Ether		alkyl-yl + oxy
Aldehyde	hoofdgroep:	alkanal
	niet	oxo
Zuurhalogenide	HG	alkanoyl halide
	niet	halocarbonyl
Carbonzuur	HG	alkaanzuur
	niet	carboxy
Zuuranhydride	HG	(2x)alkanoic anhydride
	niet	?
Ester	HG	alkyl alkanoaat
	niet	alkoxycarbonyl
Amide	HG	N-alkyl alkaanamide
	niet	aminocarbonyl
Keton	HG	alkanon
	niet	oxo
Alcohol	HG	alkanol
	niet	hydroxy
Nitril	HG	alkaannitril
	niet	cyano
Amine	HG	alkaanamine
	niet	amino
-SH	HG	Huidig
	niet	mercapto
-S-	HG	2x alkyl sulfide

Overzicht

Alkenen

* alkeen + H_2 $\xrightarrow{Pt/C}$ alkaan
* cis $\underset{\text{KD}}{\overset{180°C}{\rightleftharpoons}}$ trans
* alkeen + H-X ⟶ alkyl halide
* alkeen + H_2O $\xrightarrow{H^+}$ alcohol
* alkeen + alcohol $\xrightarrow{H^+}$ ether
* alkeen + peroxyzuur ⟶ epoxide + carbonzuur
* alkeen + halogeen $\xrightarrow{H_2O}$ halohydrine + dihalogeenide
* alkeen $\xrightarrow[2.\ NaBH_4]{1.\ Hg(OAc)_2,\ H_2O,\ THF}$ alcohol — oxymercuratie reductie
* alkeen $\xrightarrow[2.\ NaB]{1.\ Hg(OAc)_2,\ \text{alcohol},\ THF}$ ether — alkoxymercuratie
* alkeen $\xrightarrow[2.\ H_2O_2,\ ^-OH,\ H_2O]{1.\ BH_3,\ THF}$ alcohol — hydroboreren
  $\xrightarrow{3.\ ^-OH,\ H_2O}$
* alkeen $\xrightarrow[^-OH\quad \Delta]{KMnO_4}$ aldehyde of keton + carbonzuur
* alkeen $\xrightarrow[2.\ Zn,\ H_2O]{1.\ O_3,\ -78°C}$ 2x aldehyde / keton

Alkyl halogeniden

* alkyl halogenide + H_2O / ^-OH $\xrightarrow{S_N}$ alcohol
  + ^-SH thiol
  + RO^- ether
  + ^-SR thioether
  + $^-NH_2$ amine
  + $-C\equiv CN$ nitril

sterisch gehinderde base

* alkyl halogenide + base $\xrightarrow{E}$ alkeen
* alkyl halogenide + ~~aldehyde~~ ester + [18]-crown-6
  → ester + X^-

Alkynen

* alkyn + H_2 $\xrightarrow{Pt/C}$ alkaan
* alkyn + H_2 $\xrightarrow{Lindlar}$ alkeen (syn)
* alkyn $\xrightarrow[NH_3(liq)\ -78°C]{Na\ of\ Li}$ alkeen (trans)
* alkyn + H-X + X_2 $\xrightarrow{solvent}$ dihalogenide
* alkyn + H_2O $\xrightarrow[Hg^{2+}]{H^+}$ keton (Hg^{2+} of $CH_3Au(PPh_3)$)
* alkyn + BH_3 $\xrightarrow[2.\ H_2O_2, OH^-, H_2O]{1.\ THF}$ keton / aldehyde
* alkyn $\xrightarrow[2\ alkyl\ halogenide]{1.\ NH_2^-}$ ketenverlenging

Alcoholen

* alcohol + H-X $\xrightarrow{SN}$ alkyl halogenide + alkeen
* alcohol + PBr_3 $\xrightarrow[2.\ X^-]{1.\ pyridine}$ alkyl halogenide
* alcohol + R'-S(=O)(=O)-Cl ⟶ goede leaving group
* alcohol + alcohol $\xrightarrow[SN2]{H^+, B^-}$ ether

* alcohol (sec) $\xrightarrow{H_2CrO_4}$ Keton
of $CrO_3 + H_2SO_4$ of $Na_2Cr_2O_7 + H_2SO_4$

* alcohol (prim) + $HO-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{Cr}}-OH$ $\xrightarrow{H-B^+}$ aldehyde

* alcohol $\xrightarrow[CH_2Cl_2]{PCC}$ aldehyde

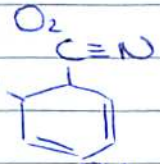
* alcohol + $CH_3\underset{\underset{O}{\|}}{S}CH_3$ + $Cl-\overset{O}{\overset{\|}{C}}-\overset{O}{\overset{\|}{C}}-Cl$ $\xrightarrow{B}$ aldehyde
Sweern oxidatie

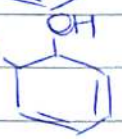
Ethers

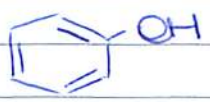
* ether + H-X $\xrightarrow{\Delta}$ alcohol + alkyl halogenide.
Sterk zuur

Areenoxiden

Vorming: benzeen $\xrightarrow{\text{cytochroom } P_{450}}$ areenoxide

* areenoxide $\xrightarrow[2\ H^+]{1.\ -C\equiv N}$ 

* areenoxide $\xrightarrow[2.\ H_2O]{1.\ OH}$ 

* areenoxide $\xrightarrow{1.\ H-B^+}$ 

Zuurhalogeniden

* zuurhalogenide + carbonzuur $\xrightarrow{\text{base}}$ zuuranhydride

* zuurhalogenide + alcohol $\xrightarrow{\text{base}}$ ester

* zuurhalogeenide + H_2O $\xrightarrow{\text{base}}$ carbonzuur
* zuurhalogeenide + amine $\xrightarrow{\text{base}}$ amide
  (overmaat amine)
* zuurhalogeenide + 2 Grignard $\xrightarrow{H^+}$ alcohol (tert)
* zuurhalogeenide $\xrightarrow[Pd]{H_2}$ aldehyde
* zuurhalogeenide $\xrightarrow[2.\ H_3O^+]{1.\ NaBH_4}$ alcohol
* zuurhalogeenide $\xrightarrow[2.\ H_2O]{1.\ LiAl[OC(CH_3)_3]_3H\ -78°C}$ aldehyde

Rosenmund reductie

Zuuranhydriden

* zuuranhydride + alcohol $\xrightarrow{\text{base}}$ carbonzuur + ester
* zuuranhydride + H_2O $\xrightarrow{\text{base}}$ 2 x carbonzuur
* zuuranhydride + amine (overmaat) $\longrightarrow$ amide + carbonzuur
* zuuranhydride + 2 Grignard $\xrightarrow{H^+}$ alcohol (tert) + carbonzuur

Esters

* ester + zuur $\xrightarrow{H_2O}$ carbonzuur + alcohol
* ester + alcohol $\xrightarrow{\text{zuur}}$ ester + alcohol
  (omestering)
* ester + amine $\longrightarrow$ amide + alcohol
* ester + Grignard $\xrightarrow{H_3O^+}$ alcohol (tert)

* ester $\xrightarrow[2.\ H_3O^+]{1.\ LiAlH_4}$ alcohol

* ester $\xrightarrow[2.\ H_3O^+]{1.\ Dibal\ -78°C}$ aldehyde

* ester + RO^- ⟶ samenvoeging 2 esters
Claisen condensatie

* malonzuurester + $2RO^-$ $\xrightarrow[2.\ HCl, H_2O,\ \Delta]{1.\ R\text{-}X}$ carbonzuur

* acetoacetaatester + RO^- $\xrightarrow[2.\ HCl, H_2O,\ \Delta]{1.\ RX}$ keton.

Carbonzuren

* carbonzuur + alcohol $\xrightarrow{zuur}$ ester

* 2 carbonzuur $\xrightarrow{P_2O_5}$ zuuranhydride

* carbonzuur + $SOCl_2$ + PCl_3 + $POCl_3$ ⟶ goede leaving group + HCl ↔ zuurchloride

* carbonzuur $\xrightarrow[2.\ H_3O^+]{1.\ LiAlH_4}$ alcohol.

* carbonzuur $\xrightarrow[2.\ H_2O]{1.\ PX_3,\ X_2}$ halocarbonzuur
Hell-Volhard-Zelinsky

* ketocarbonzuur $\xrightarrow{\Delta}$ keton / aldehyde
Decarboxylering

Amiden

* amide + H_3O^+ $\xrightarrow[2.\ kat.]{1.\ \Delta}$ carbonzuur

* amide + alcohol $\xrightarrow[2.\ kat]{1.\ zuur,\ \Delta}$ ester

* amide + P_2O_5 $\xrightarrow{80°C}$ nitril
  + $SOCl_2$
  + $POCl_3$

* amide $\xrightarrow[2.\ H_2O]{1.\ LiAlH_4}$ amine

Nitrillen

* nitril + H_3O^+ ⟶ carbonzuur

* nitril + sterke base $\xrightarrow{H_2O}$ zout

* nitril + $2H_2$ $\xrightarrow{Pd/C}$ amine

Ketonen en aldehyden

* Keton/aldehyde + Grignard. $\xrightarrow{H_3O^+}$ alcohol

* aldehyde + acetylide $\xrightarrow[H^+]{pyridine}$ alkynol

* Keton + cyanide $\xrightarrow{H^+}$ cyanohydrine

* Keton/aldehyde $\xrightarrow[2.\ H_2O]{1.\ NaBH_4,\ LiAlH_4}$ alcohol

* Keton/aldehyde $\xrightarrow{Raney\ Ni,\ H_2}$ alcohol

* Keton + prim. amine $\xrightarrow{H\text{-}B^+}$ imine

* Keton + sec. amine $\xrightarrow{H\text{-}B^+}$ enamine

* aldehyde + hydroxylamine $\xrightarrow{H^+}$ oxime + H_2O

* Keton + hydrazine → hydrazon $\xrightarrow[H_2O]{^-OH}$ alkaan
Wolf-Kischner reductie

* Keton $\xrightarrow[\text{40\% HCl of droge HX met X = Cl of Br}]{Zn(Hg),\ org.\ solvent}$ alkaan
Clemmensen reductie

* Keton + semicarbazide $\xrightarrow{H^+}$ semicarbazone

* Keton + H_3O^+ → hydraat

* Keton/aldehyde + alcohol $\xrightarrow{HCl}$ hemiacetaal of hemiketaal
acetaal of ketaal $\xleftarrow[\text{alcohol}]{HCl}$
aldehyde

* Keton + S-nucleofiel $\xrightarrow{HCl}$ thioacetaal of thio-ketaal

* Keton/aldehyde + sterke base $\xrightarrow{H_3O^+}$ $-\overset{\overset{OH}{|}}{\underset{\underset{B}{|}}{C}}-$

opm: indien zwakke base zal C=O overanderd blijven

* Keton/aldehyde + $H_3O^+ + X_2$ → halogenering
$+ {}^-OH + X_2$

* Keton $\xrightarrow[I_2, Cl_2 \text{ of } Br_2 \text{ overmaat}]{^-OH \text{ overmaat}}$ carbonzuur + CHX_3
Haloform reactie

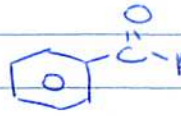
* Keton + peroxyzuur $\xrightarrow{B}$ ester + carbonzuur
* aldehyde + peroxyzuur $\xrightarrow{B}$ 2x carbonzuur
} Bayer-Villiger

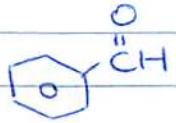
* 2x aldehyde/Keton $\xrightarrow[H_2O]{^-OH}$ samenvoeging
Aldol reactie

* aldehyde $\xrightarrow{H_2CrO_4 \text{ of } CrO_3 + H_2SO_4 \text{ of } NaCrO_4 + H_2SO_4}$ carbonzuur

Benzeen

* benzeen + X_2 + oxidant ⟶ halogenide benzeen
  (vb. $FeBr_3$)

* benzeen + zuurhalogenide + $AlCl_3$ ⟶ 
  Friedl-Crafts Acylering

* benzeen + CO + HCl $\xrightarrow[AlCl_3]{\text{druk, CuCl}}$ 
  Gatterman-Koch

* benzeen + R-X / alkeen / alcohol / ...
  benzeensubstituent ⟵ $AlCl_3$ / HF / H_2SO_4 ...
  Δ, B
  Friedl-Crafts Alkylering

* benzeen + HNO_3 + H_2SO_4 $\xrightarrow{B}$ 

* benzeen + $2H_2SO_4$ $\xrightarrow{B}$ 

* benzeen + H_2 $\xrightarrow[\text{(overmaat)}]{Ni,\ \Delta,\ \text{druk}}$ cyclohexaan

* benzeen $\xrightarrow[H_2SO_4]{HNO_3}$ $\xrightarrow[NO]{H_2,\ Kat.}$ diazoniumion
  Diazotatie

Benzeensubstituenten

* alkyl subst. + NBS $\xrightarrow[\Delta]{\text{peroxide}}$ 1-broomalkyl subst.

* alkyl subst. $\xrightarrow[H^+\ \Delta]{KMnO_4 / Na_2Cr_2O_7}$ carbonzuur subst.

* alcohol subst. $\xrightarrow[H^+\ \Delta]{KMnO_4}$ carbonzuur subst.
  (sterke oxidatie)

* alcohol subst. $\xrightarrow[H^+\ \Delta]{MnO_2}$ keton / aldehyde subst.
  (milde oxidatie)

* Nitro subst. $\xrightarrow[H_2 + Kat.]{\text{metaal + zuur of}}$ amine subst.

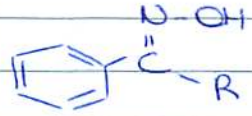
* alkeen subst. $\xrightarrow{H_2 + Kat}$ alkaan subst.

* aldehyde subst. $\xrightarrow{H_2 + Kat}$ alcohol subst.

* cyanide subst. $\xrightarrow{H_2 + Kat}$ amine subst.

* alcohol subst. $\xrightarrow{(KSO_3)_2NO}$ keton subst. (milde oxidatie)

* Keton subst. $\xrightarrow{NaBH_4}$ alcohol subst.

*  $\xrightarrow{H_2O}$ amide subst.
Beckmann omlegging

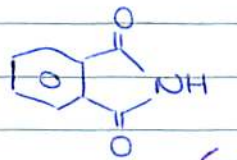
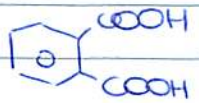
* amide subst. $+ \bar{O}H + Cl_2 \xrightarrow{H_2O}$ amine subst.
Hoffmann omlegging

S-groepen

* disulfide $\xrightarrow[Zn]{HCl}$ 2 thiol

* thiol $\xrightarrow{HNO_3}$ sulfonic zuur

Aminen

Synthese ·  $\xrightarrow[3.\ H_3O^+\ \Delta]{1.\ \bar{O}H\ \ 2.\ R\text{-}Br}$  + amine

Gabriël synthese

* amine (prim) + alkyl halogenide ⟶ amine (sec)

* amine $\xrightarrow[K_2CO_3\ solvent]{CH_3I}$ $(CH_3)_4N^+\ I^-$ Overalkylering

* amine + alkeen ⟶ samenvoeging Michael addition