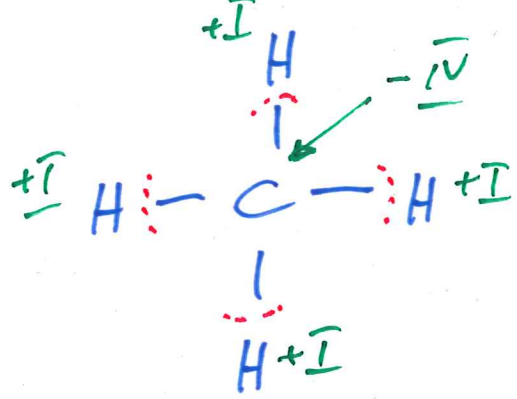
3sb, 24.10

OC II

I

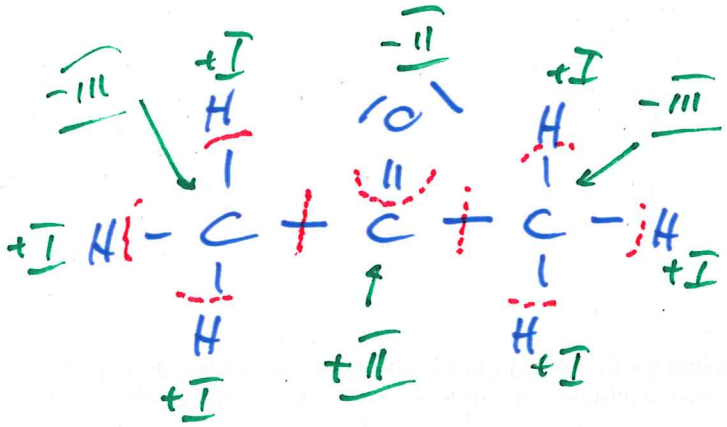
1. Oxidationszahlen : deren Bestimmung



EN(H) = 2.2
EN(C) = 2.6

(kovalente e⁻'s!)

Lewis: H· ·Ċ· :Ö·



EN(H) = 2.2
EN(C) = 2.6
EN(O) = 3.4

Lewis: H· ·Ċ· ·Ö:

Häufig ... H: +I
O: -II

Bsp. $H-\underline{\underline{O}}-H$, $H-\underline{\underline{O}}-\underline{\underline{O}}-H$

$H-\underline{\underline{O}}-\underline{\underline{O}}-H$

1.1. Oxidation

Rost : Eisenoxid

Fahrrad ... rostet ("ox:i:dest") (: Eisen)

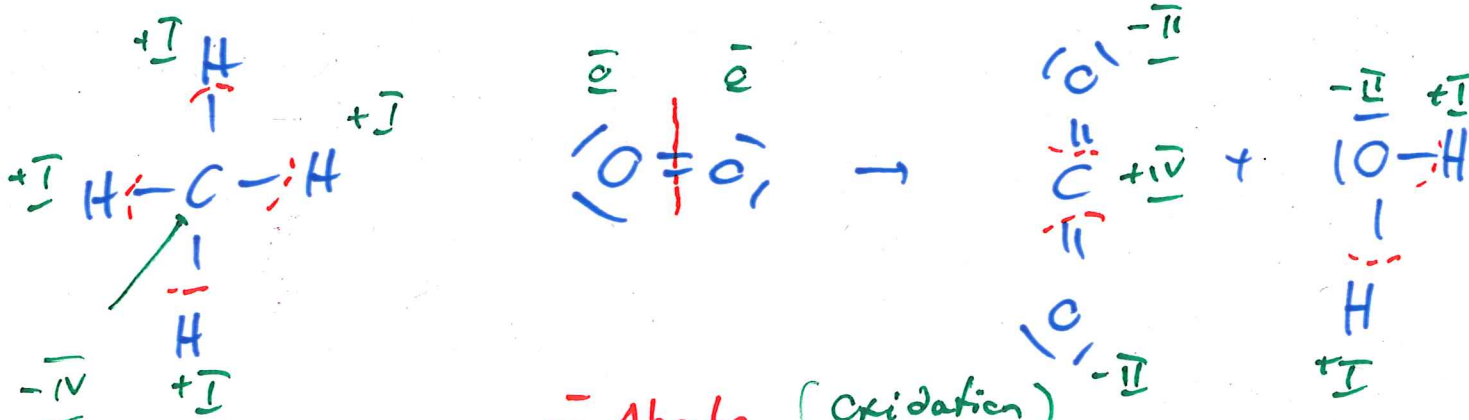
Def:
- Reaktion mit Sauerstoff
- Abgabe von Elektronen

Rost ... Eisenoxid → Fe^{+III} : Fe^{3+}

O^{-II} : O^{2-}

neutral: Fe_2O_3

$1 \cdot CH_4 + 2 \cdot O_2 \rightarrow 1 \cdot CO_2 + 2 \cdot H_2O$



e⁻ Abgabe (Oxidation)

C: $-IV \rightarrow C + IV$

e⁻ Aufnahme (Reduktion)

O: $0 \rightarrow O: -II$

3b5, 21.10

Alkan

- $CH_4 + \frac{1}{2} O_2 \xrightarrow{\text{kat.}}$ Methanol

Methan

Methanal

Alkohol

$C: -IV \rightarrow C: -II$ (: Oxidation)

Alkan

- $\xrightarrow[\text{Kat}]{O_2}$

Alkohol

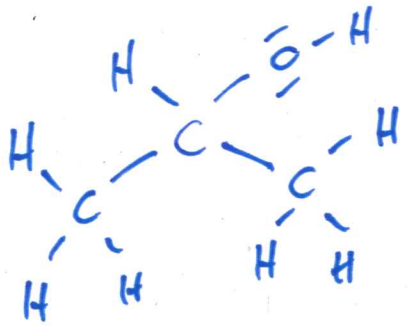
$C: -III \rightarrow C: -I$ (: Oxidation)

$O: 0 \rightarrow O: -II$ (Reduktion)

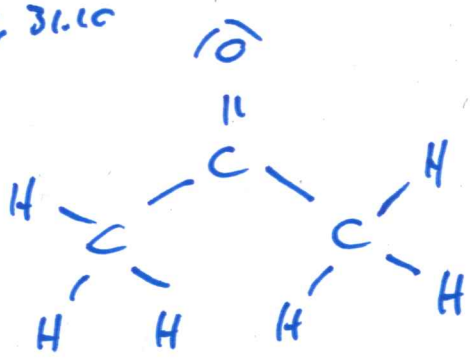
$\xrightarrow[\text{Kat.}]{O_2}$ Alkohol $\xrightarrow[\text{Kat}]{O_2}$ Aldehyd

Säure

$C: -II \rightarrow C: 0 \rightarrow C: +II$ (: Oxidation



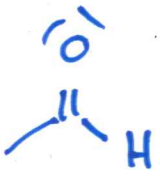
ox.



Alkohol

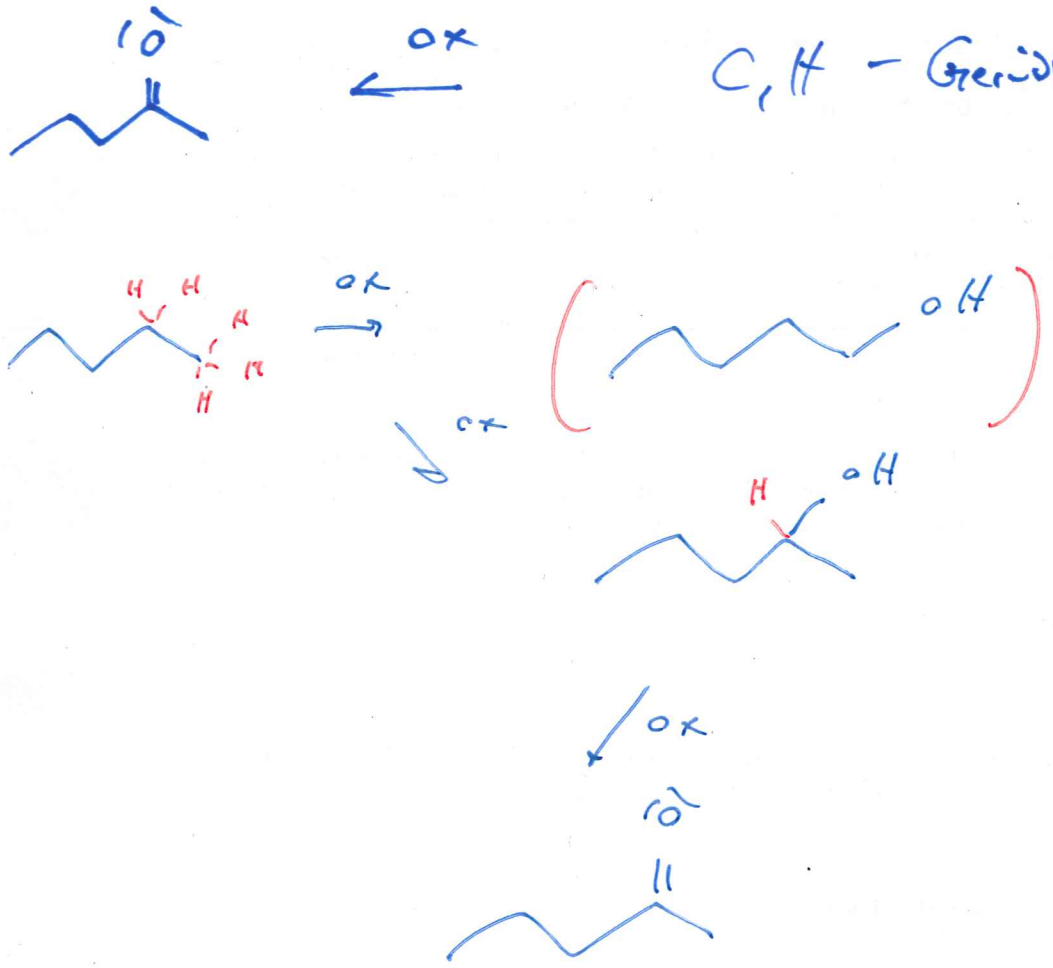
Keton

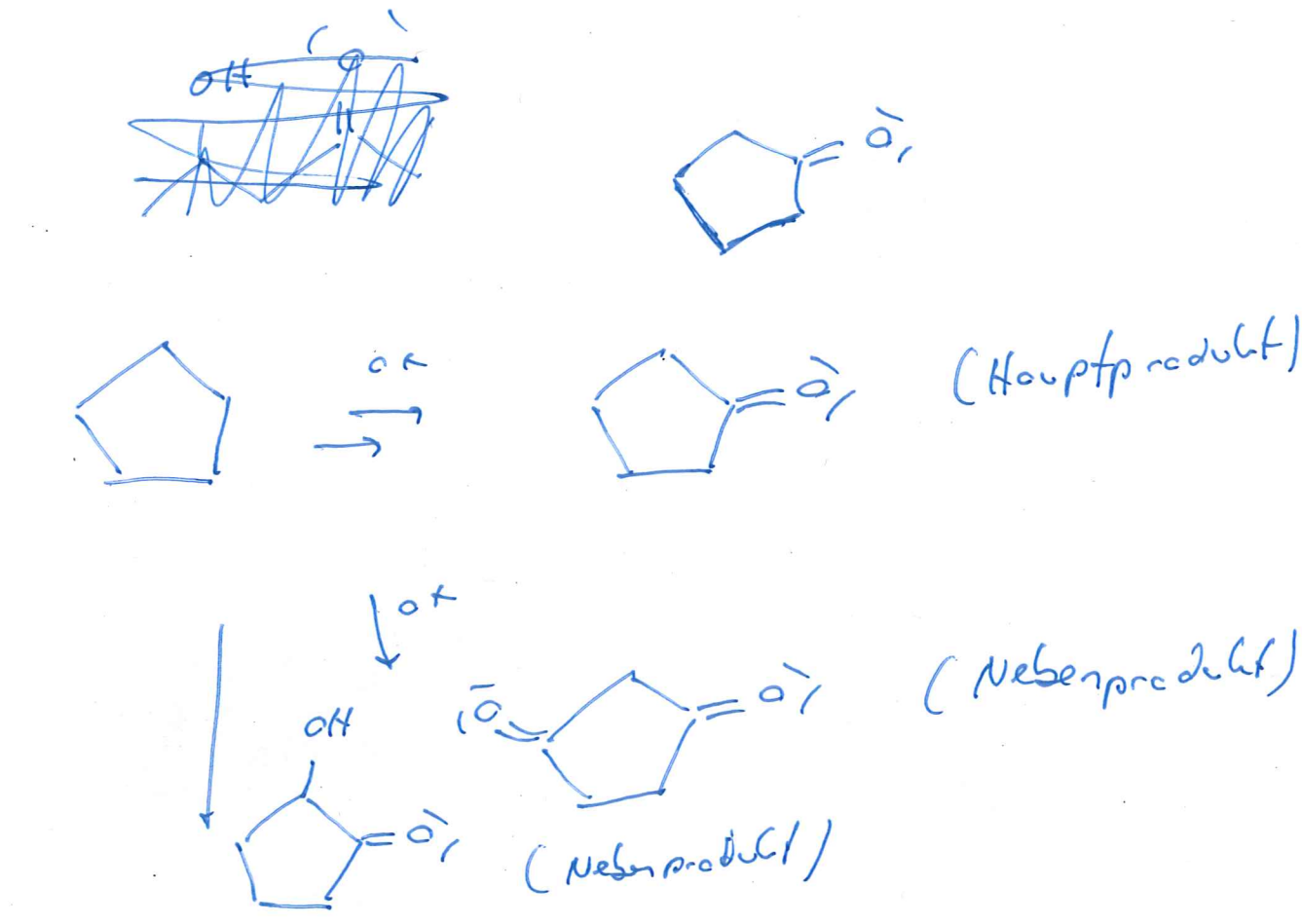
Ubg



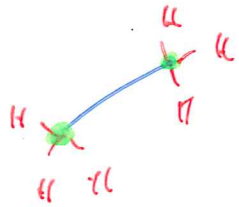
← ← C,H-Gerüst

! Anzahl C-Atome bleibt identisch !

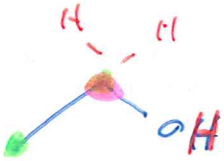

Ox
C, H - Gerüst
Ox
Ox
Ox


Ox
(Hauptprodukt)
Ox
(Nebenprodukt)
(Nebenprodukt)

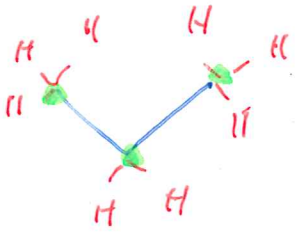
1.2° verschiedene Alkohole



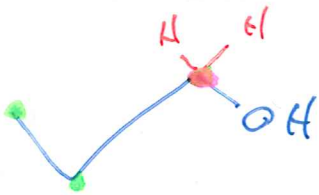
OX →



primärer Alkohol

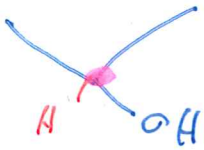


OX →

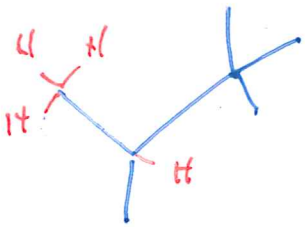


primärer Alk.

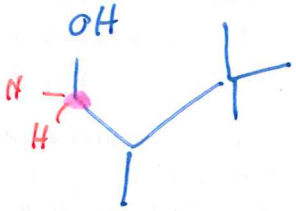
OX ↓



sekundärer Alk.

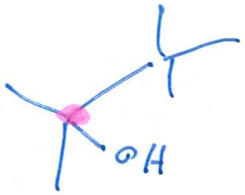


OX →



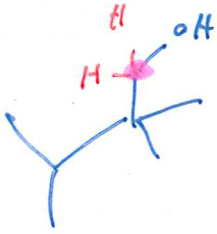
primär Alk.

OX ↓



tertiärer Alkohol

OX ↓

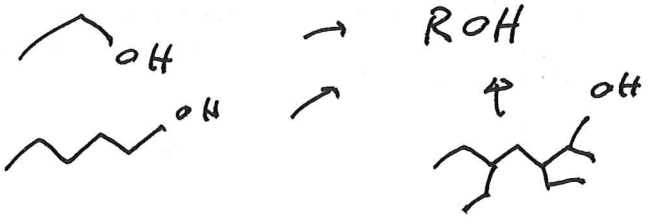


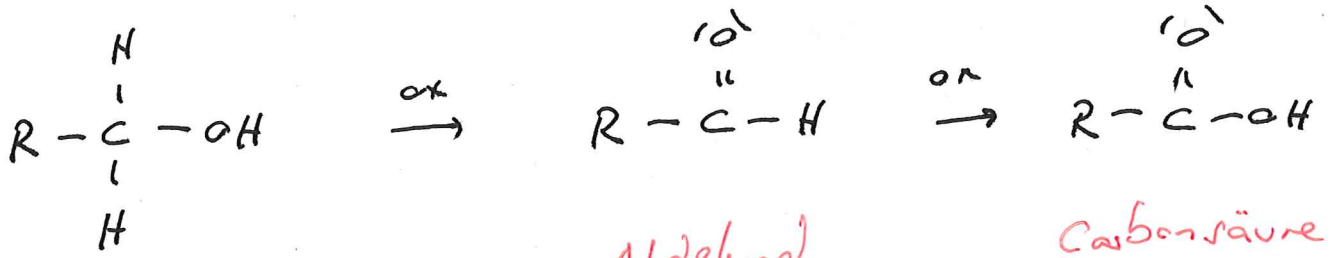
primärer Alkohol

1.3 Oxidationsstufe

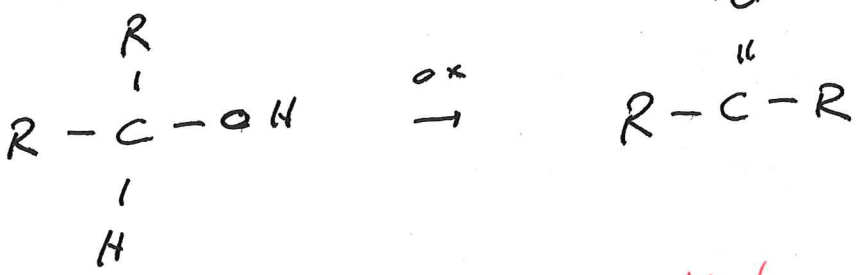
allg. Schreibweise für Reste von C,H-Verbindungen: R
(Spezialfall: nur H ist möglich)

Bsp. Alkohol:

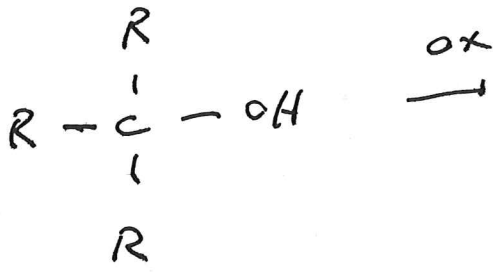


- 

primärer Alk. — Aldehyd — Carbonsäure

- 

sekundärer Alk. — Keton

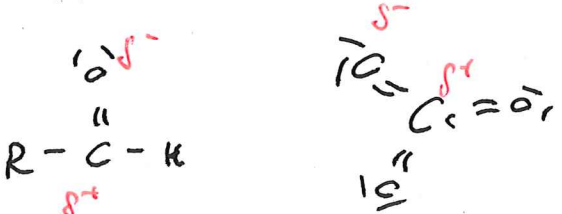
- 

× (geht nicht)

tertiärer Alkohol

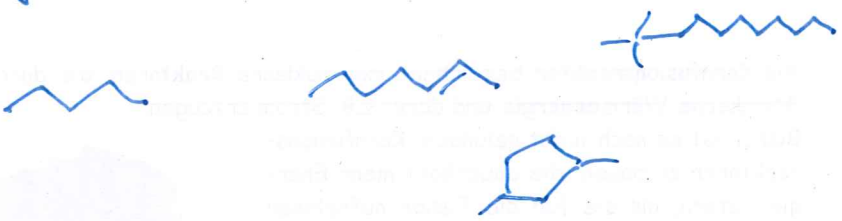
---

z.B. Oxidation: $Cr^{6+}O_3$

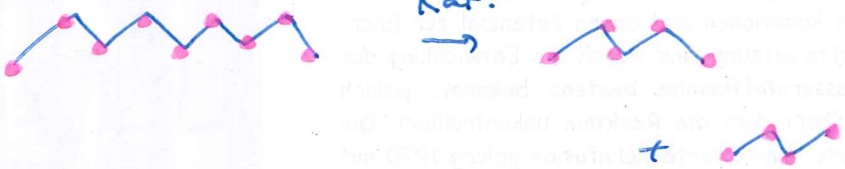


1.4. Anzahl C-Atome bleibt nicht konstant!

Erd-öl, Mischung aus C_xH_y



- Trennung durch Destillation
- Cracken (spalten)

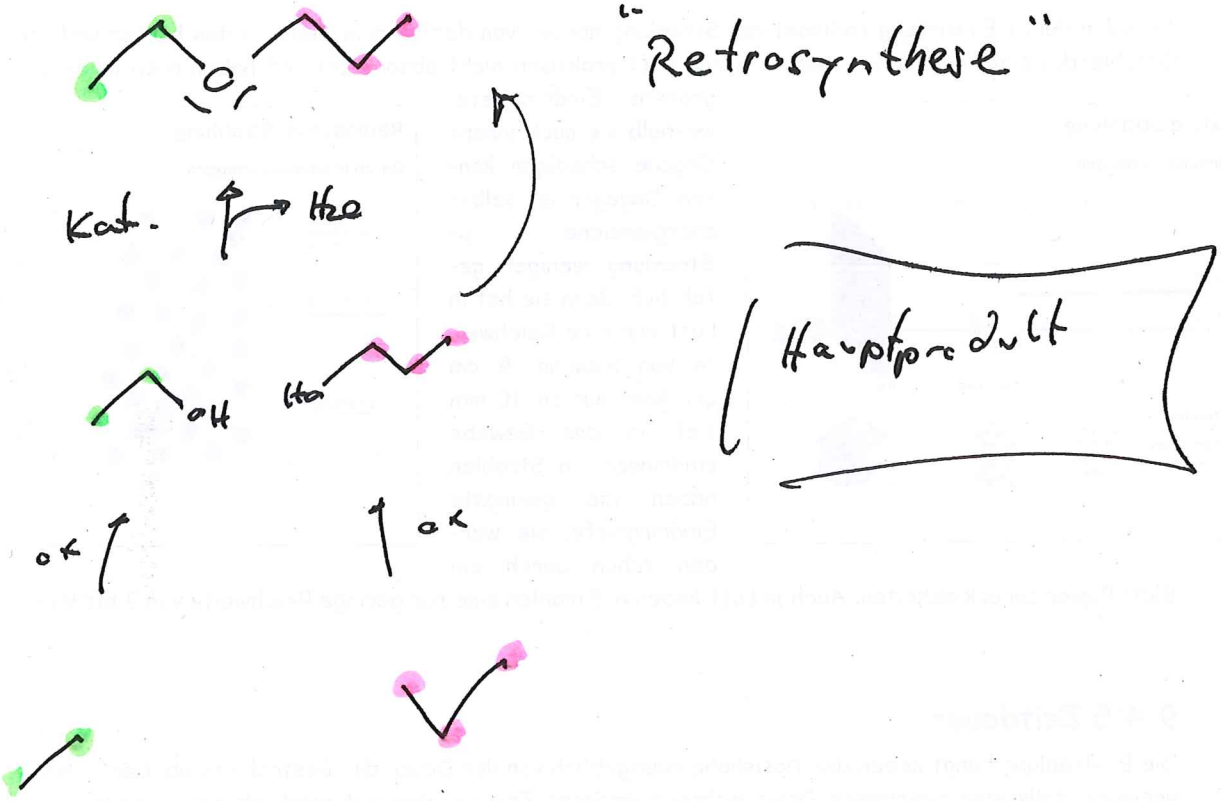


- Reformieren (Umlagerung)

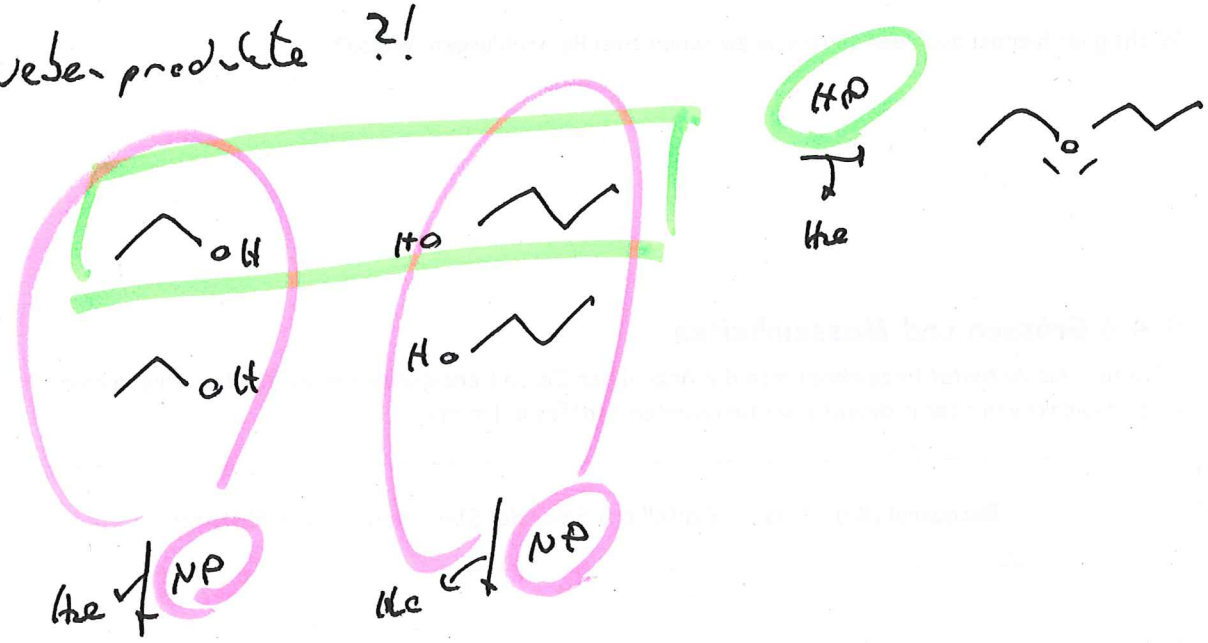
Exp. „Ölbrand"

14.11

Stelle folgende Moleküle her: (Ausgangsmaterial sei C-H-Gerüst)



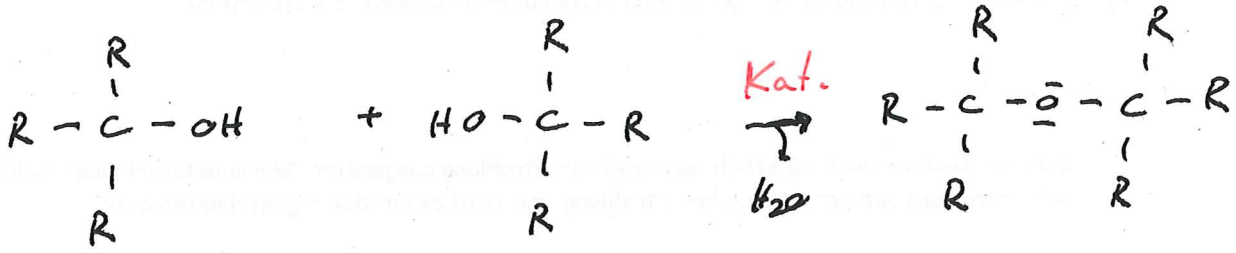
- Nebenprodukte ?!



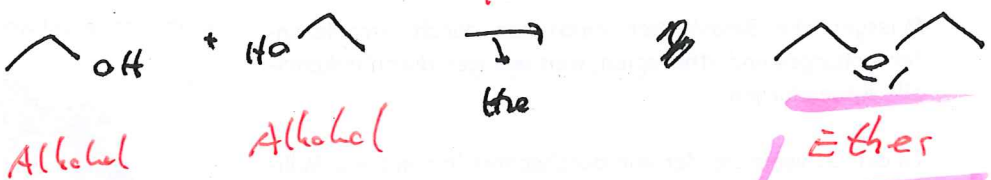
- 

14.11

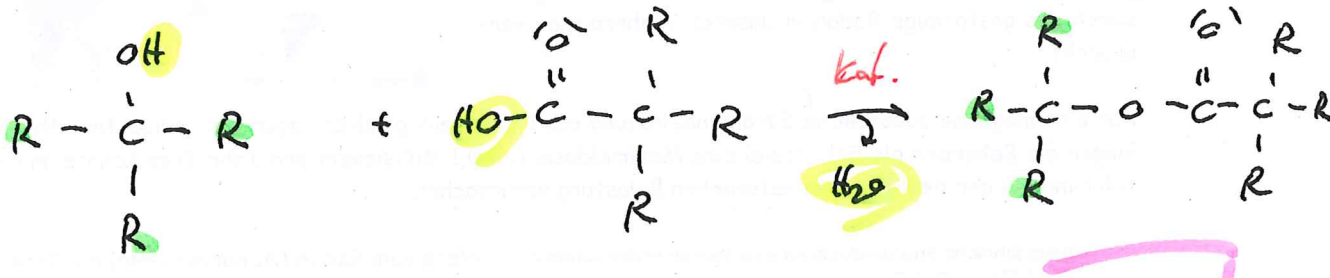
1.5 Reaktionen der fkt. Gruppen untereinander



Bsp.



Alkohol Alkohol

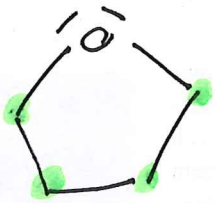


Alkohol + Säure

Ester

vgl. Aspirin-Synthese im Labor

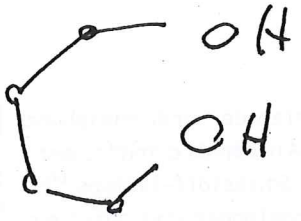
14.11

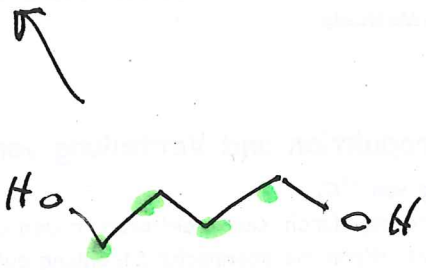


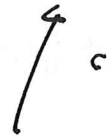
Herstellen aus

C, H

(cyclischer) Ether



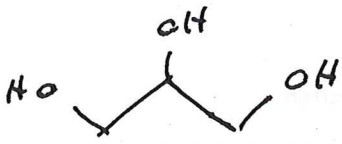




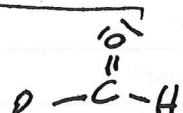
1.6. Eigenschaften

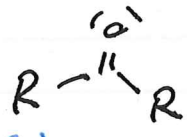
- Alkohol ROH  Ethanol

 Methanol

 Glycerin

(Frostschutzmittel!)

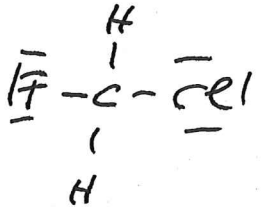
- Aldehyd, Keton RCHO (nicht! RCOH) 

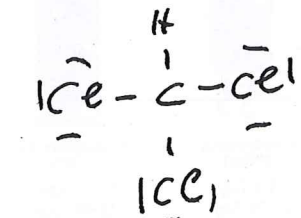
RCOR 

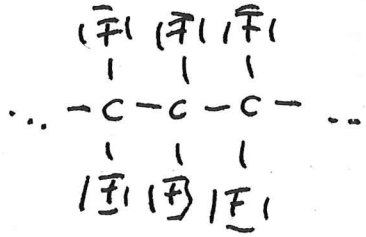
häufig Lösungsmittel ()

Geruchsstoffe, z.B. Erdbeeraldehyd

- Halogenalkane R-X ; X sei F, Cl, Br, I



 Chloroform

 "Teflon"

"FCKW"

Fluor - Chlor - Kohlen - Wasserstoff

↳ Ozonabbau!

2.0 Carbonsäuren

Säure

pH-wert / Hyaluronsäure / Urea (Harnsäure)

Zitronensäure / veätzen

Salzsäure (HCl), Essigsäure

$H^{\oplus}$-Spender

- HCl $H-\underline{\ddot{C}l} \rightleftharpoons H^{\oplus} + \underline{\ddot{C}l}^{\ominus}$

$\left(H^{\cdot} + {}^{\cdot}\underline{\ddot{C}l}\right)$ $\left(H^{\ominus} + \underline{\ddot{C}l}^{\oplus}\right)$

- Schwefelsäure H_2SO_4

$H_2SO_4 \rightleftharpoons H^{\oplus} + HSO_4^{\ominus}$

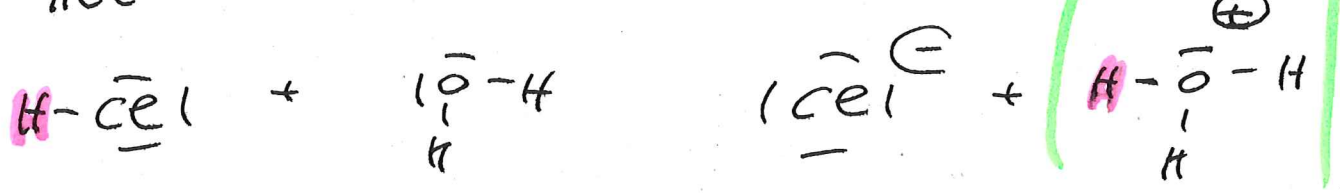
$HSO_4^{\ominus} \rightleftharpoons H^{\oplus} + SO_4^{2-}$

$2H^{\oplus} + SO_4^{2-}$

- H^{+}-Spender ... Protonenspender / donator

- Wasser (H_2O)

$HCl + H_2O \rightarrow Cl^{\ominus} + H_3O^{\oplus}$



Fakt: HCl ist eine stärkere Säure als H_2O

Hydroxonium

- H_2O ist in diesem Fall Protonenakzeptor:

Base / Lauge

- Natronlauge $NaOH + H_2O$

$Na^+ + OH^- + H_2O$

$H_2O + OH^-$ Hydroxid/

Hydroxyl