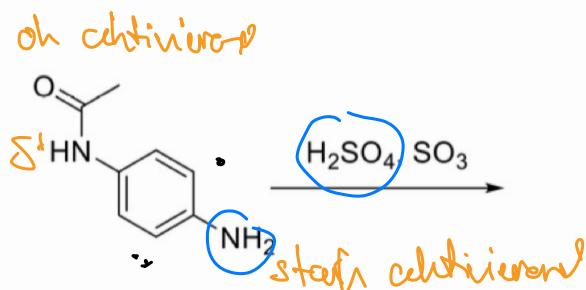
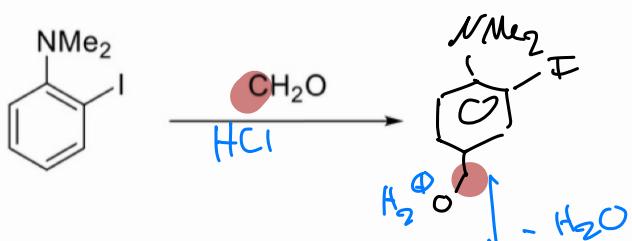
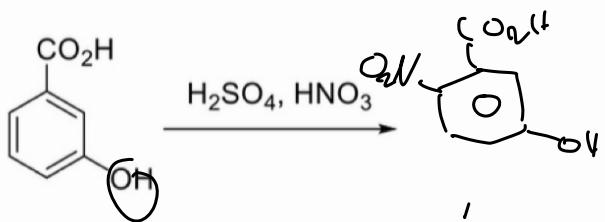
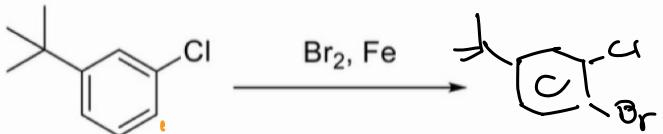
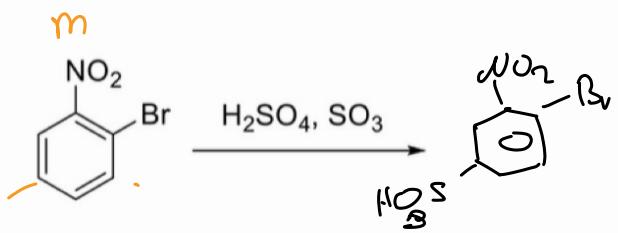
- starke aktivierende Gruppe dirigiert
- Wahrscheinlichkeit zwischen zwei meta ständigen Substituenten zu liegen gering



- 2 meta Subs.: 1 aktivierend 1 desaktivierend

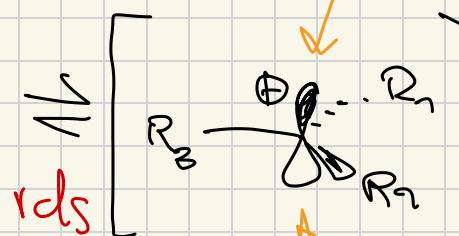
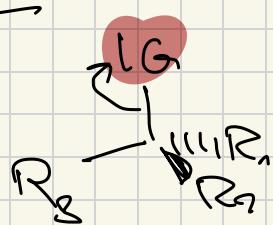
$\Rightarrow$  lieber para zur aktivierenden Gruppe





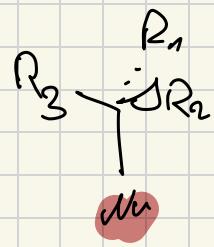
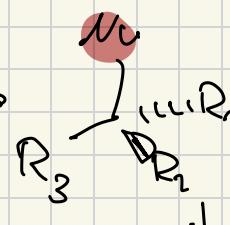
# Nucleophilic Substitution

•  $S_N1$



Racemate

(+/-)



G ↑

rds

intermediate

P

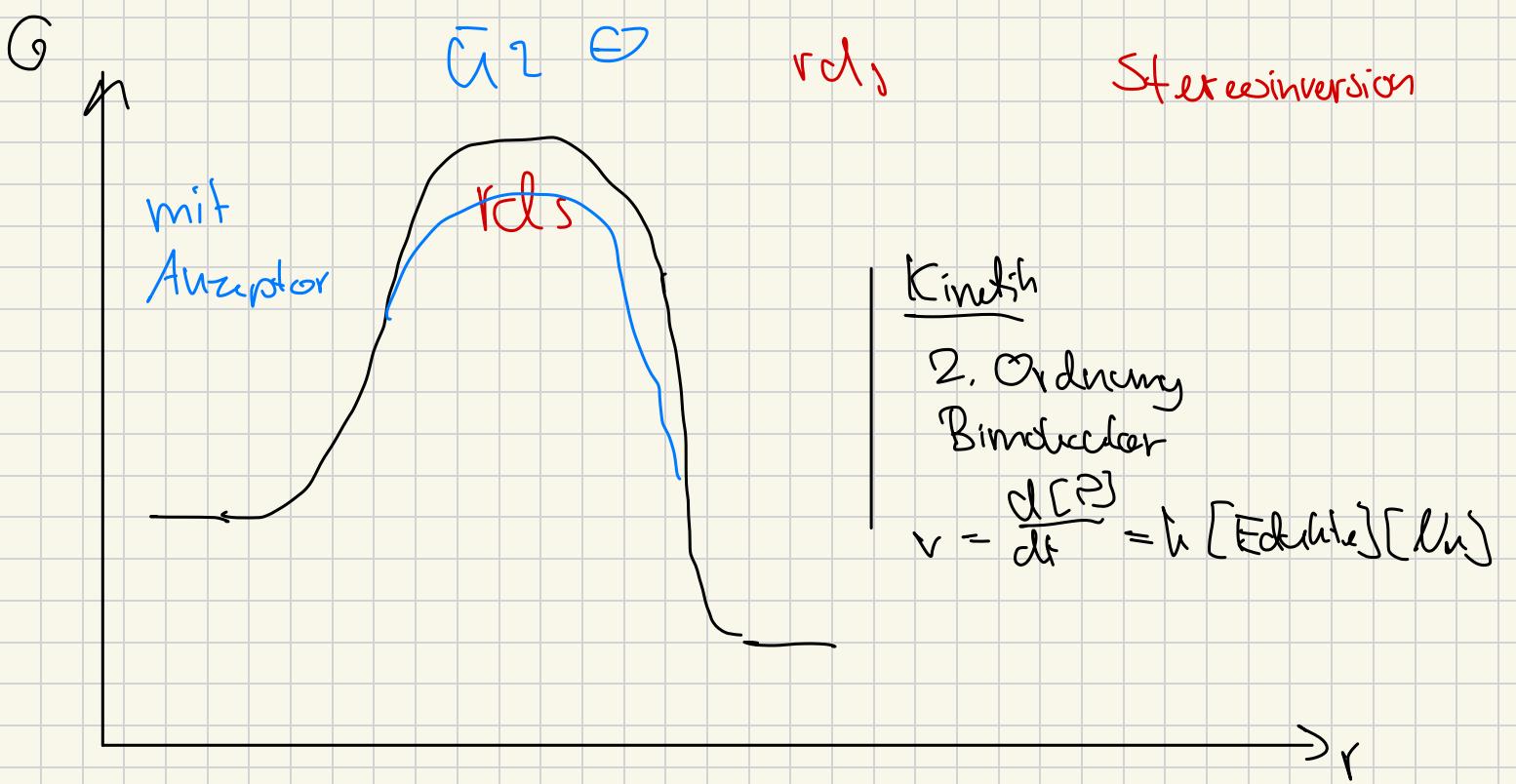
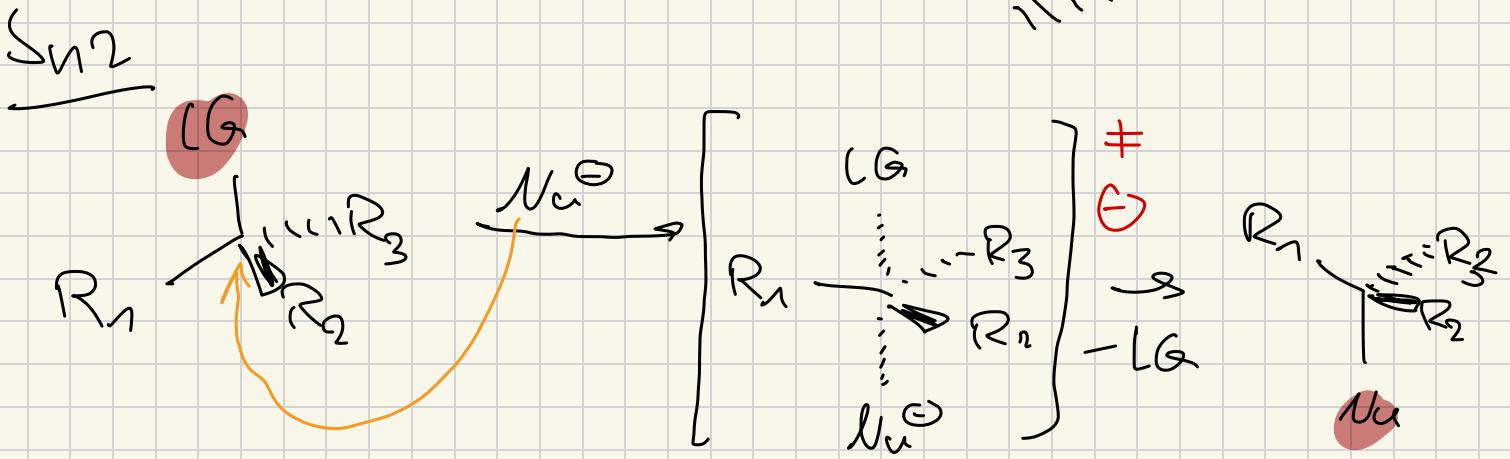
Kinetik:

1. Ordnung  
unimolekular

$$v = \frac{d[P]}{dt} = -\frac{d[E]}{dt}$$

$$= k [E]_{\text{Initial}}$$

$\Sigma v$



### Abgangsgruppen



### Nukleophili

