

AROMATICKÉ SLOUČENINY





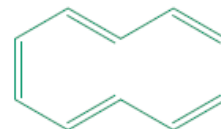
Cyclobutadiene:
planar, **antiaromatic**



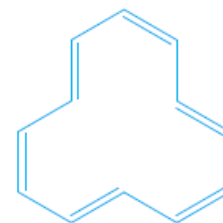
Benzene:
planar, **aromatic**



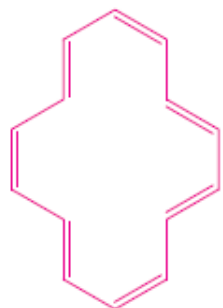
Cyclooctatetraene:
nonplanar = **nonaromatic**



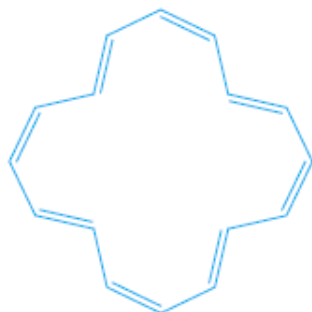
[10]Annulene:
nonplanar = **nonaromatic**



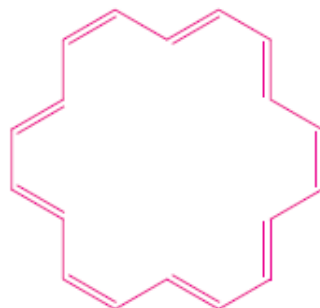
[12]Annulene:
planar = **antiaromatic**



[14]Annulene:
planar = **aromatic**



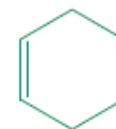
[16]Annulene:
planar = **antiaromatic**



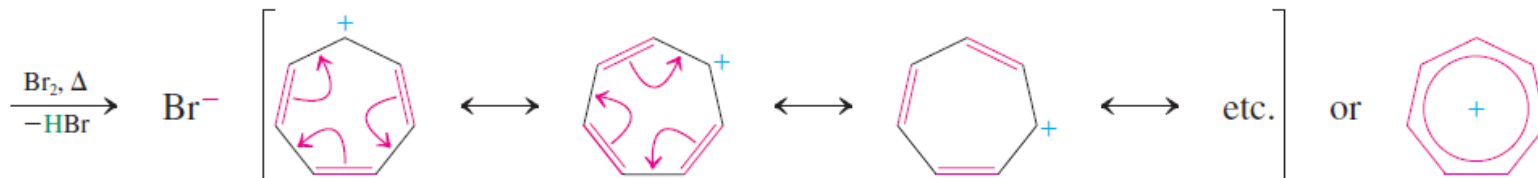
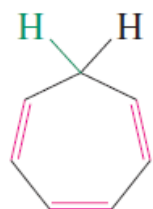
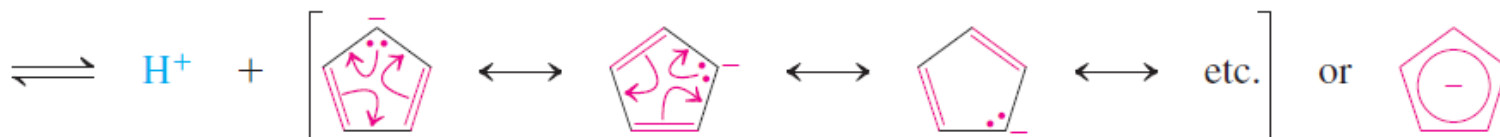
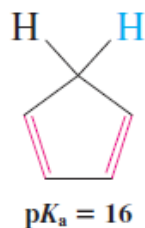
[18]Annulene:
planar = **aromatic**

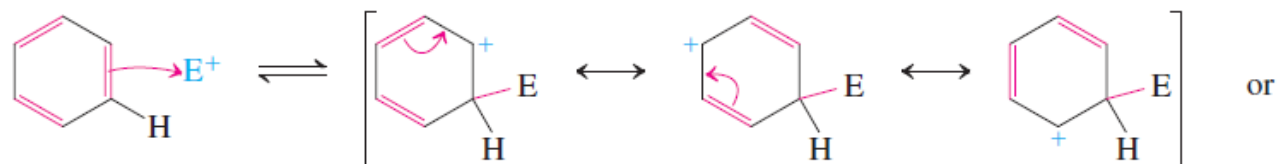


1,3-Cyclopentadiene:
nonsymmetrically delocalized
= **nonaromatic**

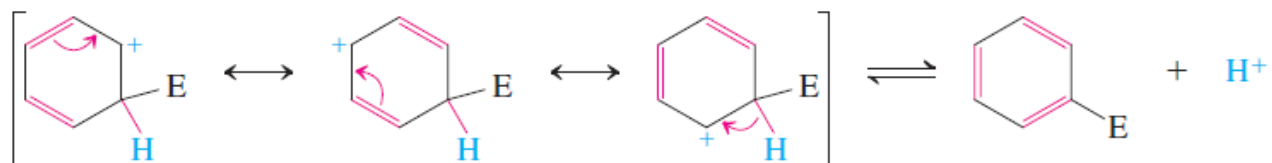


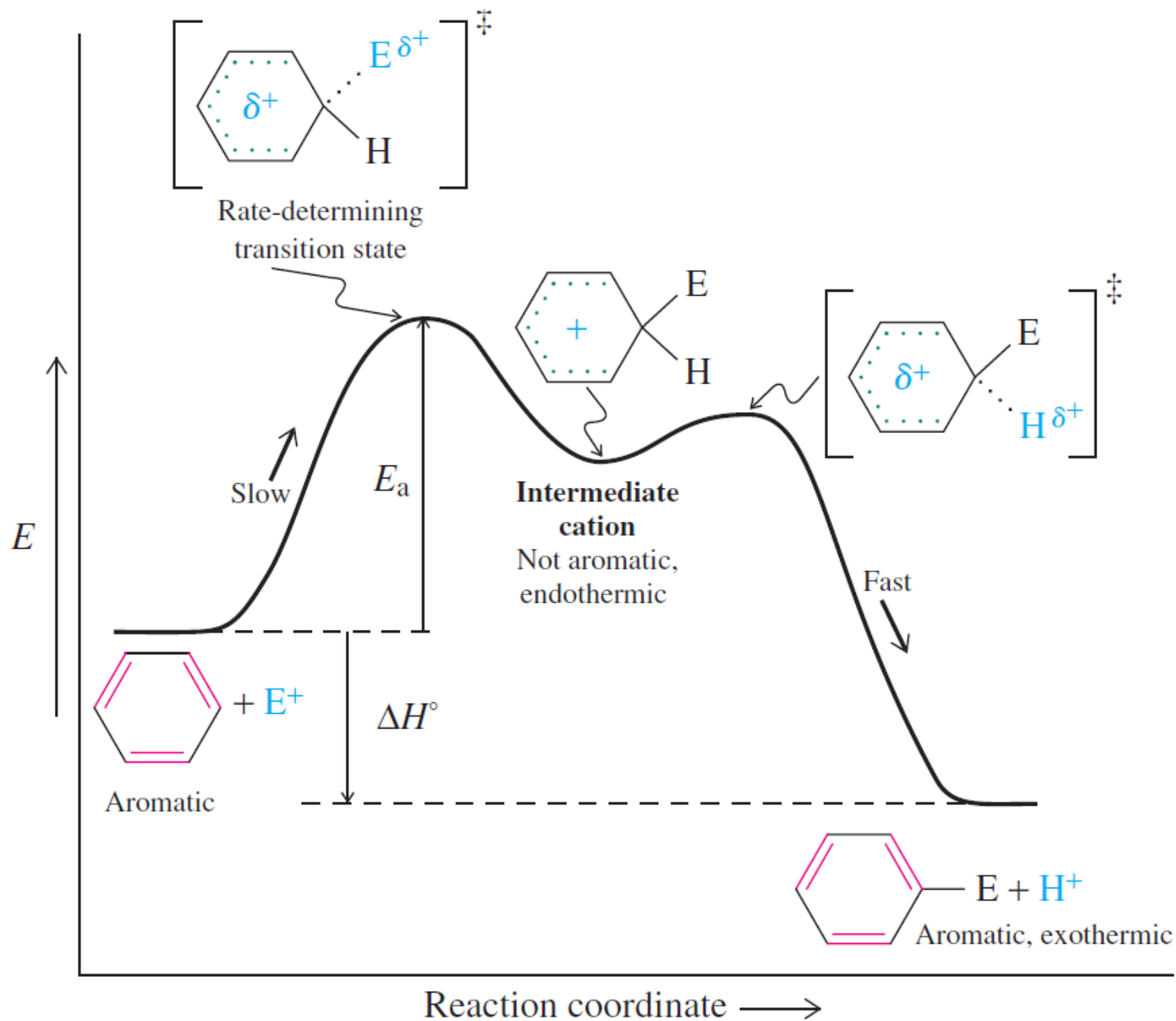
1,4-Cyclohexadiene:
nondelocalized
= **nonaromatic**





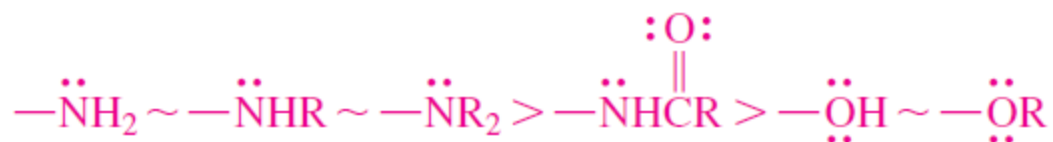
Step 2. Proton loss





Ortho and para directors

Moderate and strong activators



Increasing activation

Weak activators

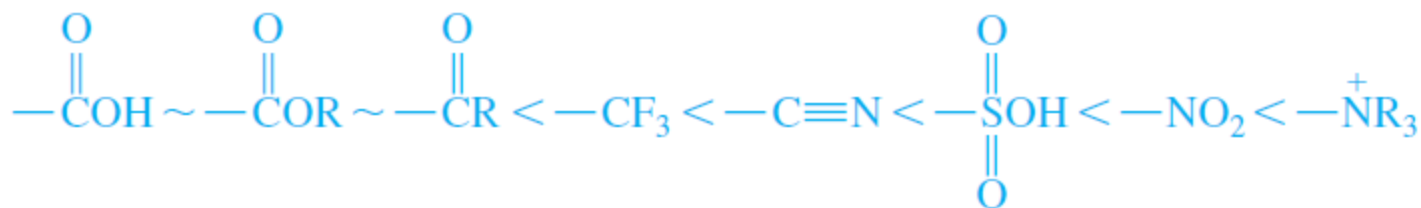
Alkyl \cong phenyl

Weak deactivators



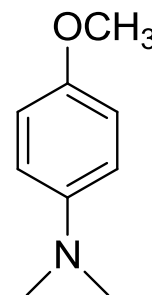
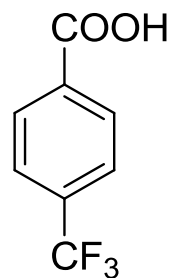
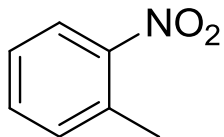
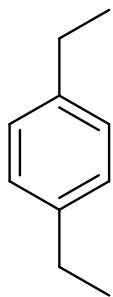
Meta directors

Strong deactivators

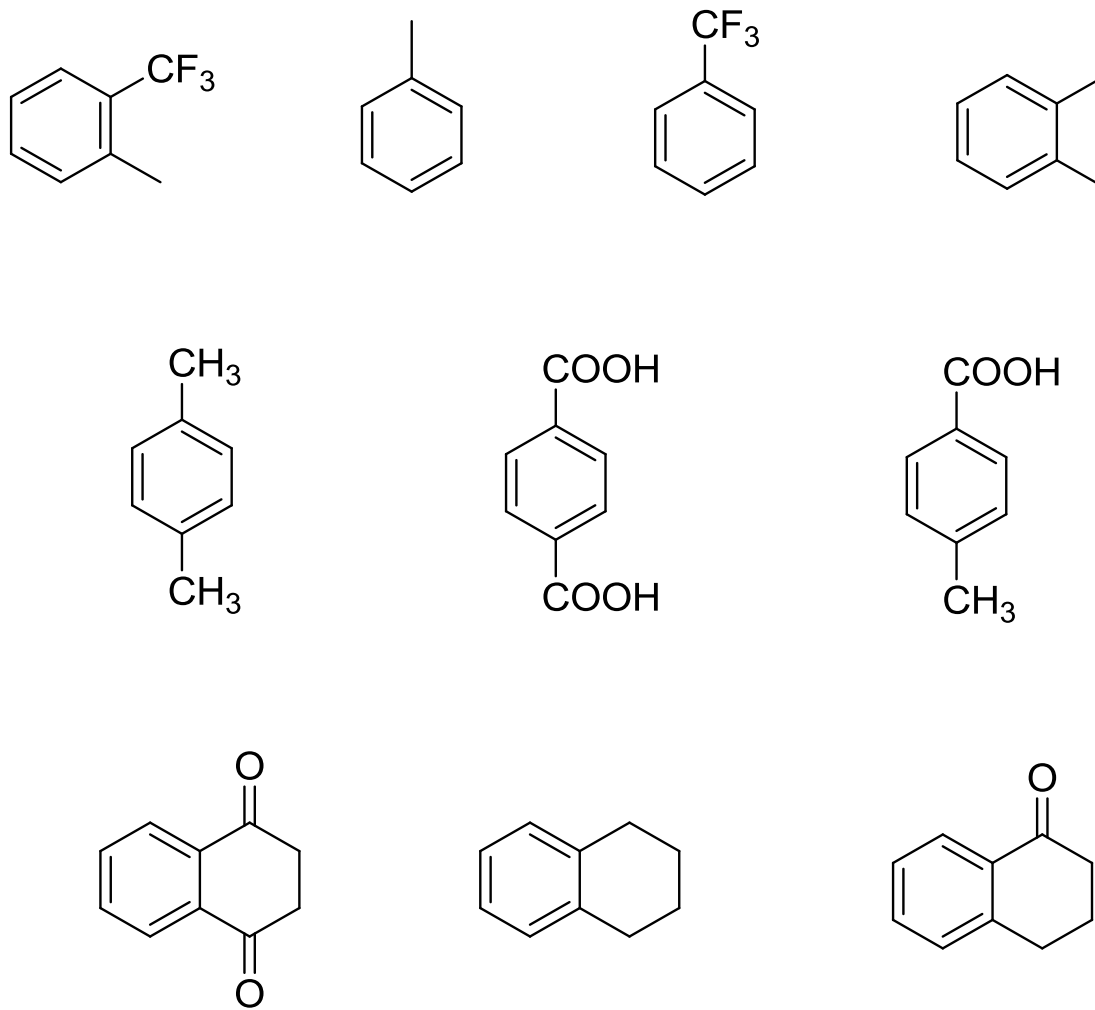


Increasing deactivation

Určete, zda je benzenové jádro aktivované nebo deaktivované pro elektrofilní aromatickou substituci



Sloučeniny seřadte podle jejich vzrůstající reaktivity při elektrofilní aromatické substituci

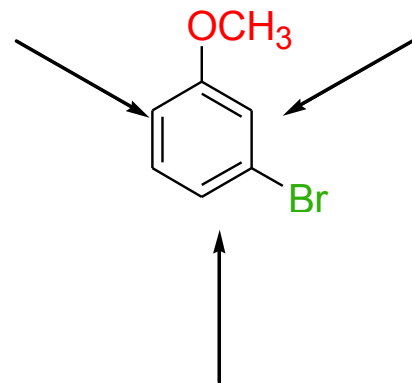
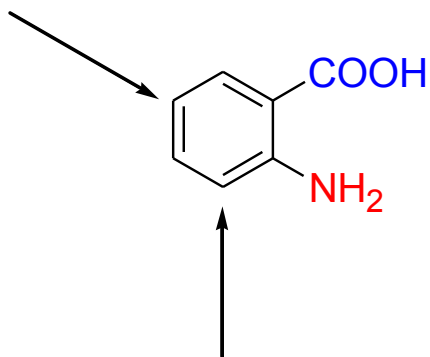
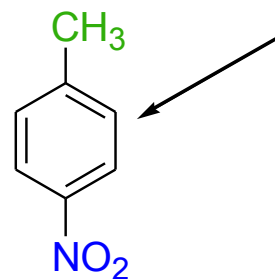
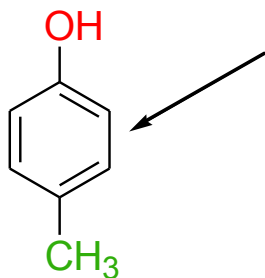


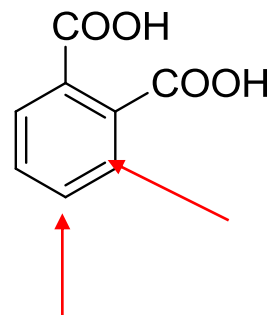
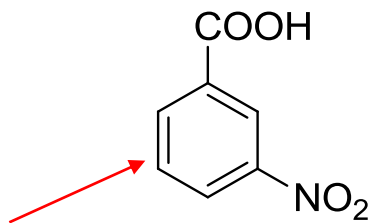
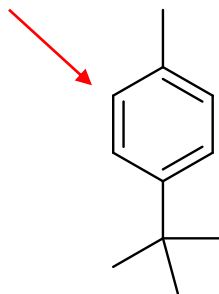
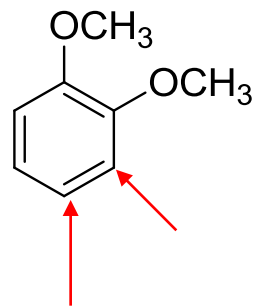
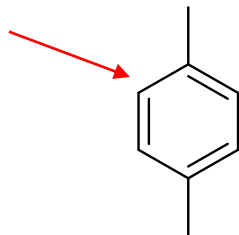
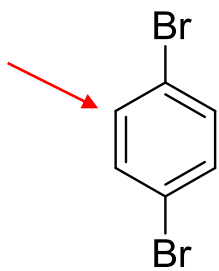
aktivující skupiny

alkyly aktivující slabě

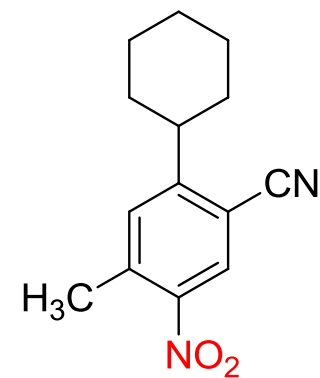
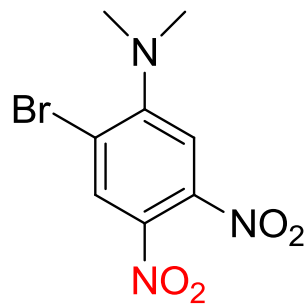
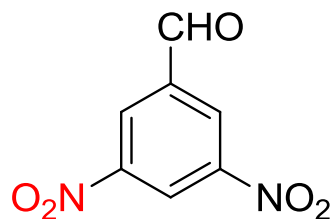
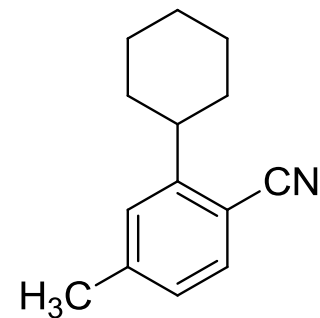
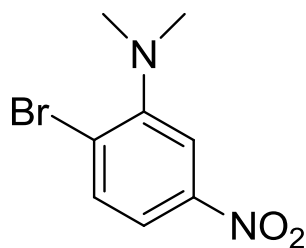
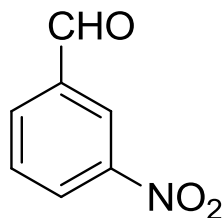
deaktivující skupiny

halogeny o-, p- dirigující
ale deaktivující





Předpovězte produkt mononitrační reakce



a) Nitrace

b) Sulfonace

c) Halogenace

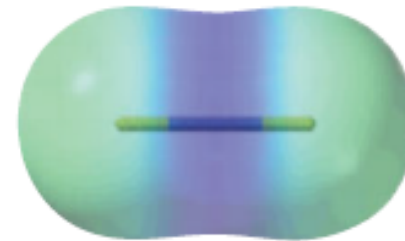
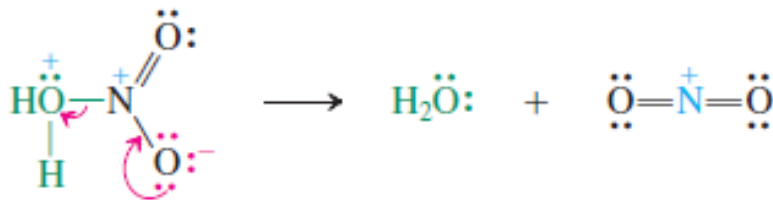
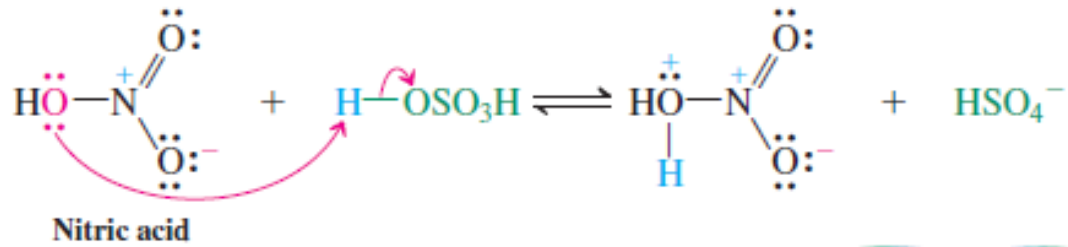
d) Friedl-Craftsova alkylace a acylace

- 1) ne na aromátech se silnými akceptory (CN, NO₂)
- 2) nereagují aromatické halogenderiváty a vinylhalogenidy
- 3) problém vícenásobné substituce, protože zavedením alkyly je produkt pro další elektrofilní substituci reaktivnější
- 4) přesmyky karbokationtů
- 5) nelze provádět na substrátech s aminoskupinou, komplexace Lewisovy kyseliny na volný elektronový pár dusíku

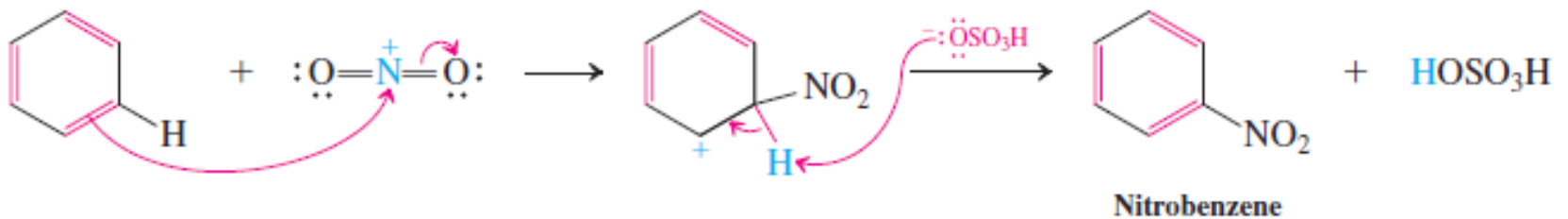
e) Kopulace



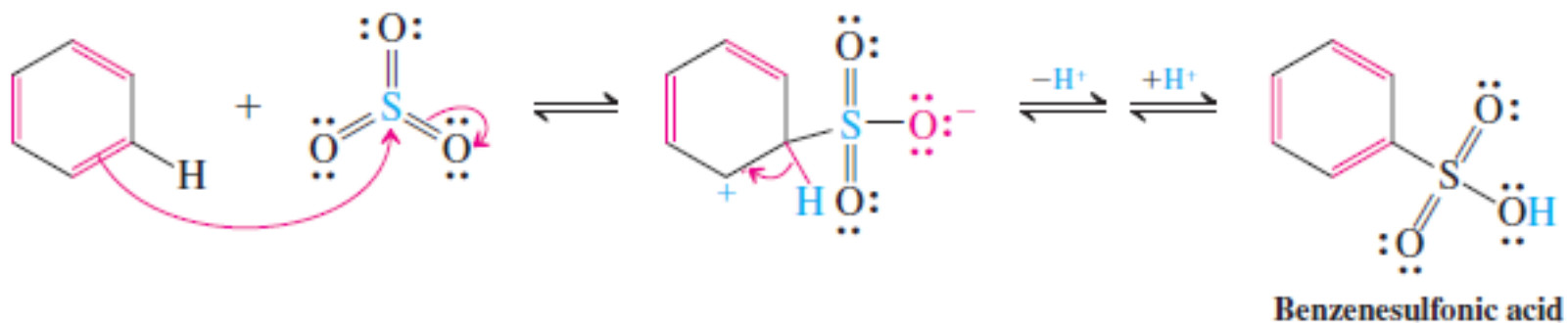
Nitrace



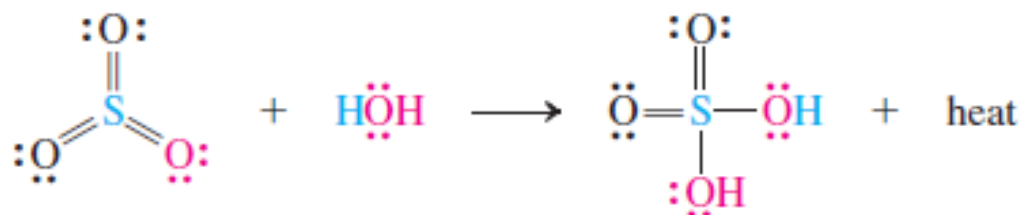
Nitronium ion



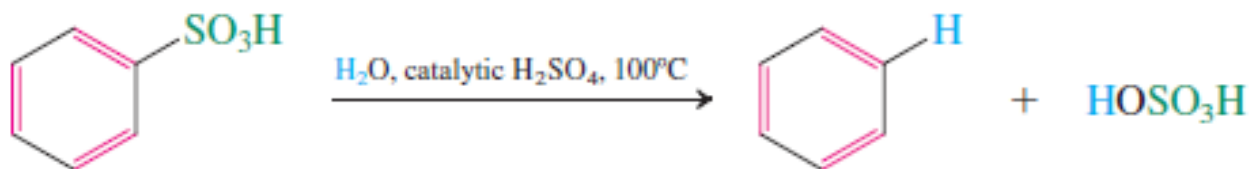
Sulfonace



Hydration of SO₃



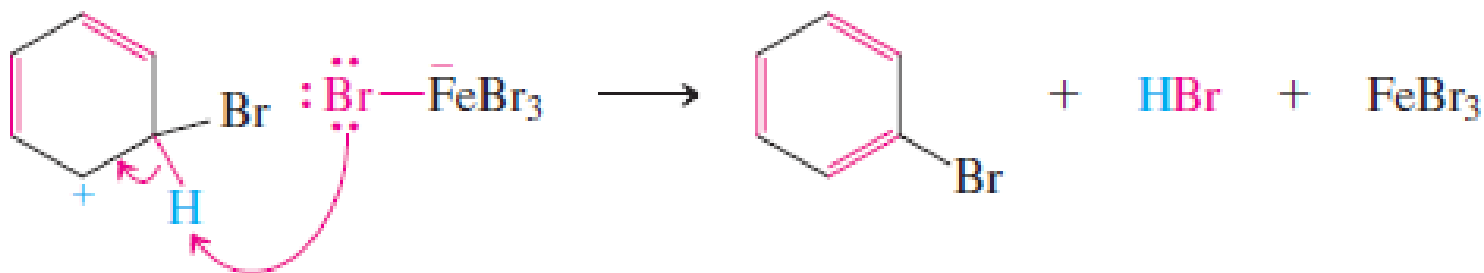
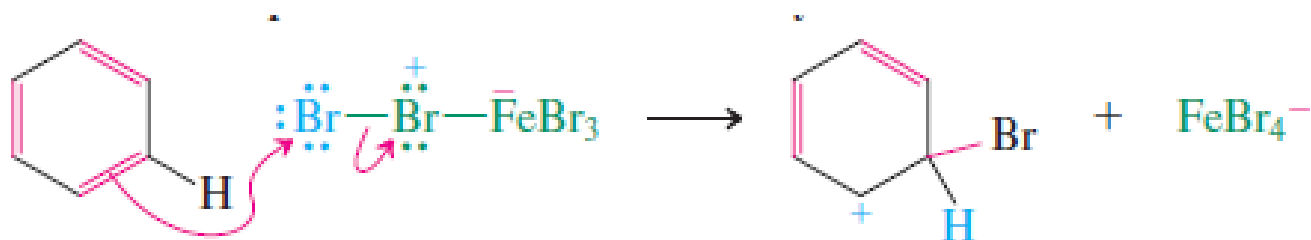
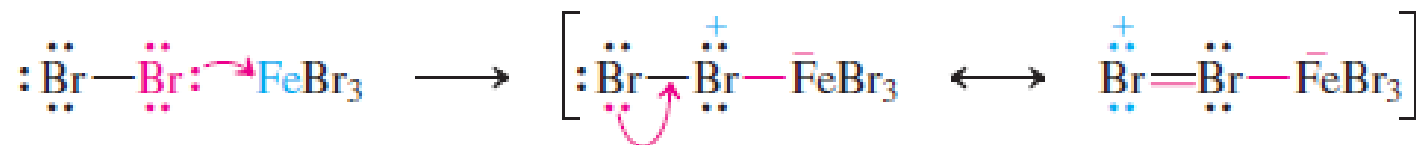
Reverse Sulfonation: Hydrolysis



Aromatic sulfonation is readily reversible. The reaction of sulfur trioxide with water to give sulfuric acid is so exothermic that heating benzenesulfonic acid in dilute aqueous acid completely reverses sulfonation.



Halogenace



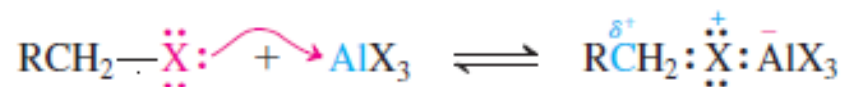
Friedl - Craftsova alkylace a acylace

reaktivita halogenalkanů se zvyšuje se zvyšující se polaritou C-X vazby
typické Lewisovy kyseliny BF_3 , SbCl_5 , FeCl_3 , AlCl_3 , AlBr_3

RI RBr RCl RF



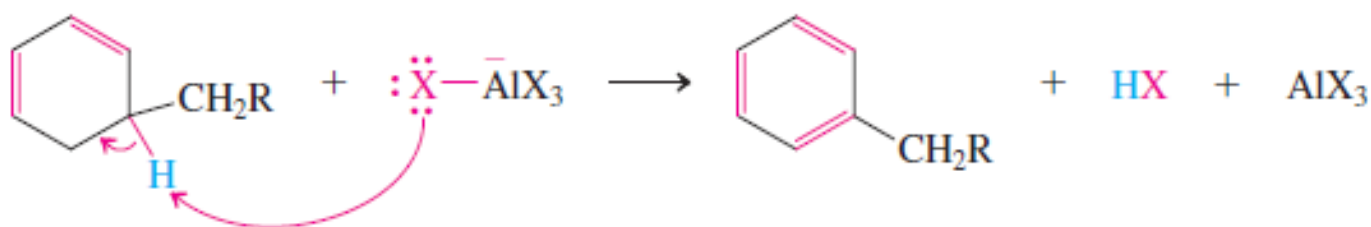
Step 1. Haloalkane activation



Step 2. Electrophilic attack

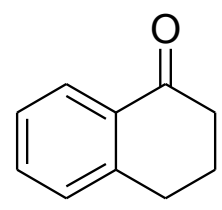
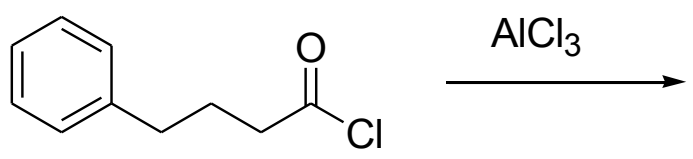
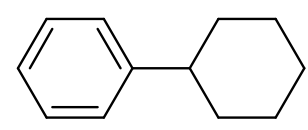
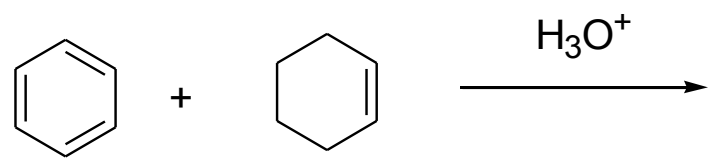
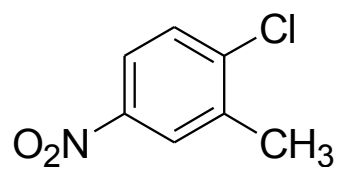


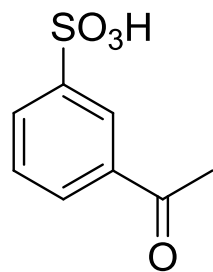
Step 3. Proton loss



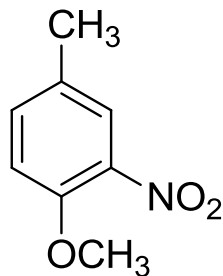
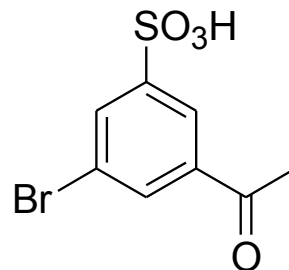
With secondary and tertiary halides, free carbocations are usually formed as intermediates; these species attack the benzene ring in the same way as the cation NO_2^+ .



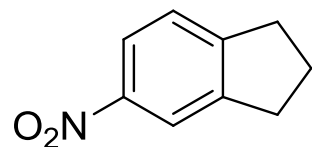
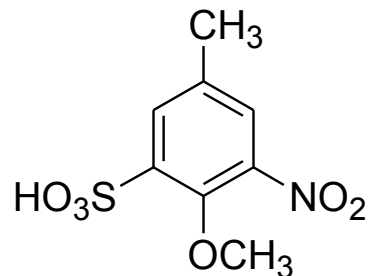




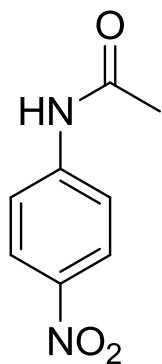
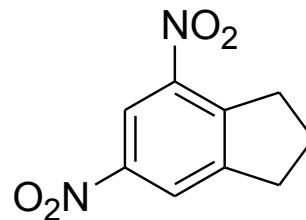
$\text{Br}_2, \text{FeBr}_3$



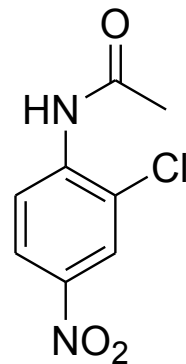
$\text{SO}_3, \text{H}_2\text{SO}_4$

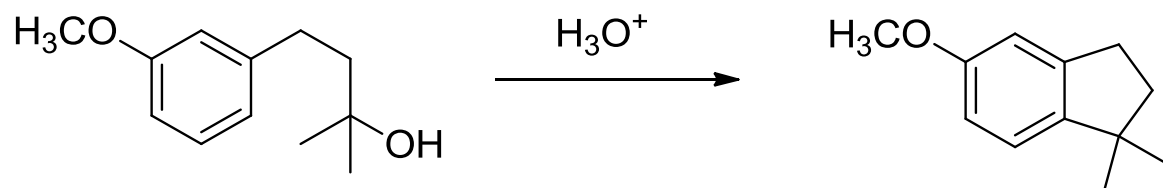
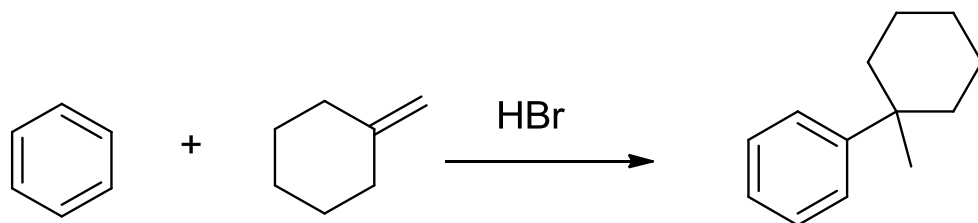
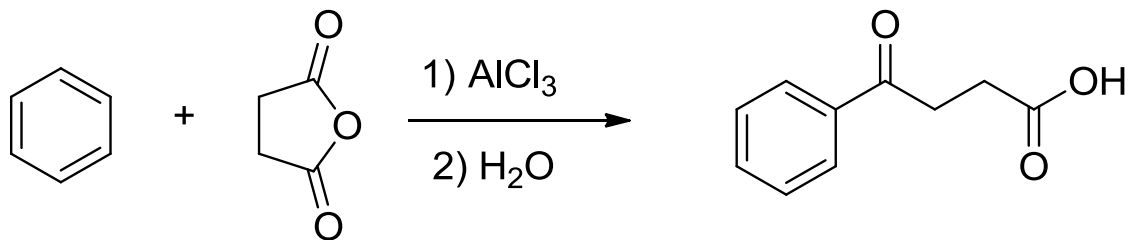
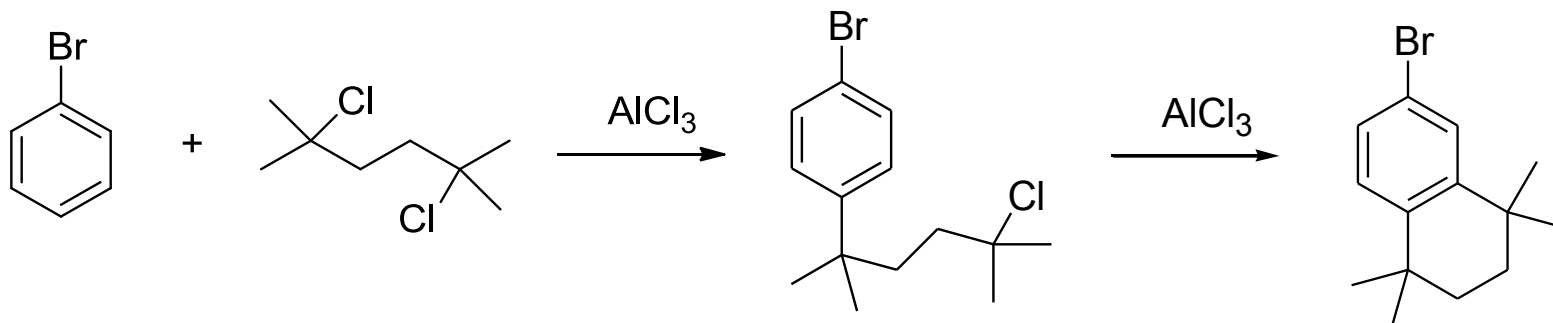


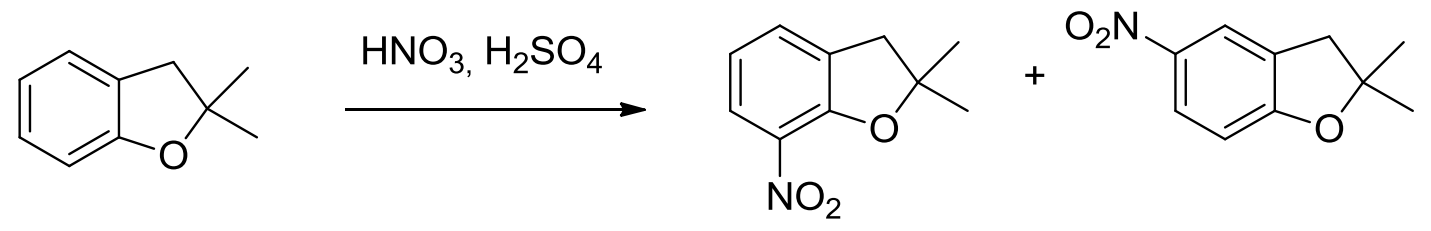
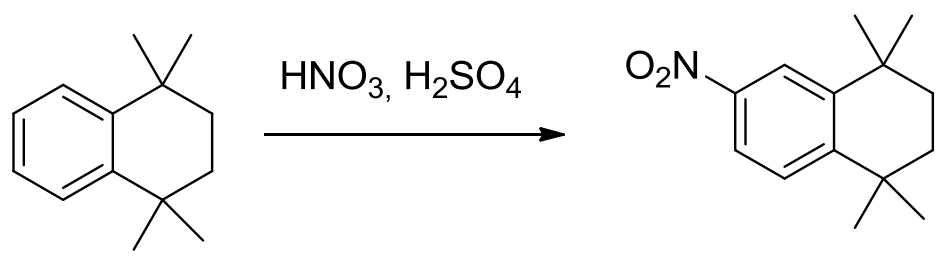
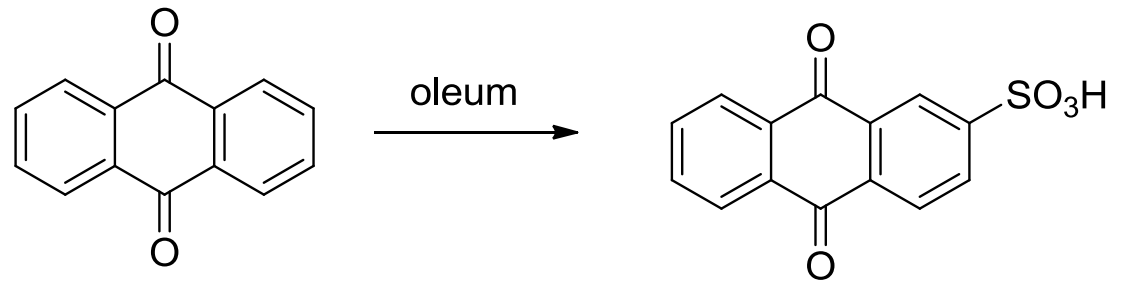
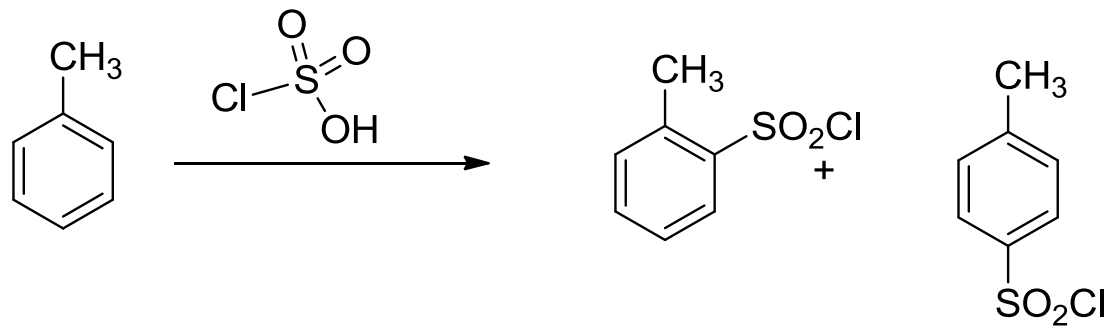
$\text{HNO}_3, \text{H}_2\text{SO}_4$



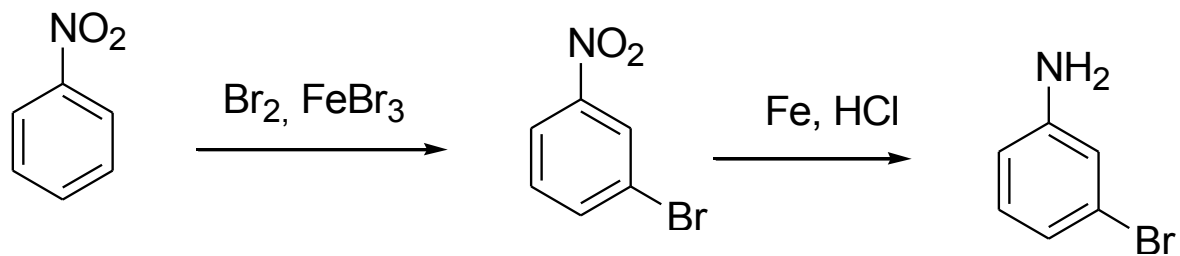
$\text{Cl}_2, \text{AlCl}_3$



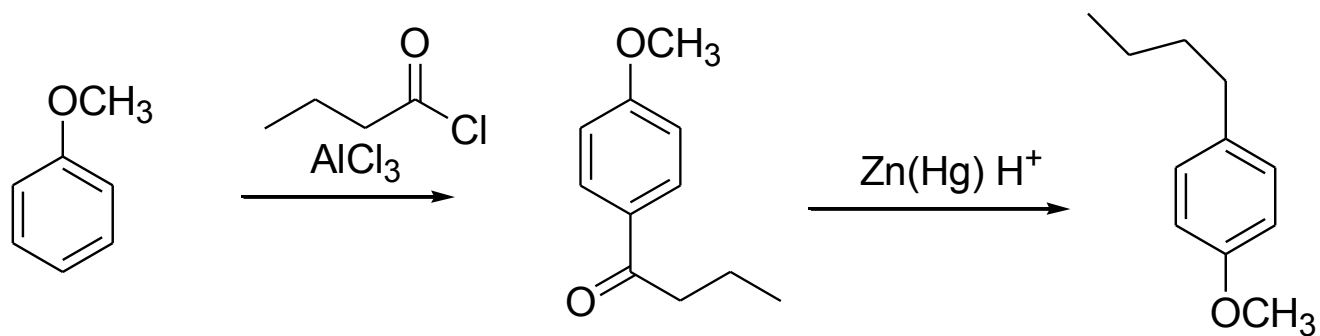




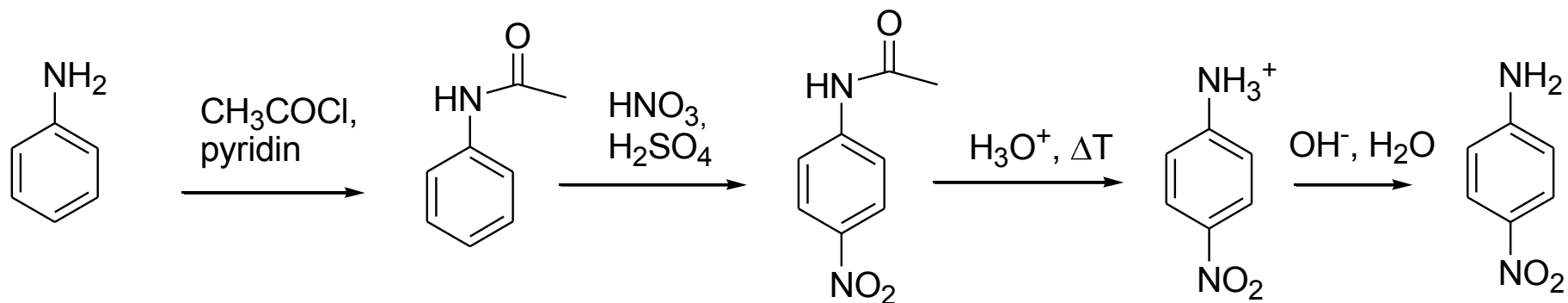
Navrhněte syntézu uvedené sloučeniny

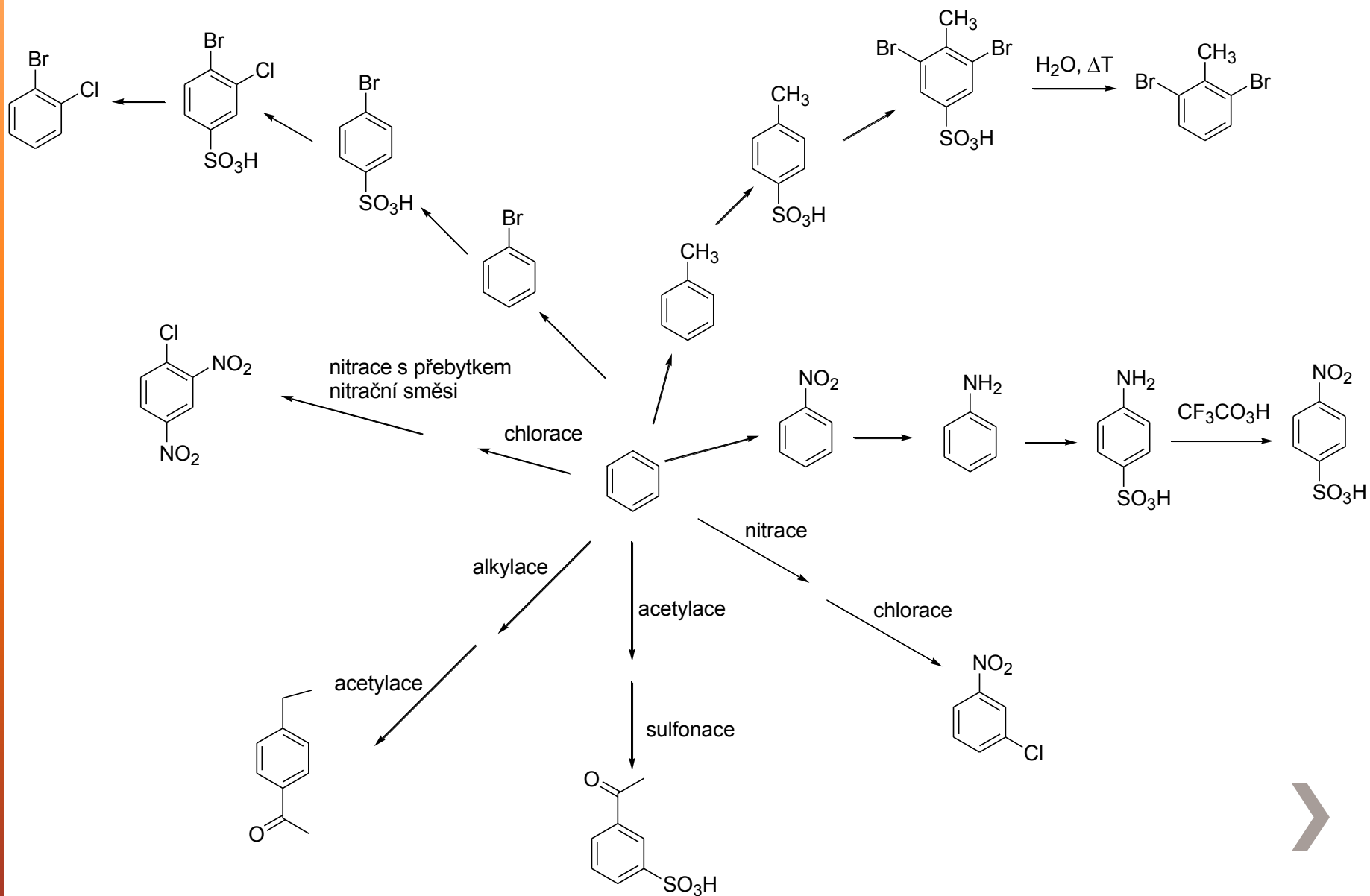


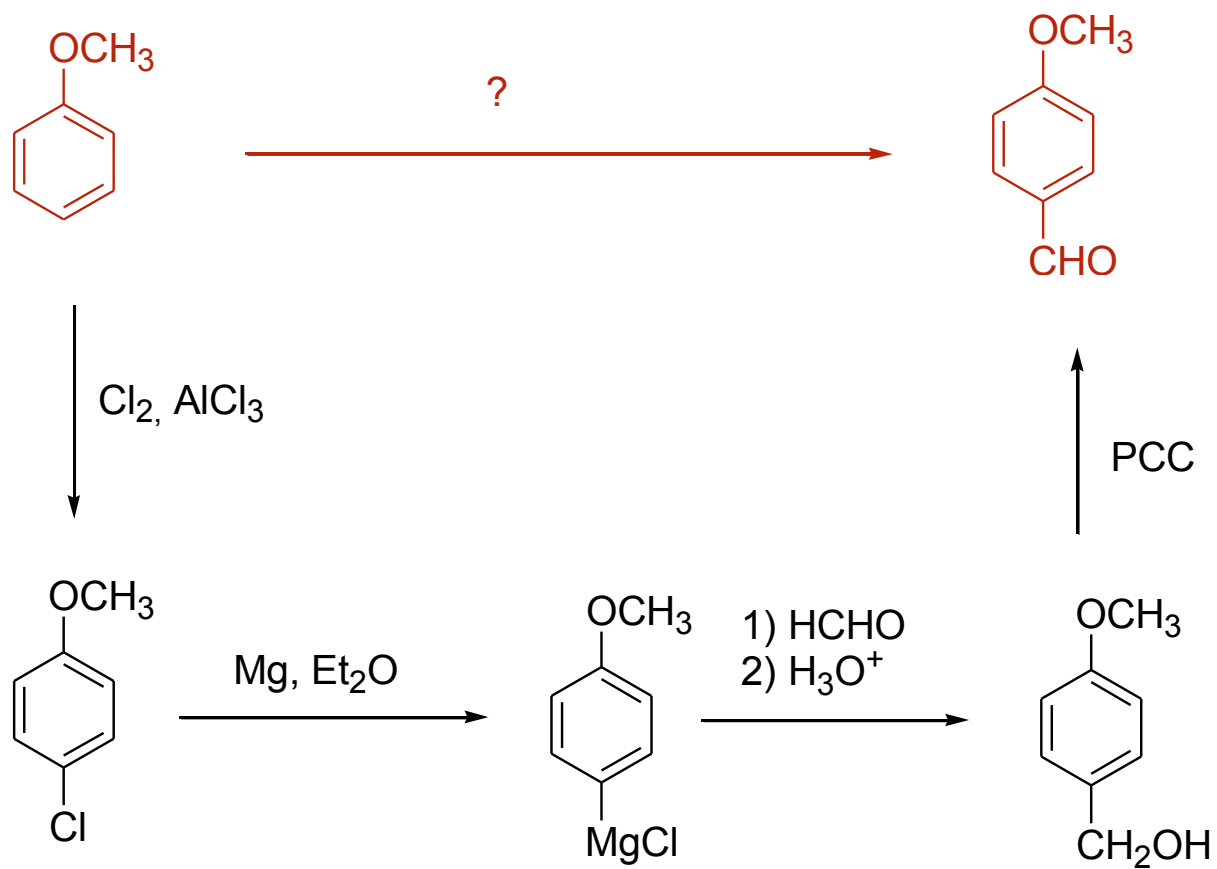
Navrhněte syntézu uvedené sloučeniny

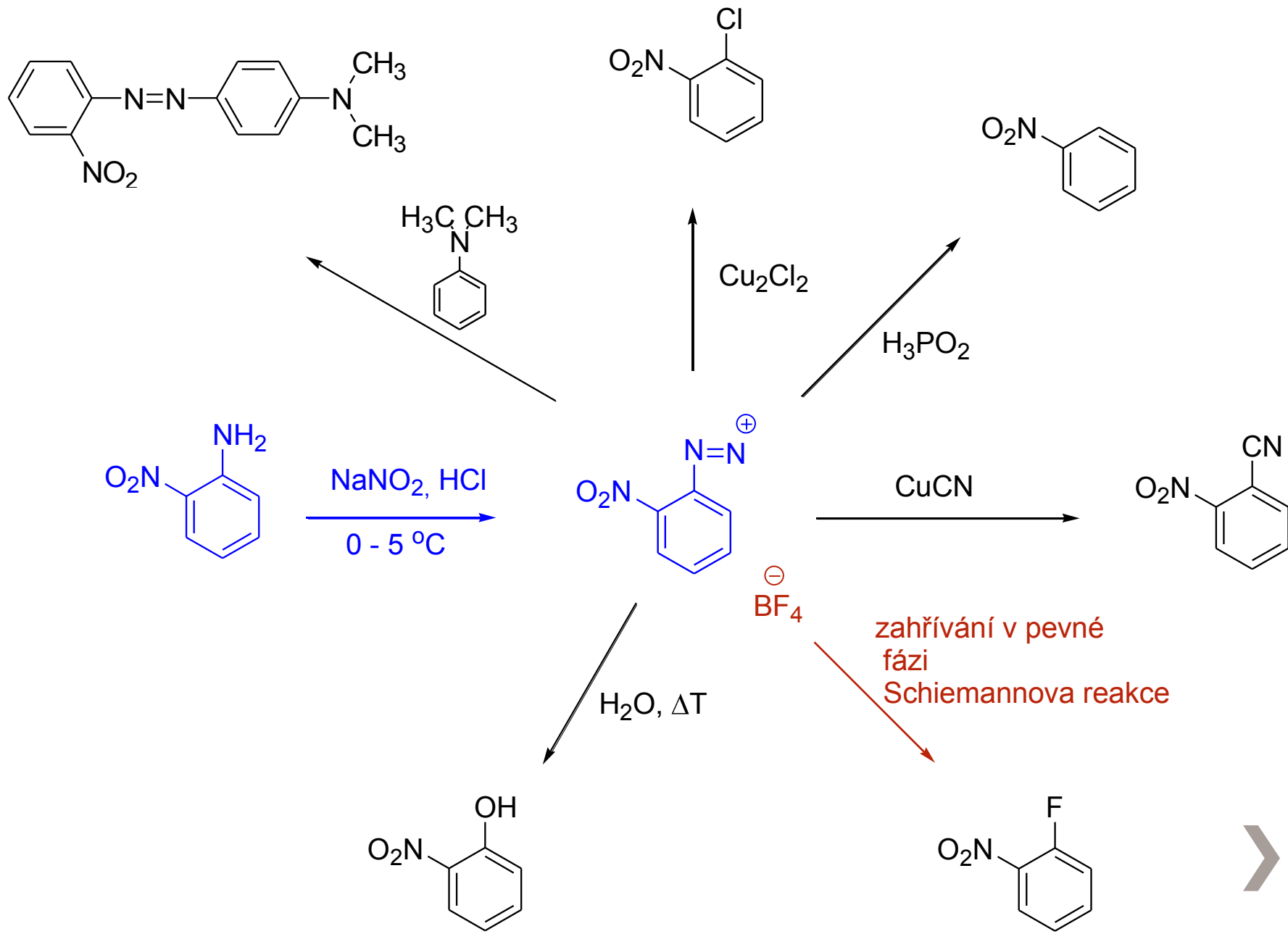


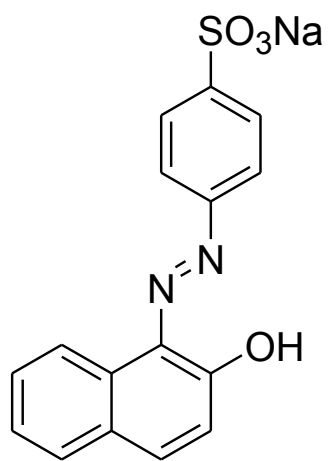
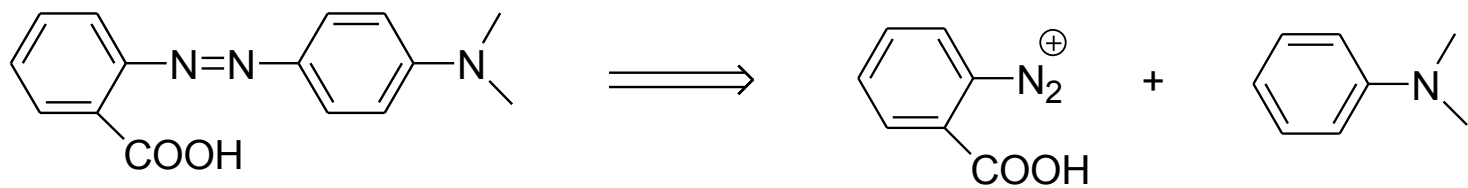
Navrhněte syntézu uvedené sloučeniny



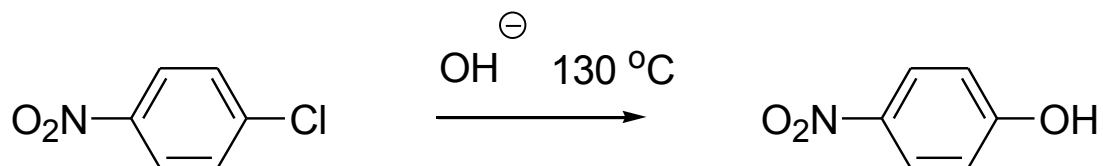
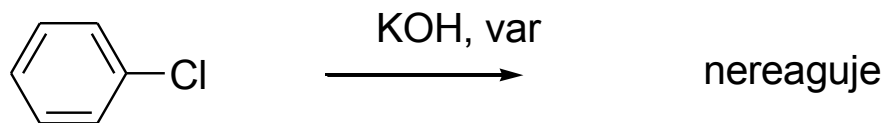


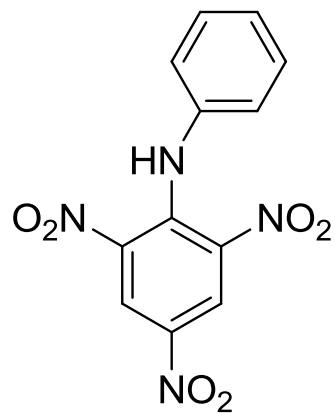
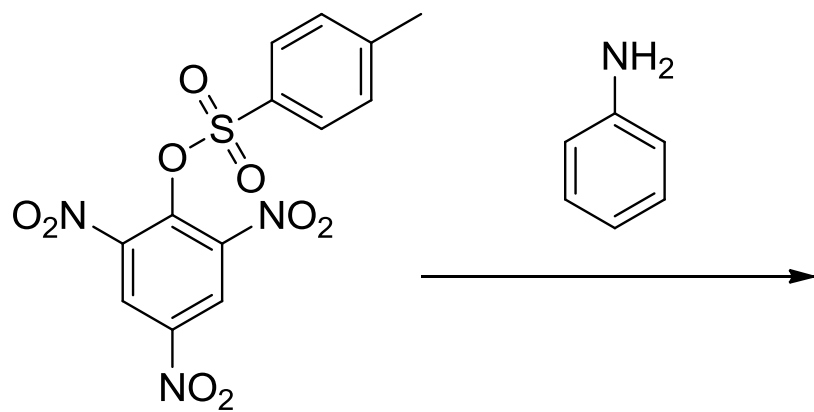
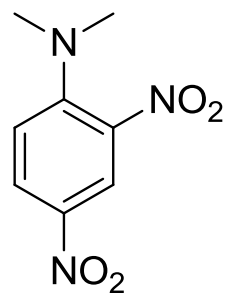
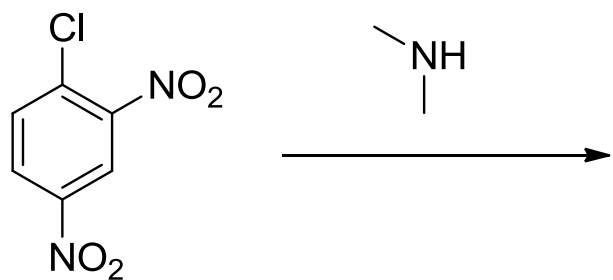


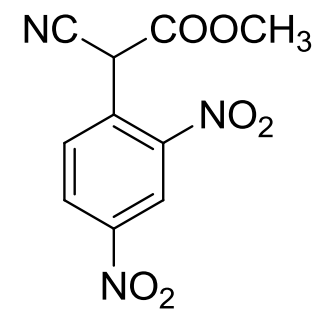
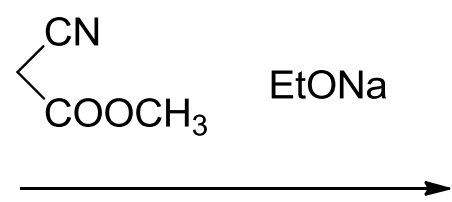
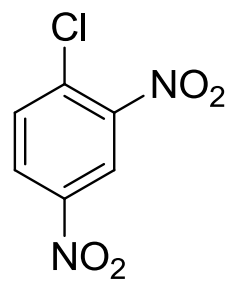
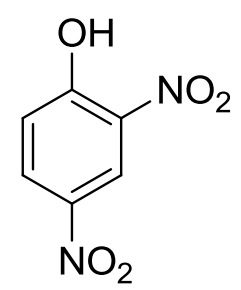
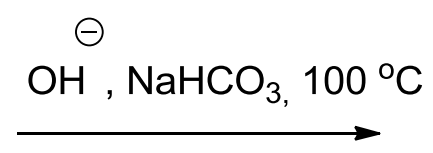
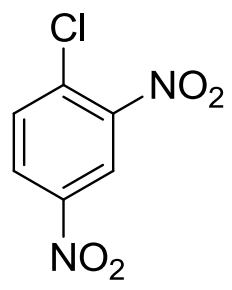




Nukleofilní aromatická substituce mechanismus Ad - E







Nukleofilní aromatická substituce mechanismus E - Ad

