| Target | => | Synthon | Type of reaction | Reagents | Mechanism facts | Comments |
|---|---|---|---|---|---|---|
| alkoxide (RO-) | => | alcohol (ROH) | acid/base | STRONG base (e.g. NaNH2) | | chap 3 |
| alkynide | => | alkyne | acid/base | STRONG base (e.g. NaNH2) | | chap 3 |
| carboxylate (RCOO-) | => | carboxylic acid | acid/base | NaOH or stronger | | chap 3 |
| alkane | => | alkene | addition | H2 / Pt or Pd or Ni | syn-addition | chap 4 & 7 |
| alkane | => | alkyne | addition | H2 / Pt or Pd or Ni | | chap 4 & 7 |
| alkyne | => | alkyl halide | substitution | alkynide | inversion of configuration;<br>CHECK TABLE 6.6 | chap 4, 6, & 7 |
| alcohol | => | alkyl halide | substitution | NaOH | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| ether | => | alkyl halide | substitution | alkoxide | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| thiol | => | alkyl halide | substitution | NaSH | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| thioether | => | alkyl halide | substitution | NaSR | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| nitrile | => | alkyl halide | substitution | NaCN | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| iodide | => | alkyl halide | substitution | KI | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| carboxylic ester | => | alkyl halide | substitution | carboxylate | check table 6.6;<br>Inversion with SN2, racemization with SN1<br>aprotic solvent helps | chap 6 |
| alkene | => | alkyl halide | elimination | KOH / ethanol / heat | check table 6.6;<br>anti-periplanar; Zaitsev | chap 6 & 7 |
| alkene | => | alcohol | elimination | strong acid and heat | carbocation mechanism; Zaitsev;<br>3° easiest, 1° most difficult | chap 7 |
| alkene, *cis*- | => | alkyne | addition | H2 / P-2 or Lindlar's catalyst | syn addition | chap 7 |
| alkyne | => | vicinal dihalide | elimination | STRONG base (e.g. NaNH2) | two stages - first vinyl halide; then - with more difficulty - alkyne | chap 7 |
| vinyl halide | => | vicinal dihalide | elimination | KOH / ethanol / heat | see alkyne => vicinal dihalide | chap 7 |
| alkyne | => | vinyl halide | elimination | STRONG base (e.g. NaNH2) | see alkyne => vicinal dihalide | chap 7 |
| alkyl halide | => | alkene | addition | HX | carbocation mechanism;<br>Markovnikov | chap 8 |
| alcohol | => | alkene | addition | H2O; H+ catalyst | carbocation mechanism;<br>Markovnikov | chap 8 |
| alcohol | => | alkene | addition | H2O / Hg(OAc)2 / THF<br>2) NaBH4 / base | no carbocation;<br>Markovnikov | chap 8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| alcohol | => | alkene | addition | BH3 / THF<br>2) H2O2 / base | anti-Markovnikov;<br>boron to least hindered position<br>syn-addition | chap 8 |
| vicinal dihalide | => | alkene | addition | X2 / CCl4 | anti-addition | chap 8 |
| halohydrin | => | alkene | addition | X2 / H2O | anti-addition | chap 8 |
| cyclopropane | => | alkene | cycloaddition | CH2N2 -or-<br>CH2I2 / Zn(Cu) | stereospecific;<br>CHCl3 / KOt-Bu for 1,1-dichlorocyclopropane | chap 8 |
| vicinal diol | => | alkene | addition | NMO / OsO4 catalyst; -or-<br>OsO4 then NaHSO3; -or-<br>cold dilute basic KMnO4 | syn-addition | chap 8 |
| carboxylic acid | => | alkene (=CHR) | oxidative cleavage | KMnO4, base, heat;<br>2) H+ | | chap 8 |
| ketone | => | alkene (=CR2) | oxidative cleavage | KMnO4, base, heat -or-<br>O3, CH2Cl2, -78 °C; 2) Me2S | | chap 8 |
| aldehyde | => | alkene (=CHR) | oxidative cleavage | O3, CH2Cl2, -78 °C; 2) Me2S | | chap 8 |
| vinyl halide | => | alkyne | addition | 1 mol HX | Markovnikov | chap 8 |
| geminal dihalide | => | alkyne | addition | xs HX | Markovnikov | chap 8 |
| geminal dihalide | => | vinyl halide | addition | HX | Markovnikov | chap 8 |
| *trans* vicinal dihaloakene | => | alkyne | addition | 1 mol X2 / CCl4 | anti addition | chap 8 |
| α,α,β,β-tetrahaloalkane | => | alkyne | addition | xs X2 / CCl4 | | chap 8 |
| carboxylic acid | => | alkyne | oxidative cleavage | KMnO4, base, heat, 2) H+<br>-or-<br>O3, CH2Cl2, -78 °C; 2) Me2S | triple bonded carbon must be non-terminal;<br>otherwise gives CO2 | chap 8 |
| alkyl halide | => | alkane | substitution | X2 / light or heat<br>alt: NBS / light (Br only) | radical; reactivity: F >> Cl > Br (I unreactive)<br>seletivity: 3° substitution > 2° > 1° > methyl<br>Br is most selective; F is least selective | chap 10 |
| alkyl halide | => | alkene | addition | HBr / peroxide | radical; anti-Markovnikov addition of HBr | chap 10 |
| polymer | => | alkene | addition | peroxide -or- AIBN | radical chain reaction | chap 10 |