

AS organic chemistry: reaction map as a table

Searchable version of Fahad Hameed's one-page AS Organic reaction map (2019, v2.0). The map is a hand-drawn diagram; this version lists every arrow on it as a reaction, with reagents and conditions, so it can be searched and copied. The original map is on the same page of megalecture.com.

Alkanes and halogenoalkanes

From	Reagents and conditions	To
alkane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$	Br_2 , UV light	halogenoalkane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
alkene, $\text{CH}_3\text{CH}=\text{CHCH}_3$	H_2 , Ni catalyst, heat	alkane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
halogenoalkane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$	NH_3 in ethanol, or concentrated NH_3 , heat	amine, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
halogenoalkane	NaOH in ethanol, heat under reflux (elimination)	alkene, $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
halogenoalkane	KCN in ethanol, heat under reflux	nitrile, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CN}$
halogenoalkane	NaOH(aq) , heat under reflux (hydrolysis)	primary alcohol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
primary alcohol	HBr , or red P and Br_2 , heat	halogenoalkane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$
secondary alcohol, $\text{CH}_3\text{CH}_2\text{CH(OH)CH}_3$	PCl_5 (white fumes of HCl)	chloroalkane, $\text{CH}_3\text{CH}_2\text{CHClCH}_3$

Nitriles and carboxylic acids

From	Reagents and conditions	To
nitrile, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CN}$	dilute HCl , heat under reflux (hydrolysis)	carboxylic acid, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$
carboxylic acid	PCl_5 (white fumes of HCl)	acyl chloride, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COCl}$
carboxylic acid, $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$	NaOH(aq) (or a reactive metal)	salt of carboxylic acid, $\text{CH}_3\text{CH}_2\text{CO}_2^- \text{Na}^+$
ethanoic acid, $\text{CH}_3\text{CO}_2\text{H}$	Na	$\text{CH}_3\text{CO}_2^- \text{Na}^+ + \frac{1}{2} \text{H}_2$ gas

Alcohols, aldehydes and ketones

From	Reagents and conditions	To
primary alcohol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	$\text{H}^+/\text{K}_2\text{Cr}_2\text{O}_7$, heat and distil off the aldehyde	aldehyde, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$



aldehyde	(1) H^+/KMnO_4 , (2) $\text{H}^+/\text{K}_2\text{Cr}_2\text{O}_7$, (3) Fehling's, or (4) Tollens' reagent, heat	carboxylic acid, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$
aldehyde	$\text{NaBH}_4(\text{aq})$, or LiAlH_4 in dry ether and heat, or H_2/Ni and heat	primary alcohol
carboxylic acid	LiAlH_4 in ether, heat	primary alcohol
secondary alcohol, $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$	$\text{H}^+/\text{K}_2\text{Cr}_2\text{O}_7$ or H^+/KMnO_4 , heat under reflux	ketone, $\text{CH}_3\text{CH}_2\text{COCH}_3$
ketone	H_2/Ni at 200 °C, or $\text{NaBH}_4(\text{aq})$, or LiAlH_4 in dry ether, heat under reflux	secondary alcohol
ketone, $\text{CH}_3\text{CH}_2\text{COCH}_3$	$\text{HCN}(\text{aq})$ in $\text{KCN}(\text{aq})$, heat under reflux	hydroxynitrile, $\text{CH}_3\text{CH}_2\text{C}(\text{OH})(\text{CN})\text{CH}_3$
hydroxynitrile	dilute HCl or dilute H_2SO_4 , heat under reflux	hydroxy acid, $\text{CH}_3\text{CH}_2\text{C}(\text{OH})(\text{CO}_2\text{H})\text{CH}_3$
hydroxy acid	Na	the disodium salt, $\text{CH}_3\text{CH}_2\text{C}(\text{O}-\text{Na}^+)(\text{CO}_2-\text{Na}^+)\text{CH}_3$
ketone, $\text{CH}_3\text{CH}_2\text{COCH}_3$	$\text{I}_2(\text{aq})$ in $\text{NaOH}(\text{aq})$, warm (iodoform reaction)	salt of carboxylic acid, $\text{CH}_3\text{CH}_2\text{CO}_2^-$ (+ CHI_3)
secondary alcohol	Na	alkoxide, $\text{CH}_3\text{CH}_2\text{CH}(\text{O}-\text{Na}^+)\text{CH}_3$ + $\frac{1}{2}$ H_2 gas
secondary alcohol	$\text{CH}_3\text{CO}_2\text{H}$, concentrated H_2SO_4 , heat (esterification)	ester, $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{OCOCH}_3$
ester	dilute HCl or $\text{NaOH}(\text{aq})$, heat (hydrolysis)	secondary alcohol + ethanoic acid

Alkenes

From	Reagents and conditions	To
alkene, $\text{CH}_3\text{CH}=\text{CHCH}_3$	hot, acidified concentrated KMnO_4 (oxidative cleavage)	ethanoic acid, $\text{CH}_3\text{CO}_2\text{H}$
alkene	cold, dilute KMnO_4 , alkaline (or acidic)	diol, $\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_3$
alkene	Br_2 in ethanol, or $\text{Br}_2(\text{l})$	dibromoalkane, $\text{CH}_3\text{CHBrCHBrCH}_3$
alkene	steam and dilute H_3PO_4 at 350 °C and 70–100 atm	secondary alcohol, $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$
dibromoalkane	$\text{NaOH}(\text{aq})$, heat under reflux	diol
dibromoalkane	NaOH in ethanol, heat under reflux	diene, $\text{CH}_2=\text{CHCH}=\text{CH}_2$
diol	concentrated H_2SO_4 and heat, or hot alcohol vapour over Al_2O_3	diene, $\text{CH}_2=\text{CHCH}=\text{CH}_2$

secondary alcohol	concentrated H_2SO_4 , heat (dehydration)	mixture of alkenes: $\text{CH}_3\text{CH}=\text{CHCH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
chloroalkane, $\text{CH}_3\text{CH}_2\text{CHClCH}_3$	NaOH in ethanol, heat under reflux	mixture of alkenes: $\text{CH}_3\text{CH}=\text{CHCH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
mixture of alkenes	H_2 , Ni , heat	alkane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

Checked by Mega Lecture

Every arrow on the map is listed once; the structures are written as condensed formulae. Two reagents are given as they appear on the map: hot acidified KMnO_4 as "concentrated", and the iodoform product as the carboxylate (the CHI_3 is added in brackets). Spotted a mistake? Tell us on WhatsApp: +92 336 780 1123.