



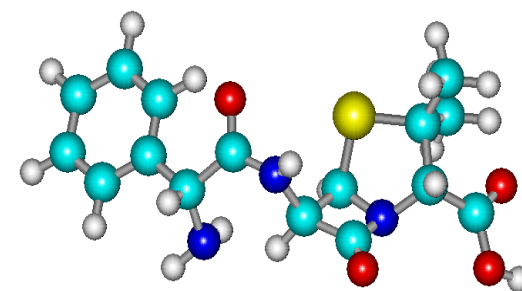
Financováno  
Evropskou unií  
NextGenerationEU



Národní  
plán  
obnovy

MŠMT  
MINISTERSTVO ŠKOLSTVÍ,  
MLÁDEŽE A TĚLOVÝCHOVY

# *Chemie organických látek*



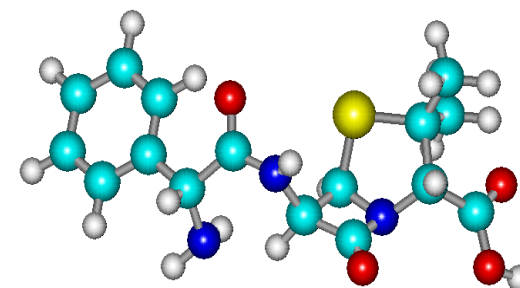
*doc. Ing. Pavel Bobál, CSc.*

MUNI  
PHARM

Ústav  
chemických  
léčiv

# Chemie organických látek

## 9. Sloučeniny dusíku



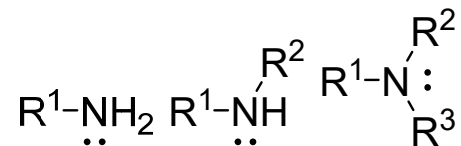
*doc. Ing. Pavel Bobál, CSc.*

**MUNI**  
**PHARM**

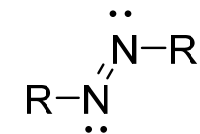
Ústav  
chemických  
léčiv

# Úvod

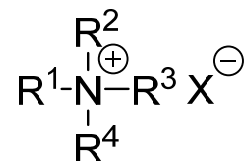
Aminy



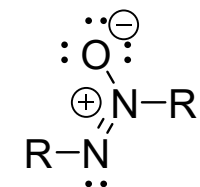
Azosloučeniny



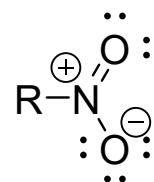
Amoniové soli



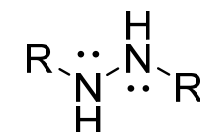
Azoxysloučeniny



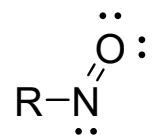
Nitrosloučeniny



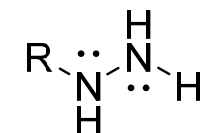
Hydrazosloučeniny



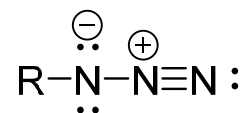
Nitrososloučeniny



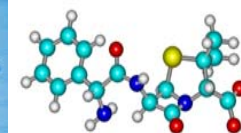
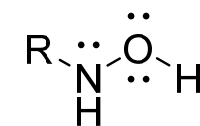
Hydraziny



Azidy



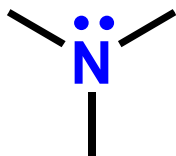
Hydroxylaminy



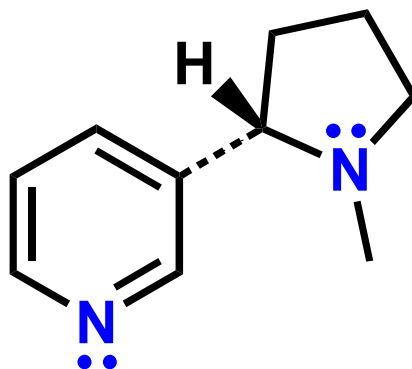


# Aminy: Úvod

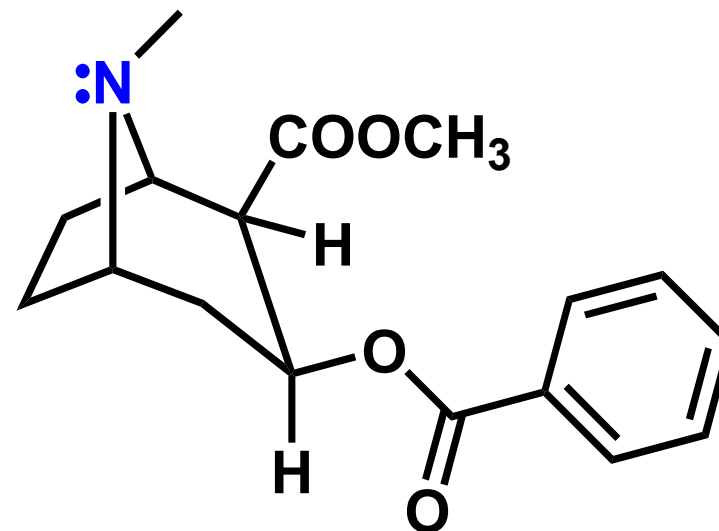
Výskyt v přírodě



trimethylamin



nikotin

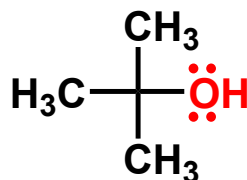


kokain

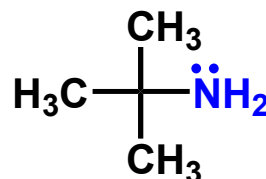


# Názvosloví aminů

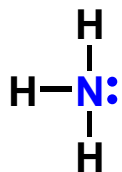
- primární, sekundární a terciární aminy



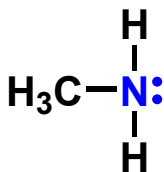
*tert*-butylalkohol  
(terciární alkohol)



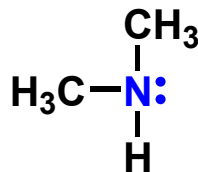
*tert*-butylamin  
(primární amin)



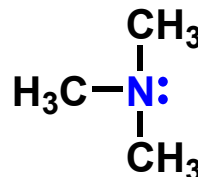
amoniak



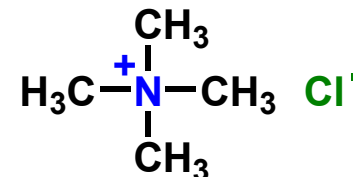
methylamin  
(primární amin)



dimethylamin  
(sekundární amin)



trimethylamin  
(terciární amin)



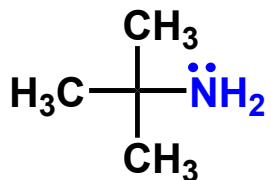
tetramethylamonium chlorid  
(kvarterní amoniová sůl)

- sufix – *amin*

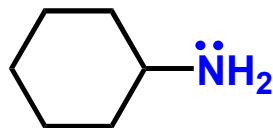
- prefix – *amino-*



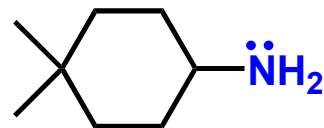
# Názvosloví aminů



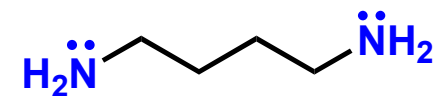
**tert-butylamin**  
(primární amin)



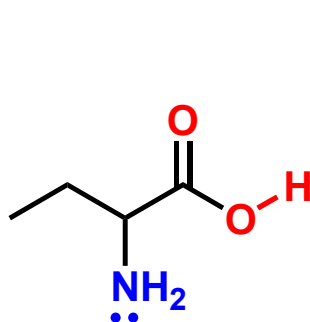
**cyklohexylamin**  
(primární amin)



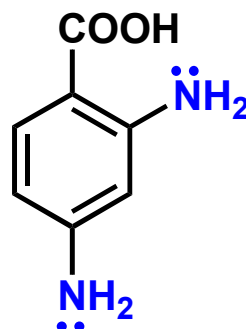
**4,4-dimethylcyklohexylamin**  
(primární amin)



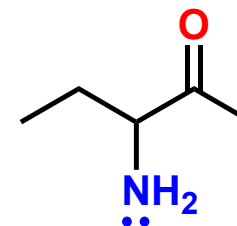
**butan-1,4-diamin**



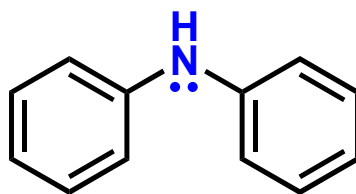
**2-aminobutanova kyselina**



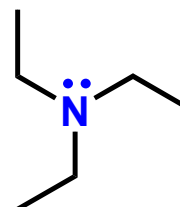
**2,4-diaminobenzoova kyselina**



**3-aminopentan-2-on**



**difenylamin**  
(sekundární amin)



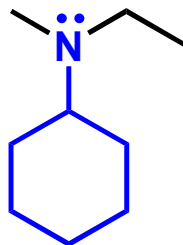
**triethylamin**



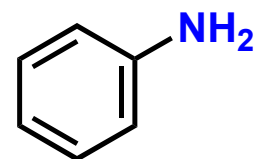
# Názvosloví aminů



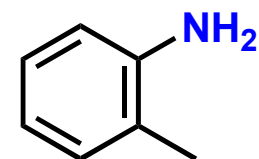
***N,N*-dimethylpropylamin**  
(terciární amin)



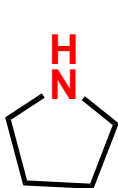
***N*-ethyl-*N*-methylcyklohexylamin**  
(terciární amin)



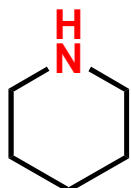
anilin



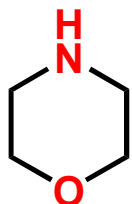
*o*-toluidin



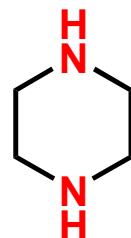
pyrrolidin



piperidin

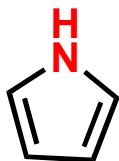


morfolin

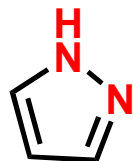


piperazin

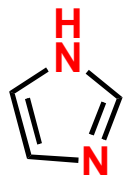
## Heterocyklické aminy



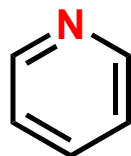
pyrrol



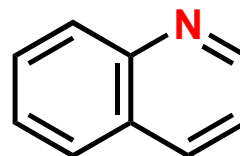
pyrazol



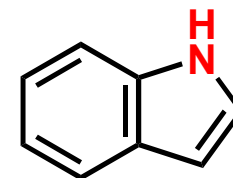
imidazol



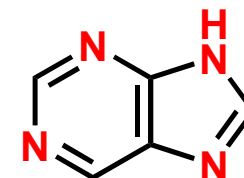
pyridin



chinolin



indol

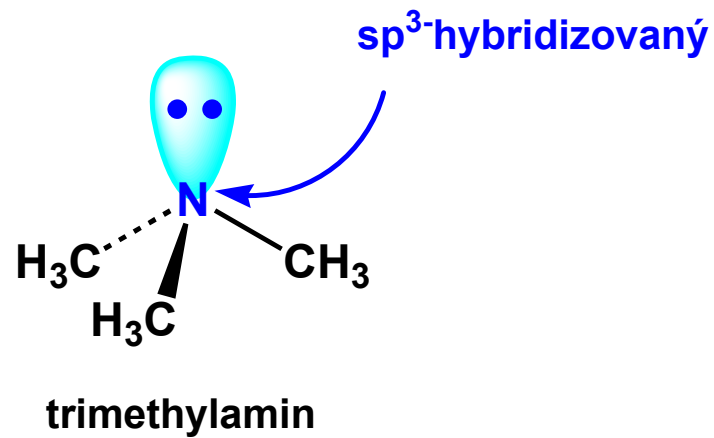


purin

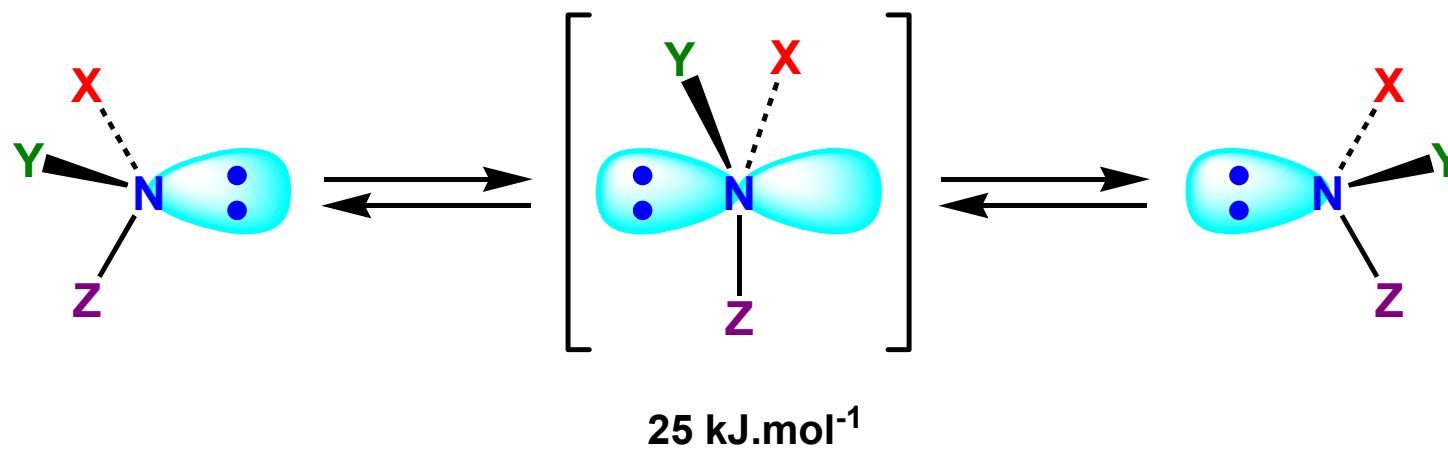




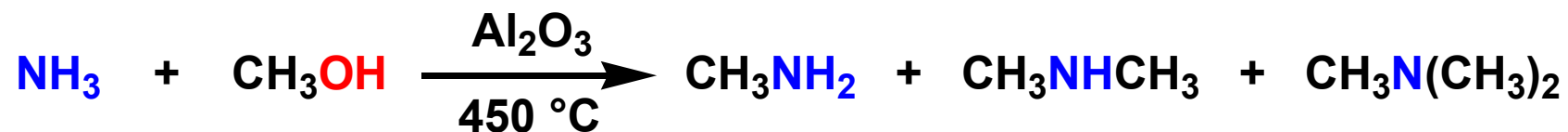
# Struktura aminů



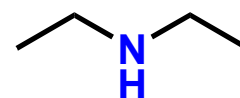
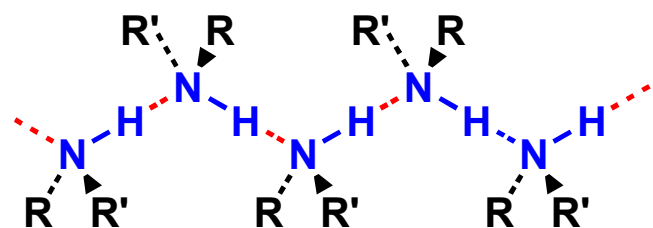
Rychlá inverze pyramidy



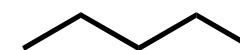
# Vlastnosti a zdroje aminů



- intermolekulární vodíkové vazby



diethylamin,  $M_r = 73,1$   
t.v.  $56,3\text{ }^\circ\text{C}$

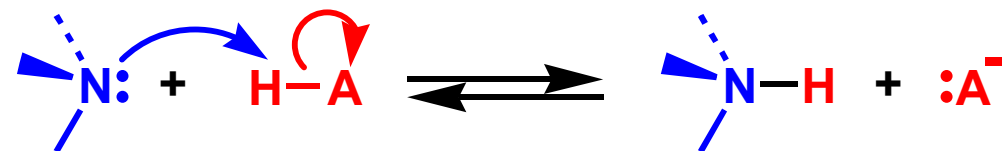


pentan,  $M_r = 72,1$   
t.v.  $36,1\text{ }^\circ\text{C}$

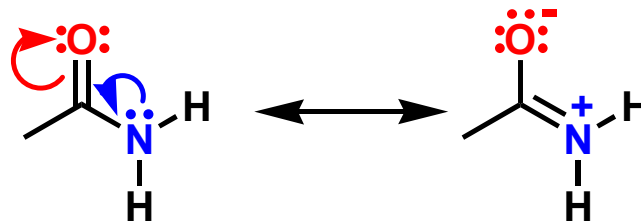


# Bazicita aminů

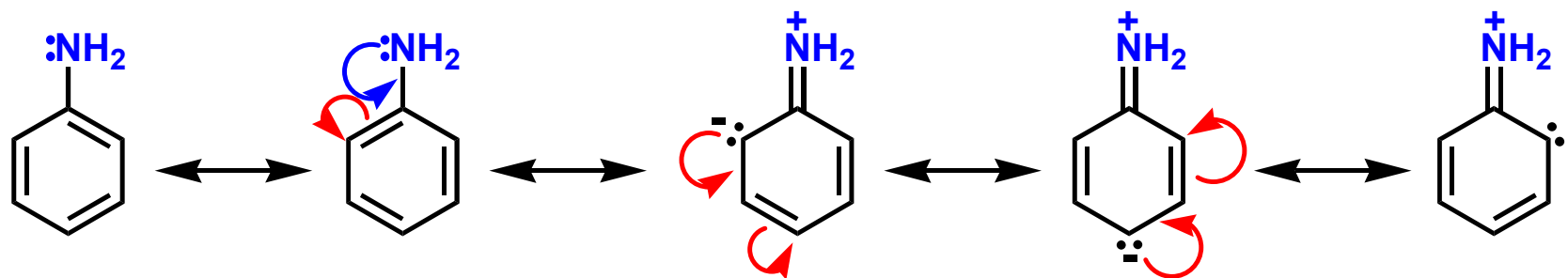
Bazické vlastnosti



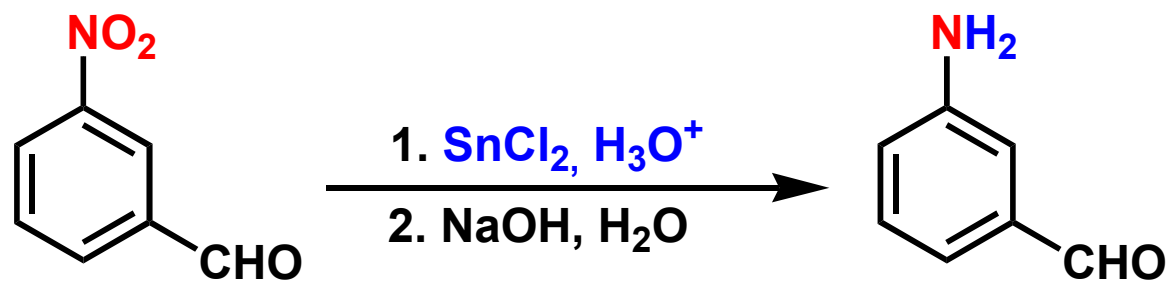
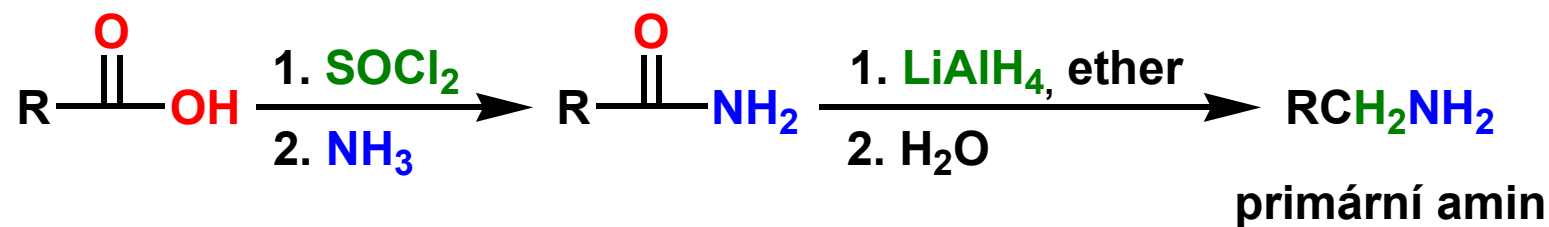
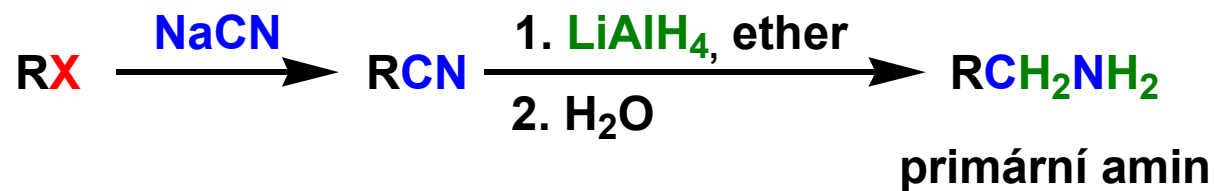
Aminy x amidy



Aromatické aminy



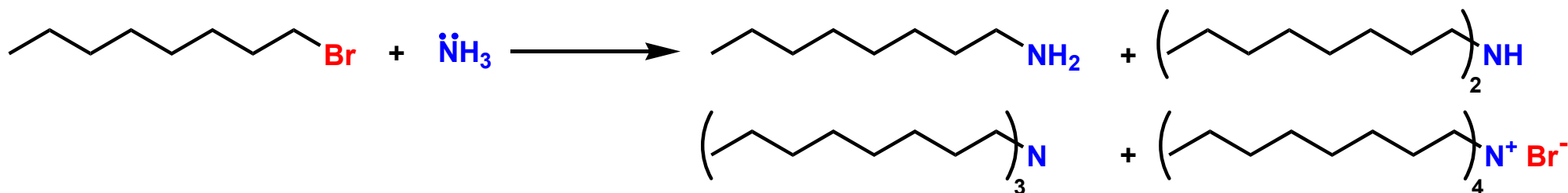
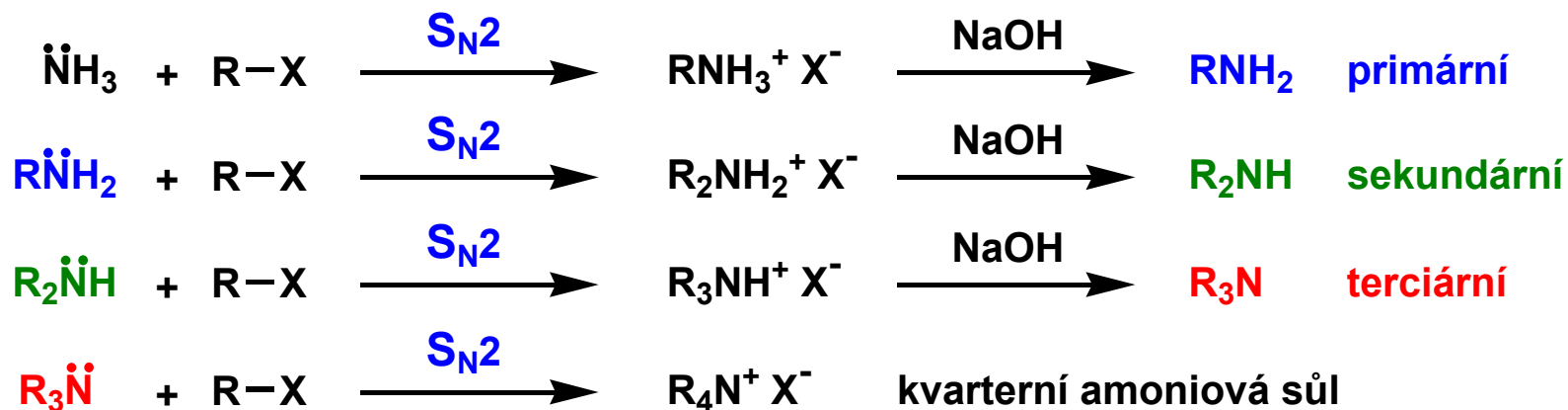
# Syntéza aminů



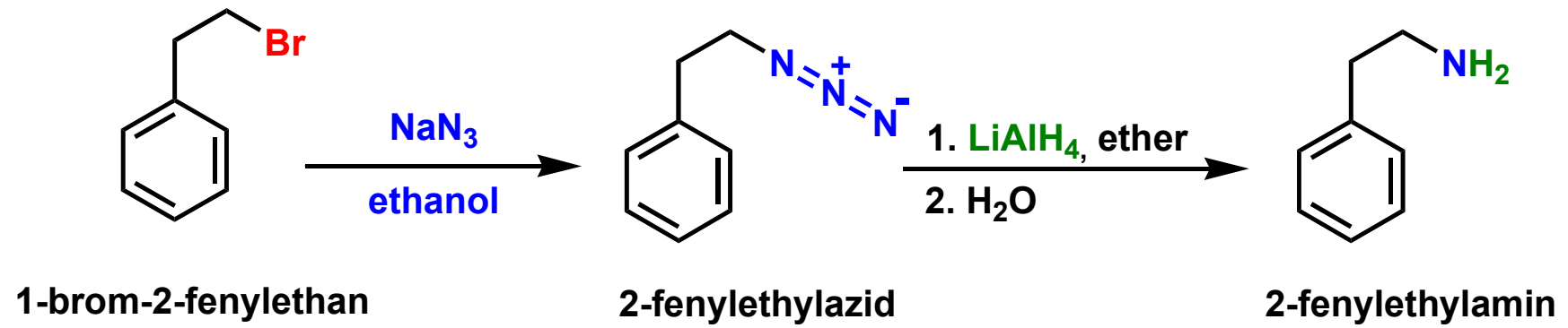
$\text{H}_2, \text{Pd/C}$  (Pt, Raney Ni)



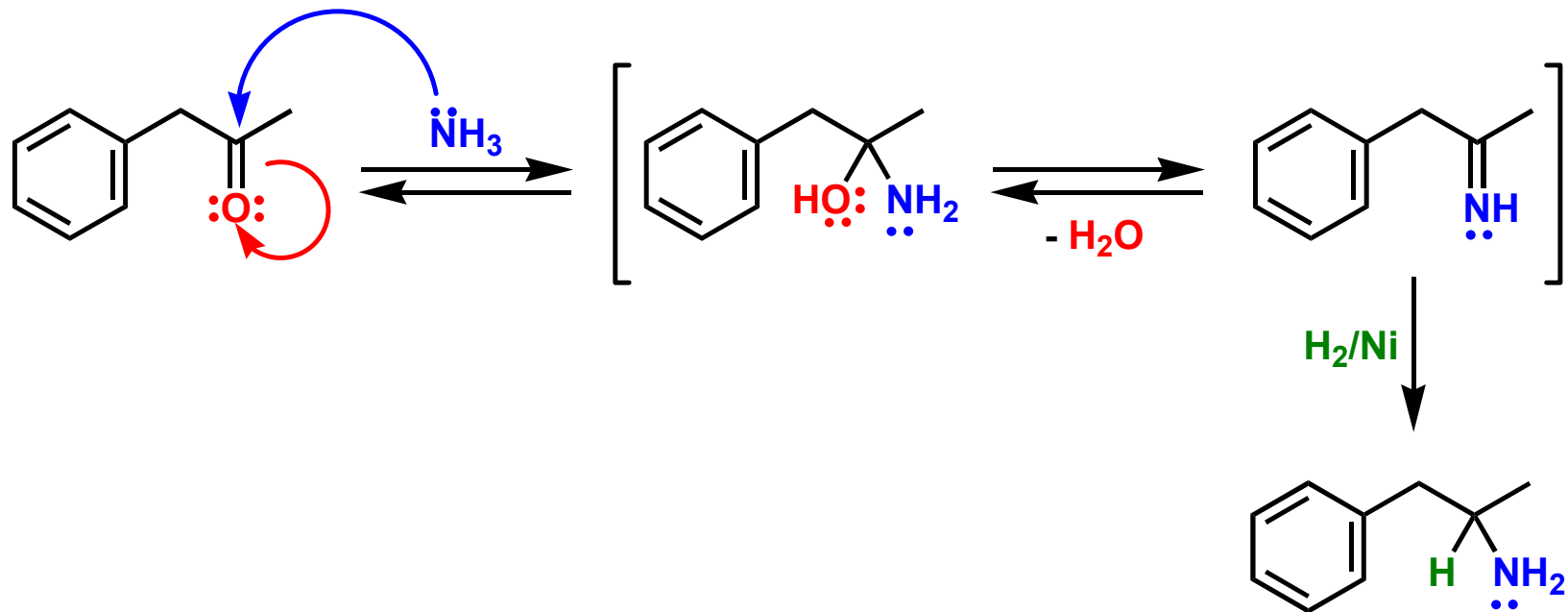
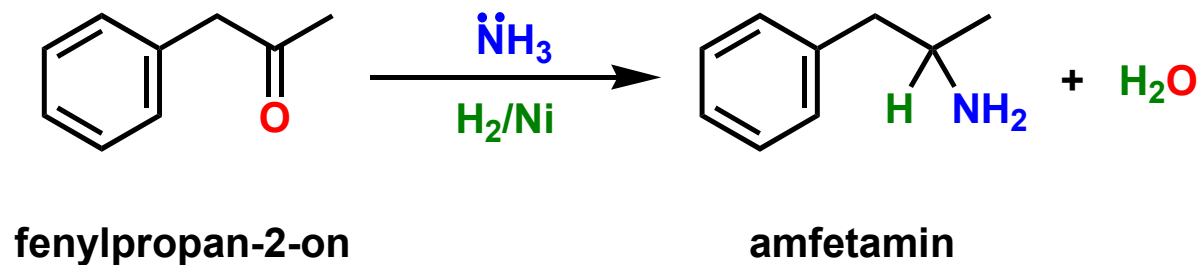
# Syntéza aminů



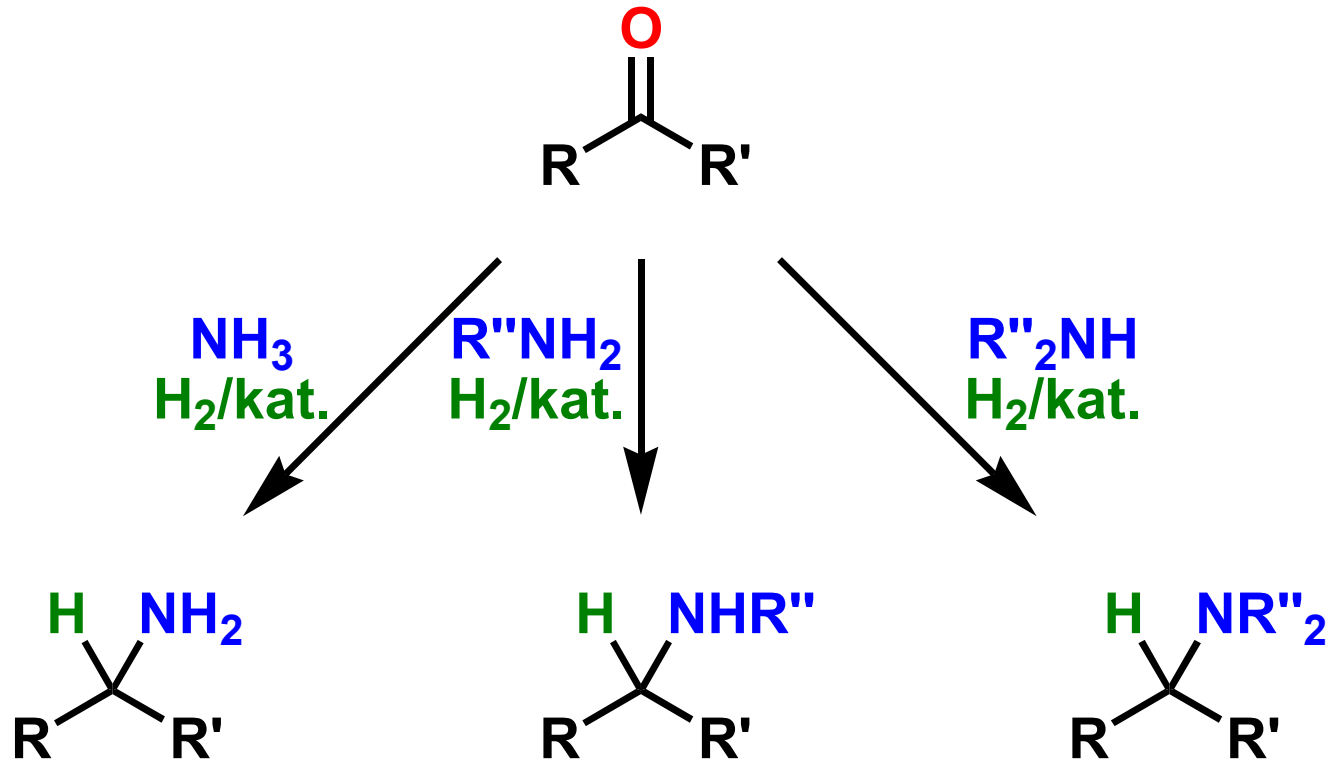
# Syntéza aminů z azidů



# Syntéza aminů: Reduktivní aminace aldehydů a ketonů



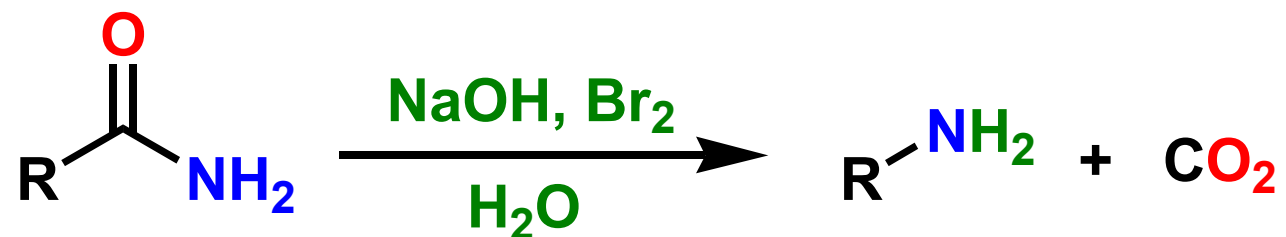
# Syntéza aminů: Reduktivní aminace aldehydů a ketonů



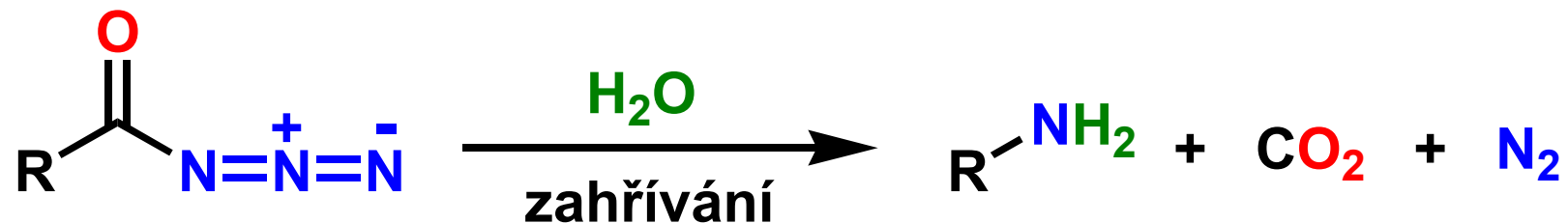


# Syntéza aminů: Hofmannovo a Curtiovo odbourávání

Hofmannovo odbourávání



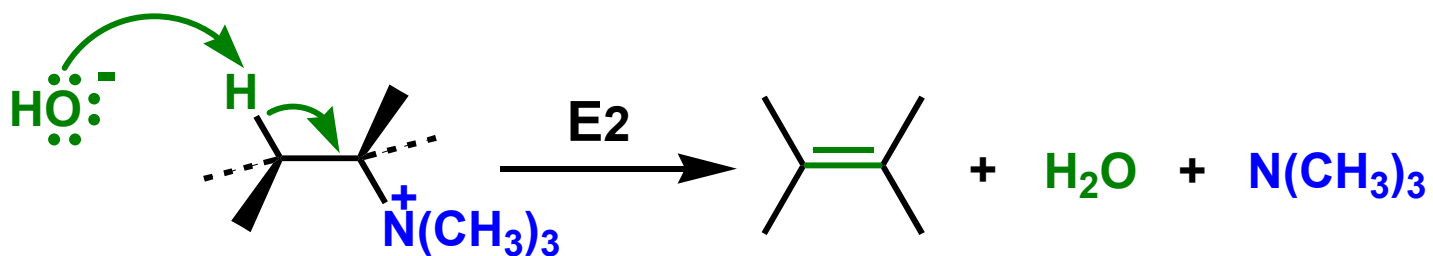
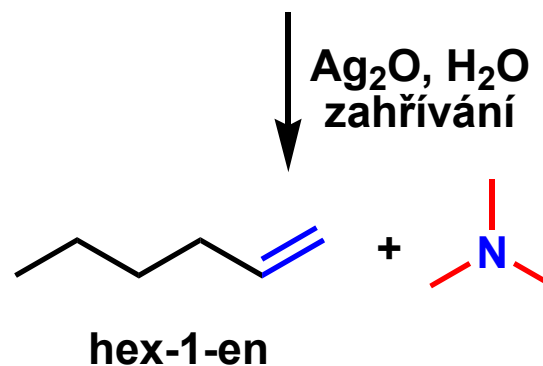
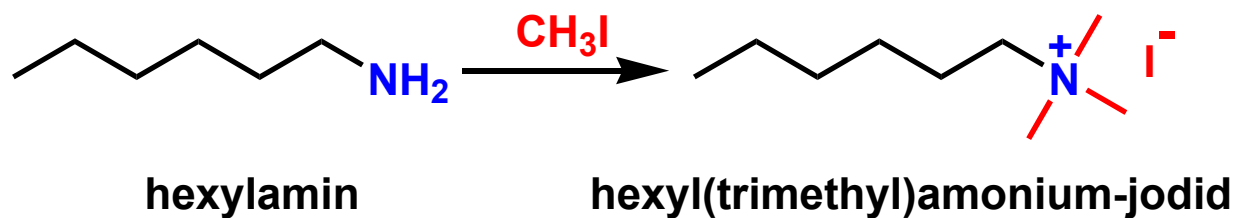
Curtiovo odbourávání



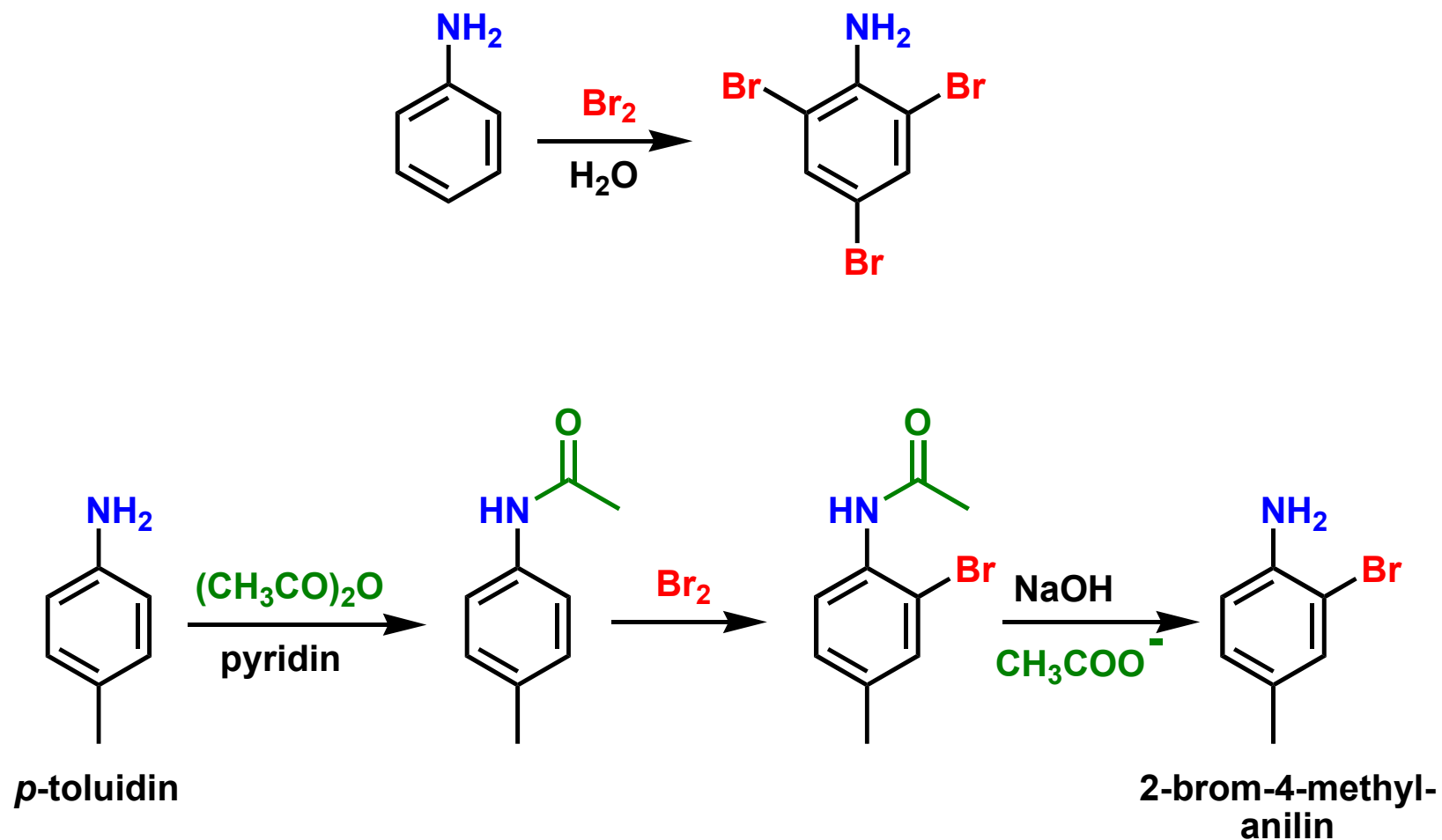


# Reakce aminů: Amoniové soli - Hofmannova eliminace

- kvarterní amoniová sůl

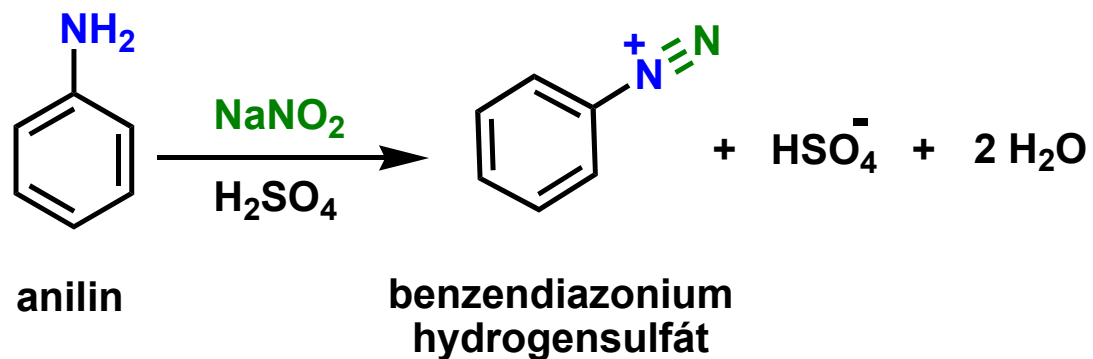


# Reakce arylaminů: Elektrofílní aromatická substituce

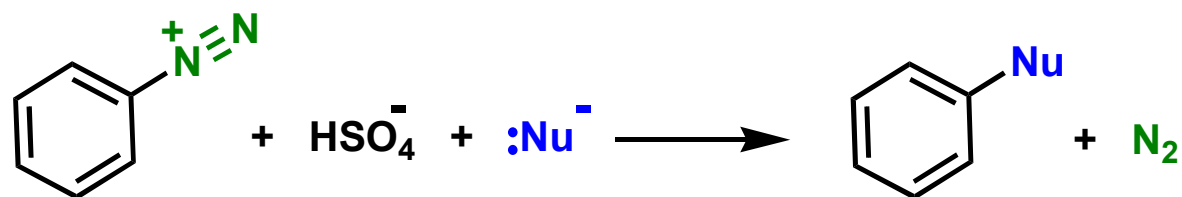


# Reakce arylaminů: Diazoniové soli – Sandmeyerova reakce

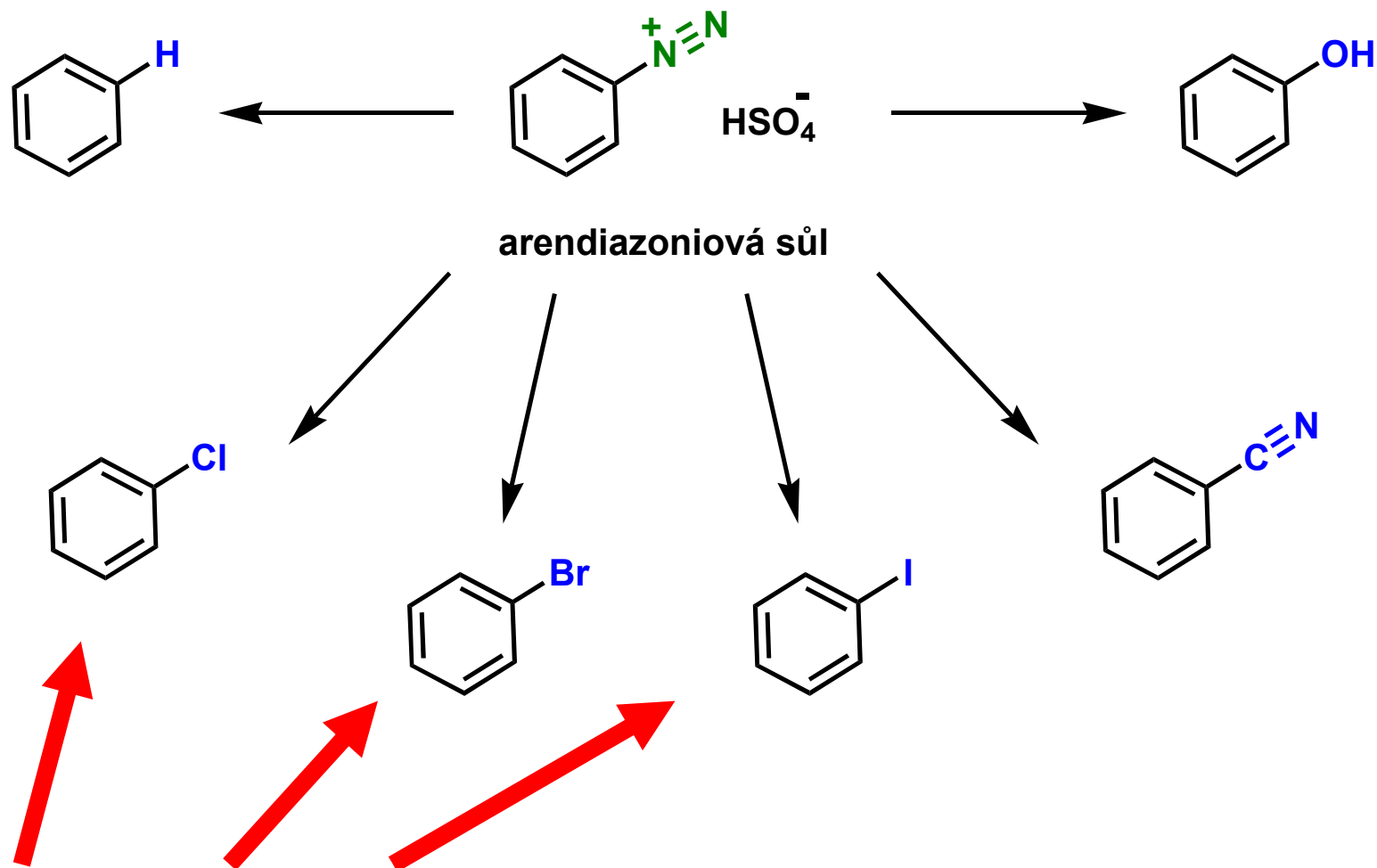
Primární aromatické amíny – s kyselinou dusitou – arendiazoniové soli - **diazotace**



- nukleofilní substituce



# Reakce arylaminů: Diazoniové soli – Sandmeyerova reakce



Sandmeyerova reakce – katalyzovány mědnými halogenidy



# Reakce arylaminů: Kopulační reakce diazoniových solí

