Disciplina
Química Medicinal

Prof. Dr. Andrei Leitão

Isomeria & isomeria constitucional

1. Isômeros são diferentes compostos com a mesma fórmula.

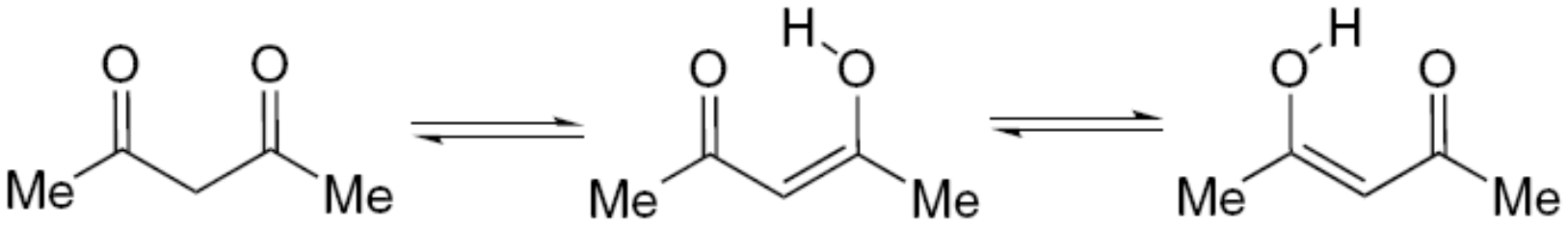
2. Isômeros constitucionais se diferem pela ordem de conexão dos átomos.

Fórmula Molecular	Número de isômeros consitucionais possíveis
C_4H_{10}	2
C_5H_{12}	3
C_6H_{14}	5
C_7H_{16}	9
C_8H_{18}	18
C_9H_{20}	35

Isomeria constitucional

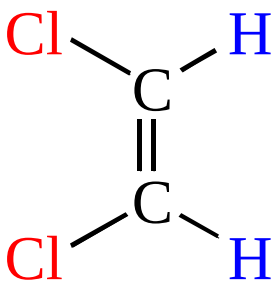
Fórmula Molecular	*Isômeros Constitucionais*		
C_4H_{10}	$CH_3CH_2CH_2CH_3$ **Butano**	e	$CH_3CH(CH_3)CH_3$ **Isobutano**
C_3H_7Cl	$CH_3CH_2CH_2Cl$ **1-Cloropropano**	e	$CH_3CH(Cl)CH_3$ **2-Cloropropano**
C_2H_6O	CH_3CH_2OH **Etanol**	e	CH_3OCH_3 **Éter dimetílico**

Isomeria constitucional

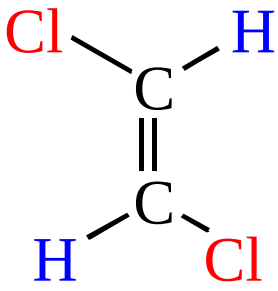


Esteroisômeros

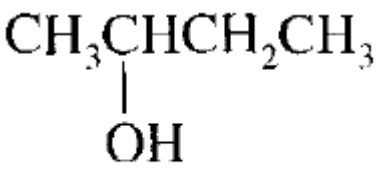
Estereoisômeros se diferem apenas pelo arranjo dos átomos no espaço. Não são isômeros constitucionais.



cis-1,2-Dichloroethene ($C_2H_2Cl_2$)
Z-1,2-Dichloroethene ($C_2H_2Cl_2$)



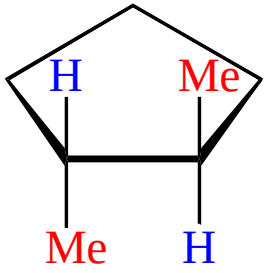
trans-1,2-Dichloroethene ($C_2H_2Cl_2$)
E-1,2-Dichloroethene ($C_2H_2Cl_2$)



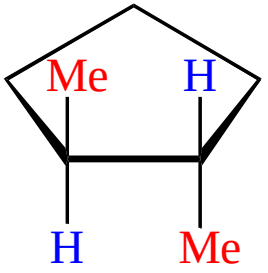
2-Butanol

Esteroisômeros (2)

Enantiômeros são imagens especulares não superponíveis.

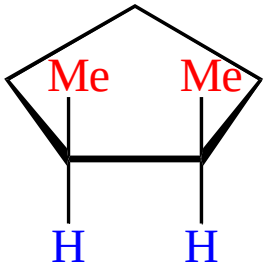


trans-1,2-Dimethylcyclopentane (C_7H_{14})

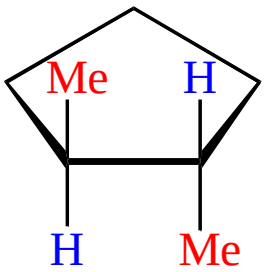


trans-1,2-Dimethylcyclopentane (C_7H_{14})

Diastereômeros não são imagens especulares.



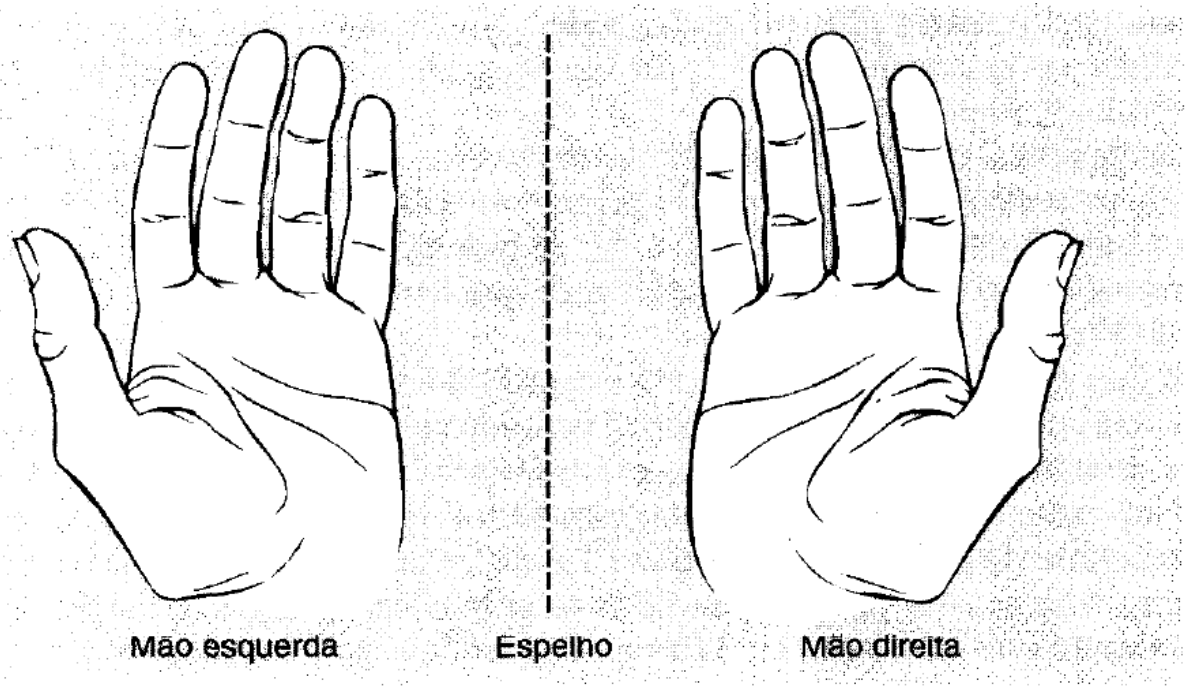
cis-1,2-Dimethylcyclopentane (C_7H_{14})

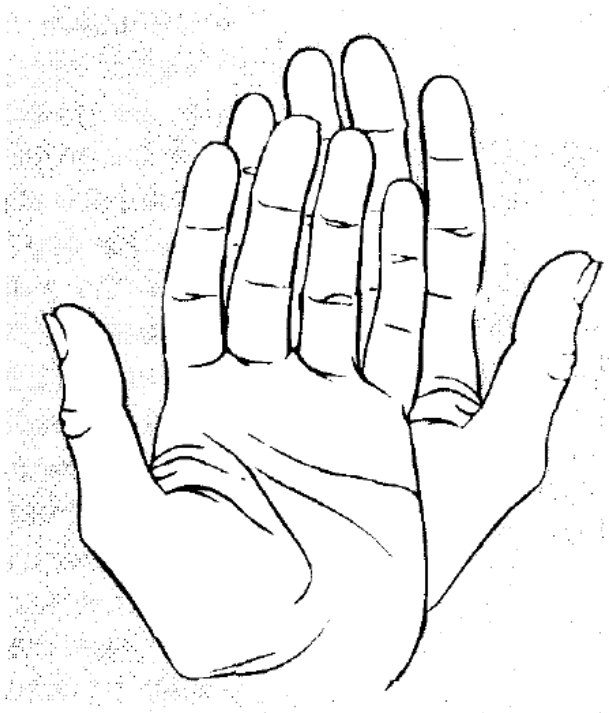


trans-1,2-Dimethylcyclopentane (C_7H_{14})

Esteroisômeros - enantiômeros

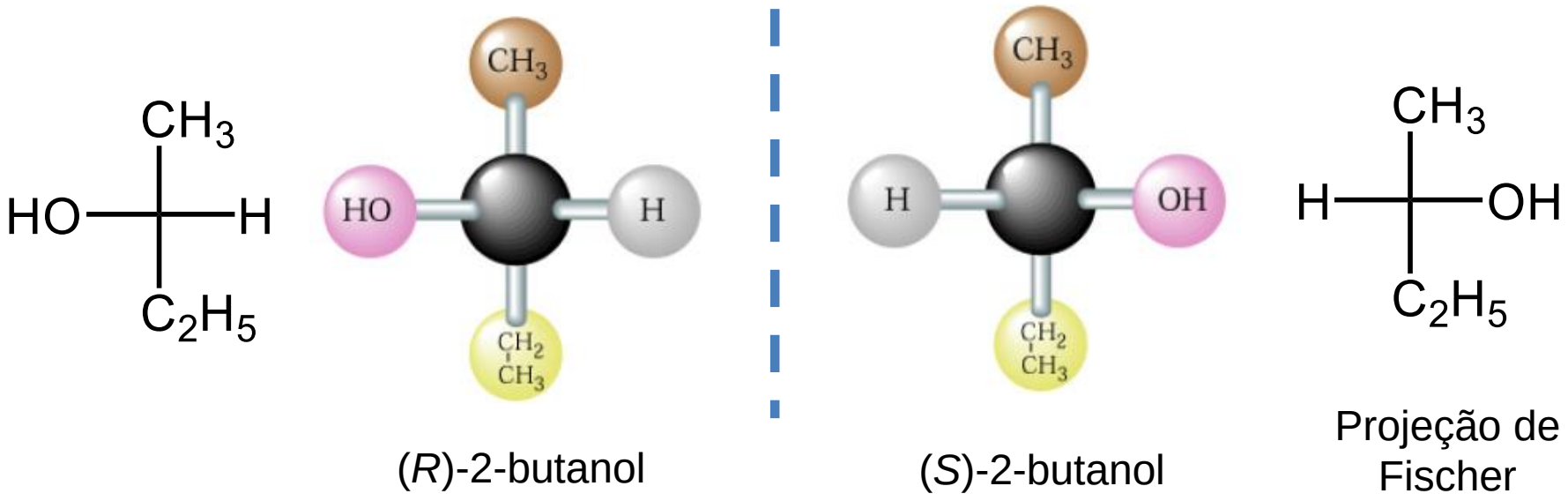
Estereoisômeros se diferem apenas pelo arranjo dos átomos no espaço. Não são isômeros constitucionais.





Estereoisomeria - Enantiômero

✓ Enantiômeros são distinguidos pela luz plano-polarizada e são a imagem especular um do outro (não se superpõem):



(*R*)-2-butanol

(*S*)-2-butanol

Projeção de Fischer

✓ O carbono assimétrico é um centro quiral

Regra de Cahn-Ingold-Prelog

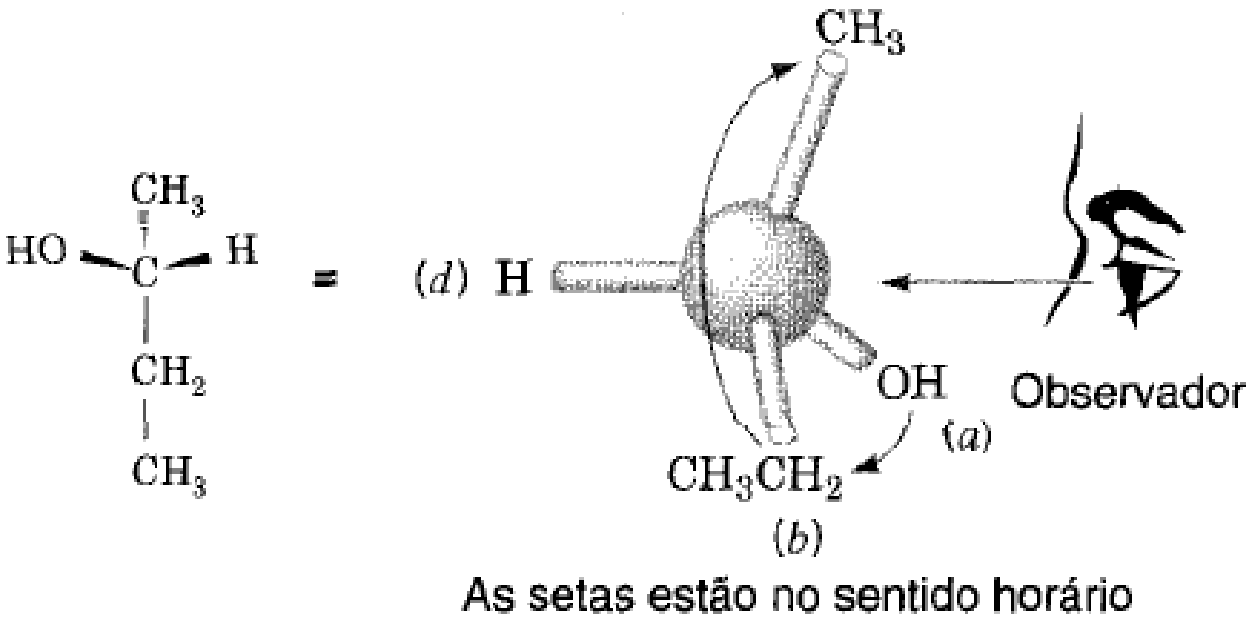
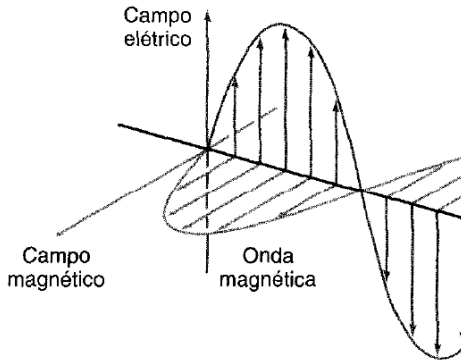
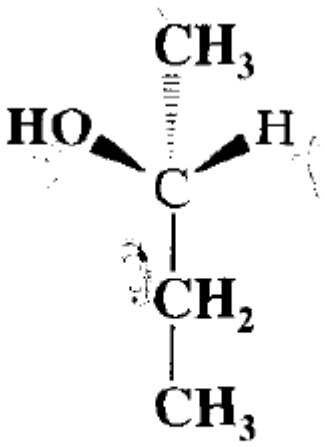


Tabela 5.1 Propriedades Físicas de (*R*)- e (*S*)-2-Butanol

Propriedade Física	(*R*)-2-Butano	(*S*)-2-Butanol
Ponto de ebulição (1 atm)	99,5°C	99,5°C
Densidade (g mL^{-1} a 20°C)	0,808	0,808
Índice de refração (20°C)	1,397	1,397

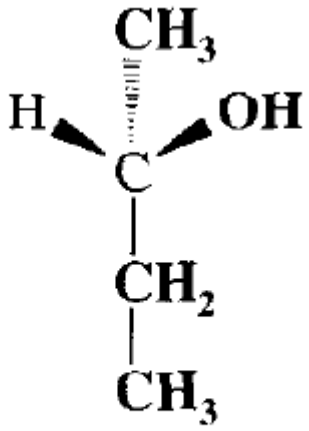
Desvio da luz plano-polarizada





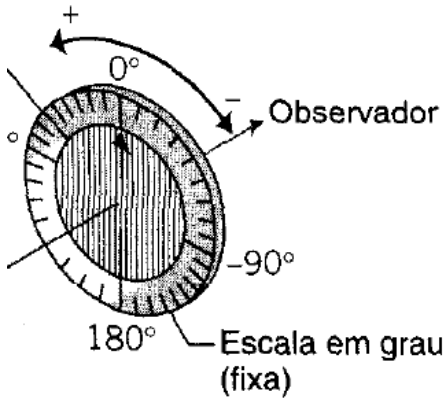
(*R*)-2-Butanol

$[\alpha]_D^{25} = -13{,}52°$



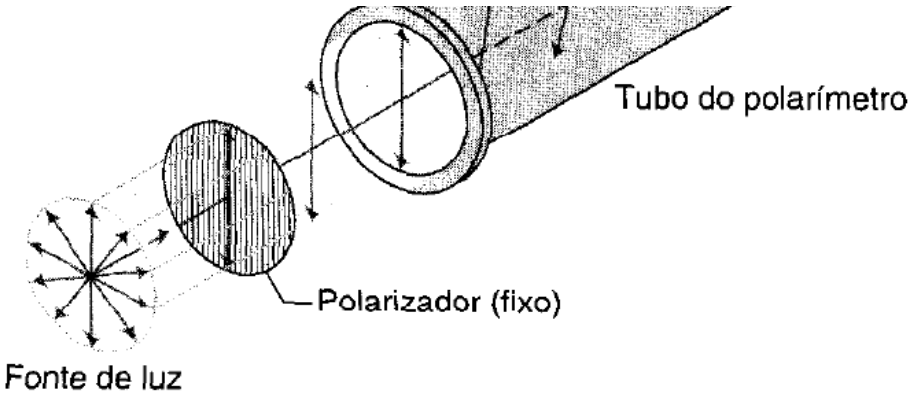
(*S*)-2-Butanol

$[\alpha]_D^{25} = +13{,}52°$



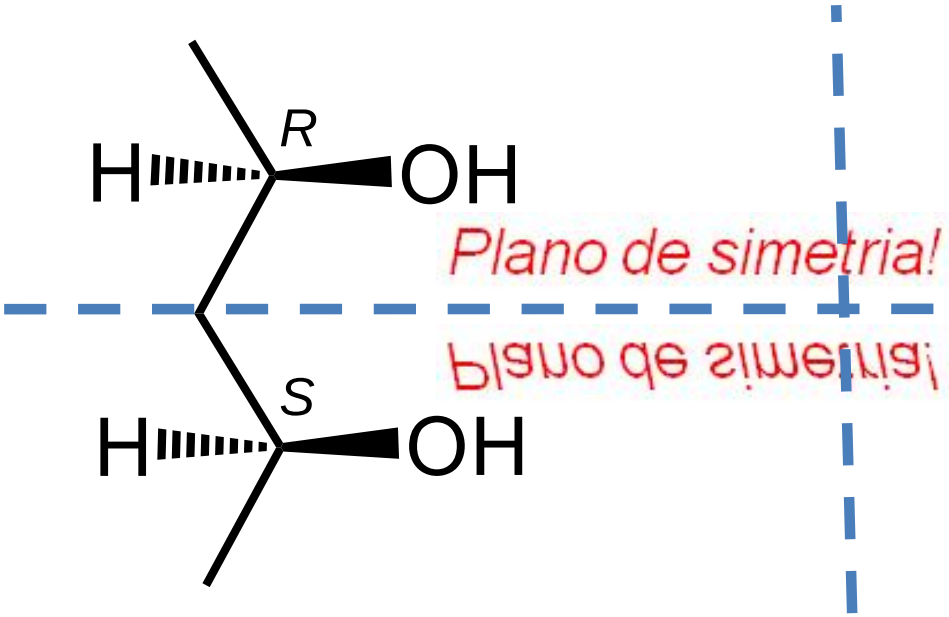
O plano de polarização da luz emergente não é o mesmo da luz polarizada de entrada.

Polarizador

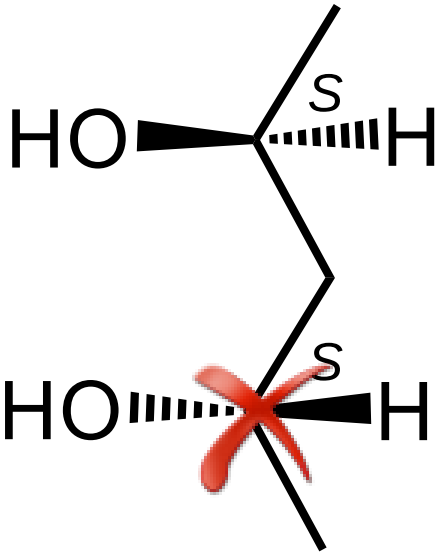


Estereoisomeria - Diastereômero

- ✓ Diastereômeros não são imagem especular um do outro:



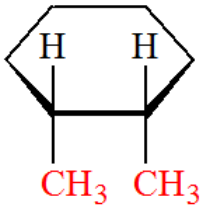
(2R,4S)-pentano-2,4-diol



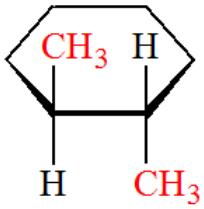
(2S,4S)-pentano-2,4-diol

Isomeria

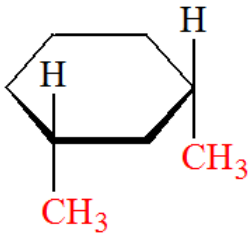
Substituinte	Isômero	PF (°C)	PE (°C)
1,2-Dimethyl-	*Z ou cis*	–50,1	130,04
1,2-Dimethyl-	*E ou trans*	–89,4	123,7
1,3-Dimethyl-	*Z ou cis*	–75,6	120,1
1,3-Dime			3,5



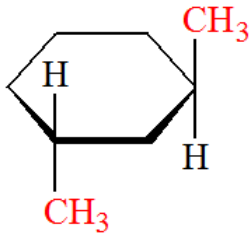
cis-1,2-dimetilcicloexano



trans-1,2-dimetilcicloexano

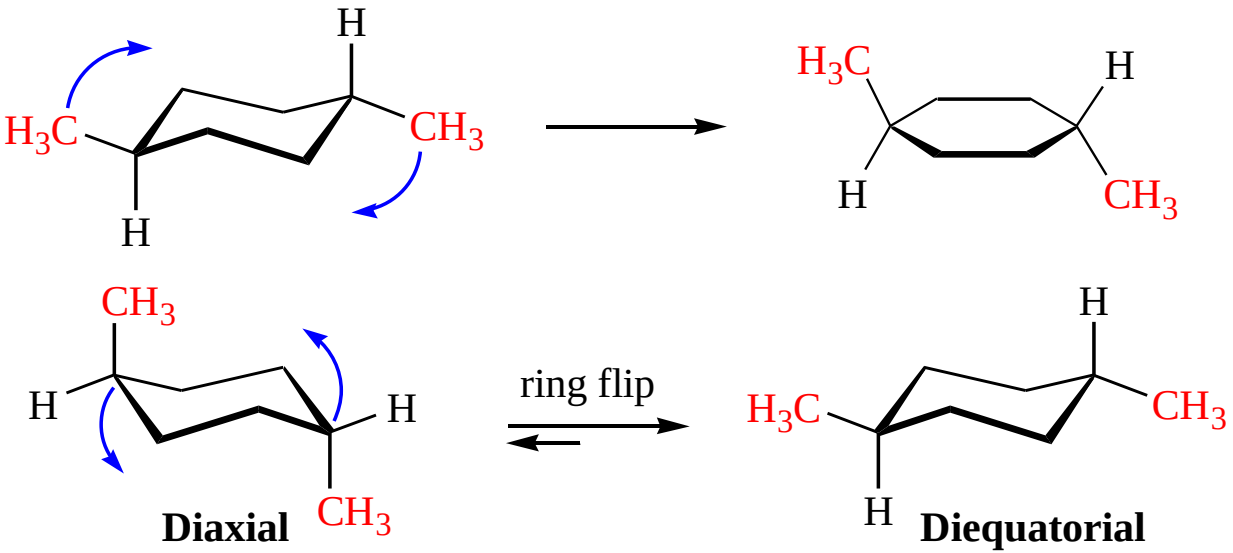


cis-1,3-dimetilcicloexano



trans-1,3-dimetilcicloexano

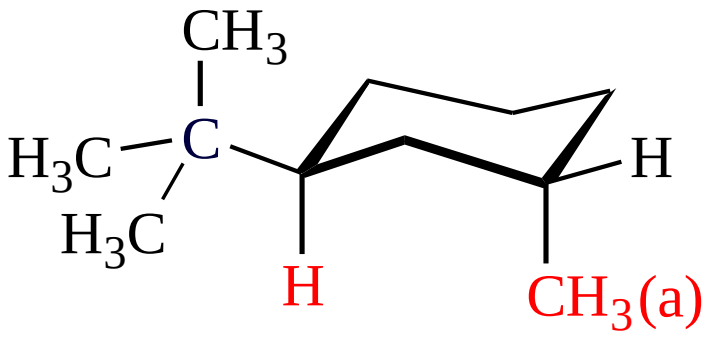
Isomeria

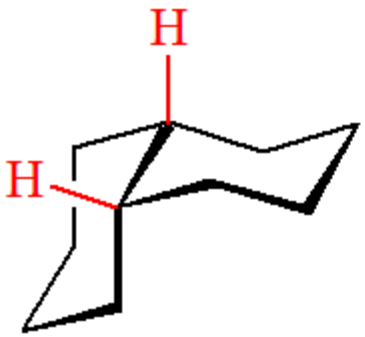


1) **Diaxial** e **diequatorial** *trans*-1,4-dimetilcicloexano.

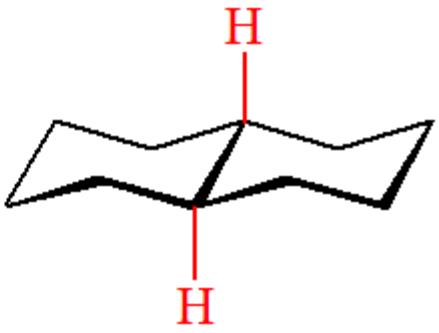
2) A conformação **diequatorial** é a **mais estável** e representa pelo menos 99% das moléculas no equilíbrio.

Isomeria





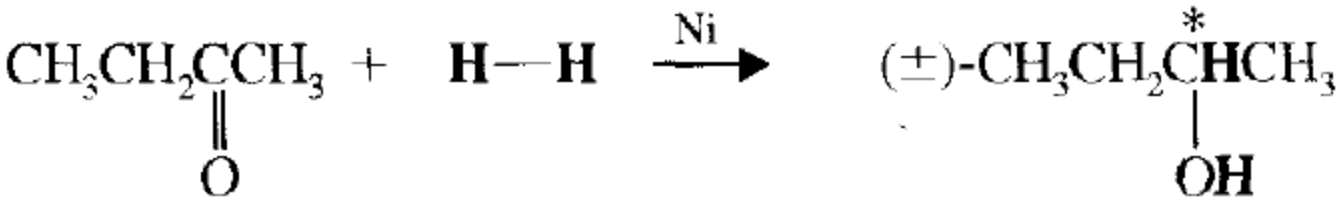
cis-Decalina



trans-Decalina

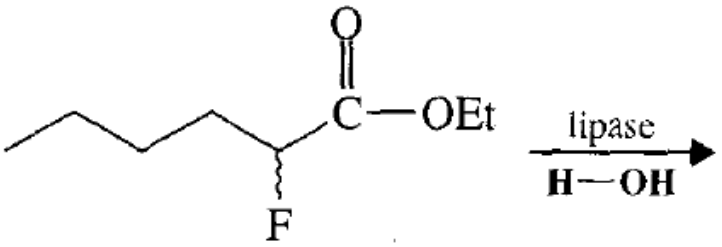
A *cis*-Decalina ferve a 195°C e a *trans*-decalina ferve a 185.5°C

Síntese de racemato



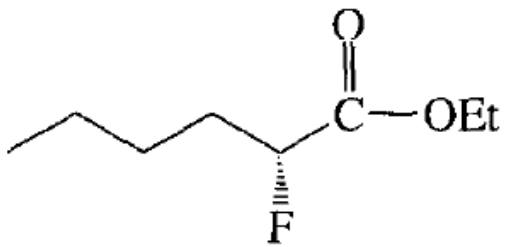
2-Butanona (moléculas aquirais) + **Hidrogênio (moléculas aquirais)** → **(±)-2-Butanol [moléculas quirais, mas mistura 50:50 de (*R*) e (*S*)]**

Síntese enantiosseletiva



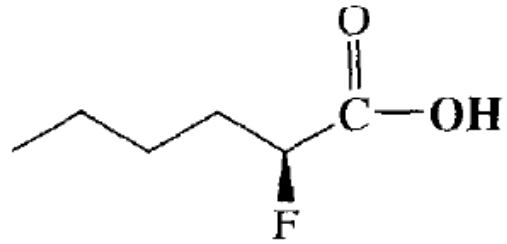
(±)-2-Fluorhexanoato de etila [um éster que é um racemato de formas (*R*) e (*S*)]

lipase
H—OH



(*R*)-(+)-2-Fluorhexanoato de etila (excesso enantiomérico > 99%)

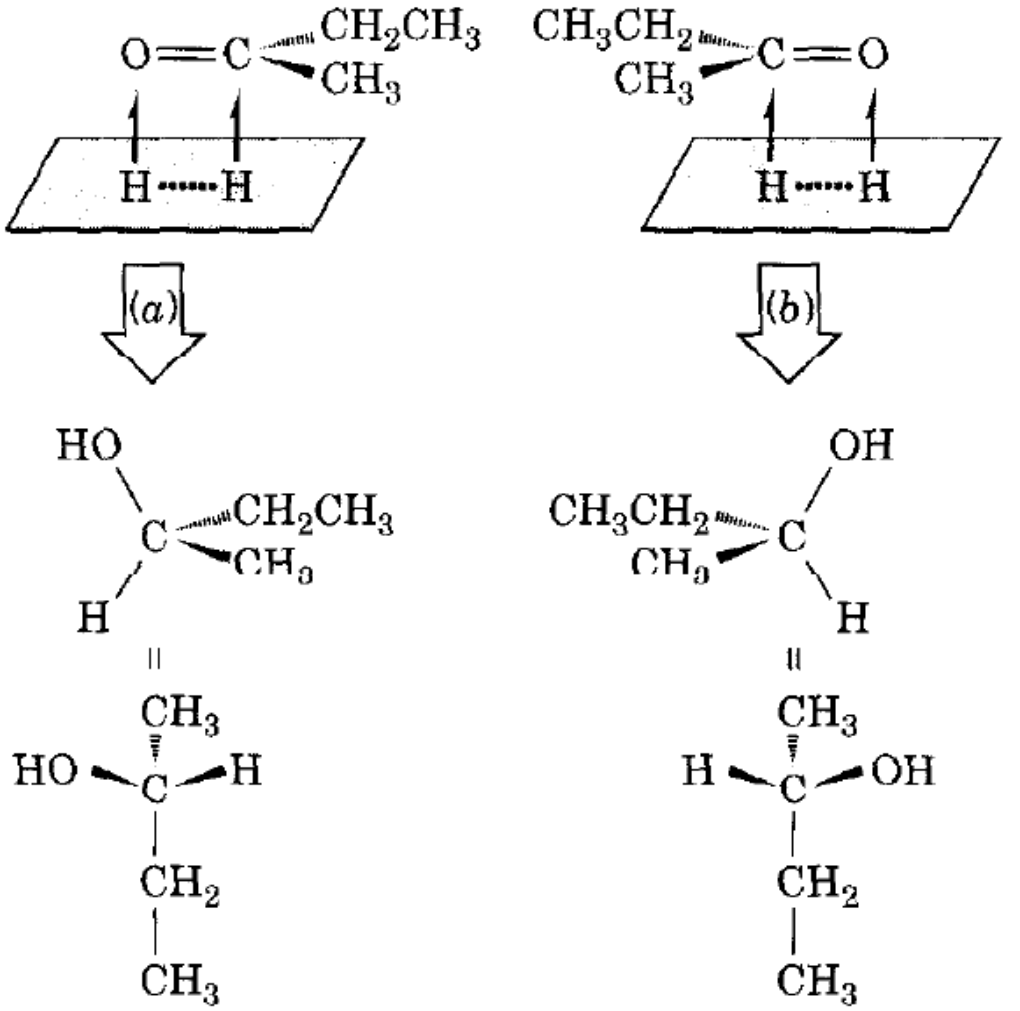
\+



\+ H—O—Et

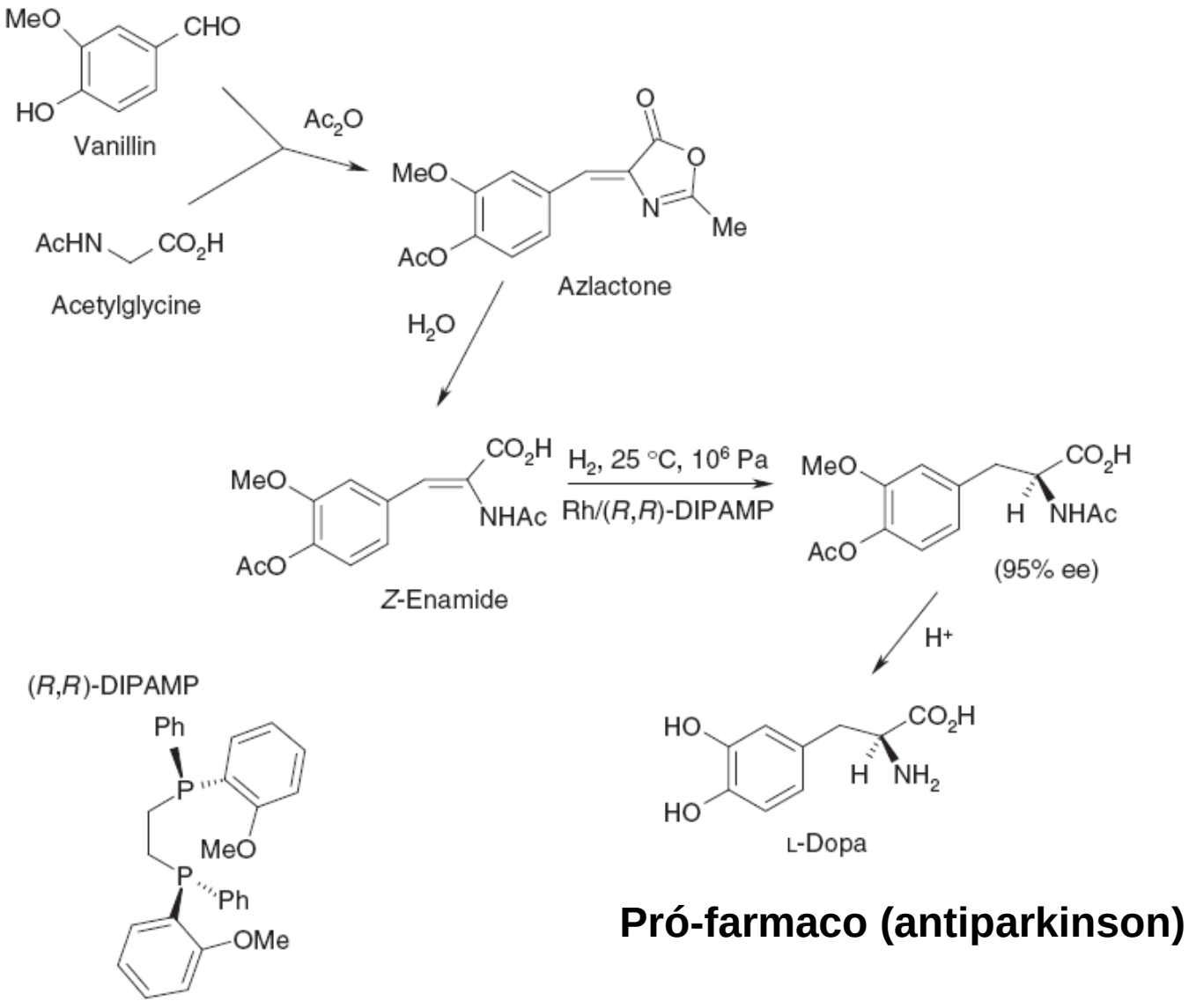
Ácido (*S*)-(−)-2-fluorhexanóico (excesso enantiomérico > 69%)

Síntese de racemato



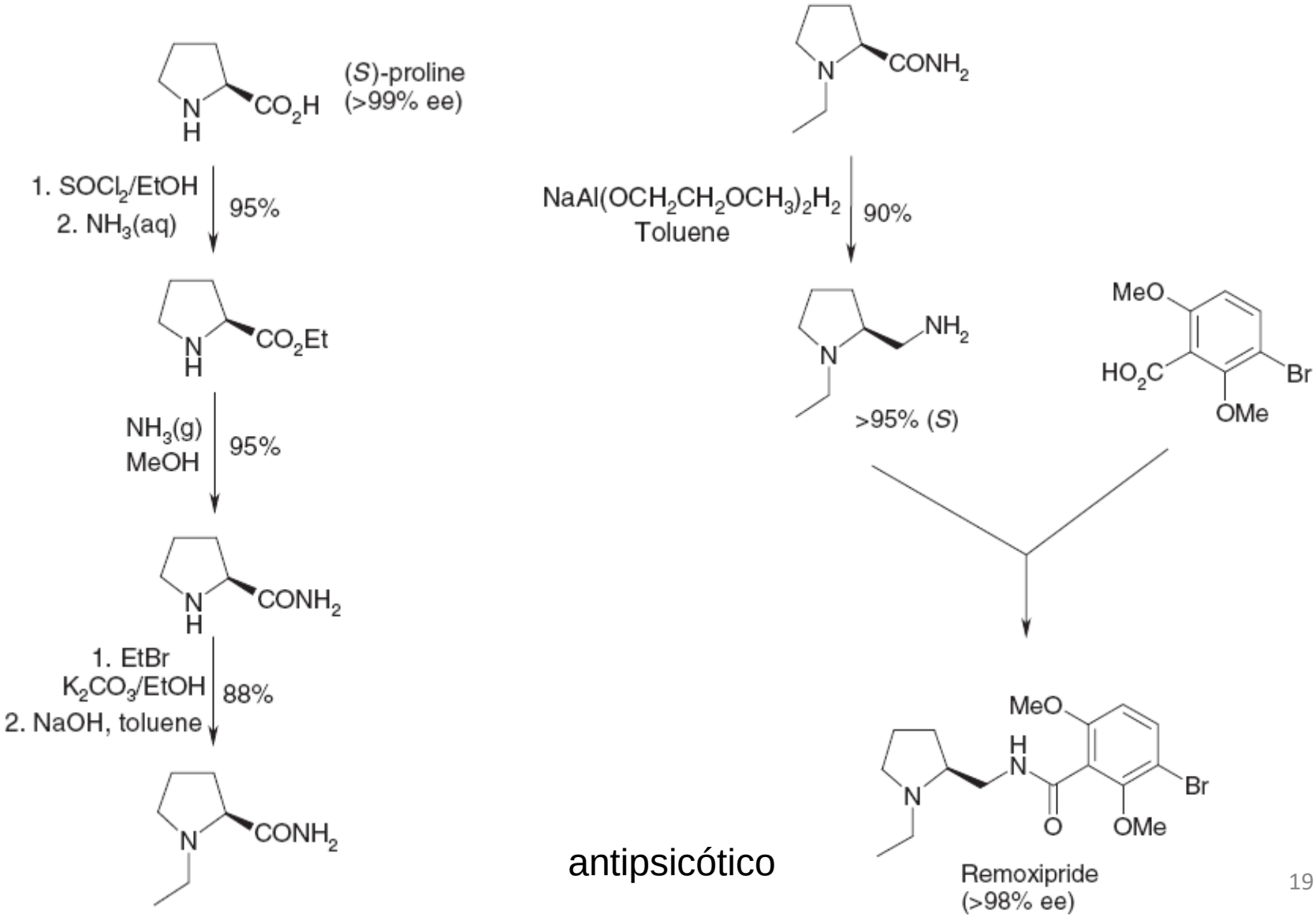
(*R*)-(–)-(2)-Butanol **(*S*)-(+)-(2)-Butanol**

Síntese enantiosseletiva

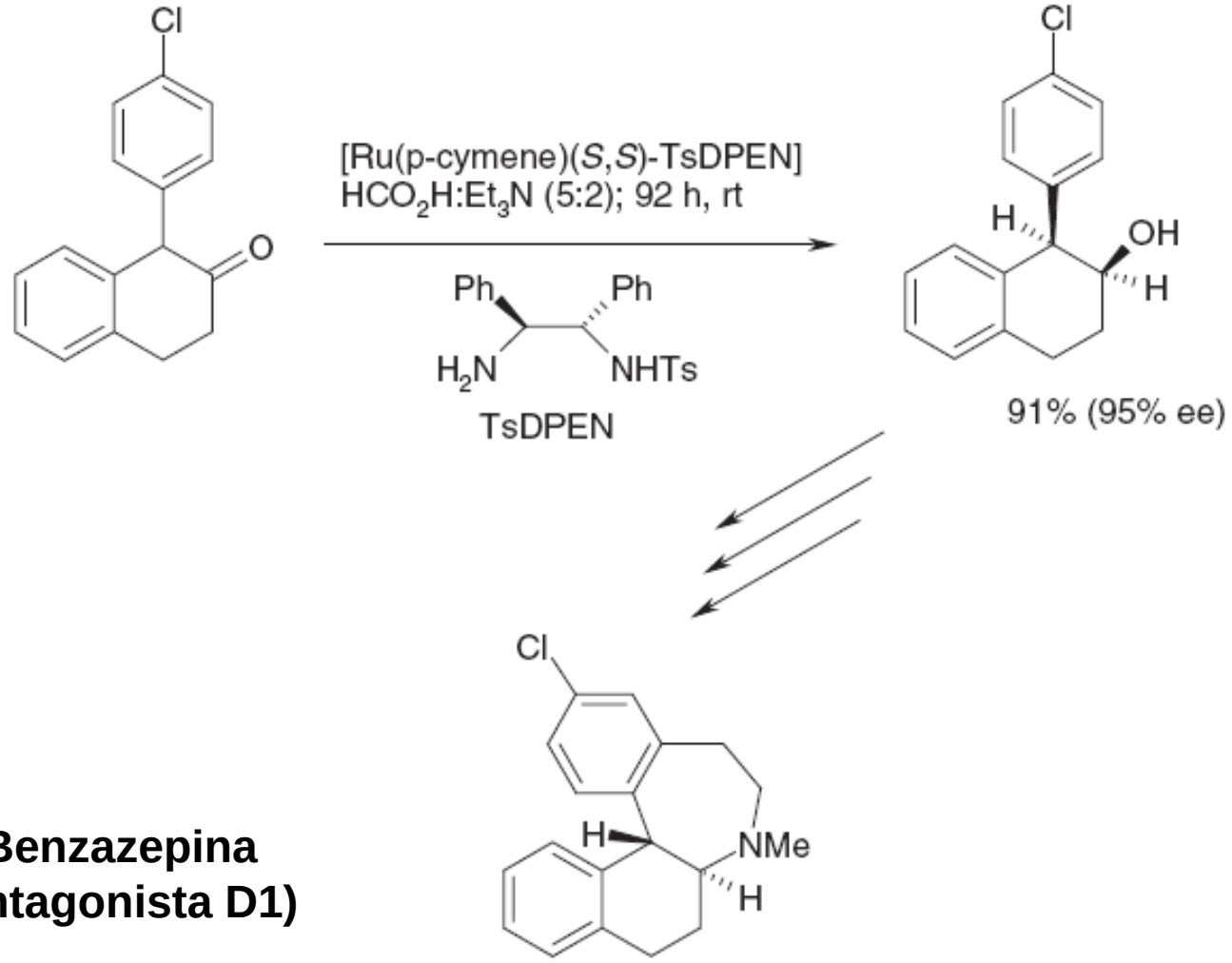


Pró-farmaco (antiparkinson)

Preservação do centro estereogênico

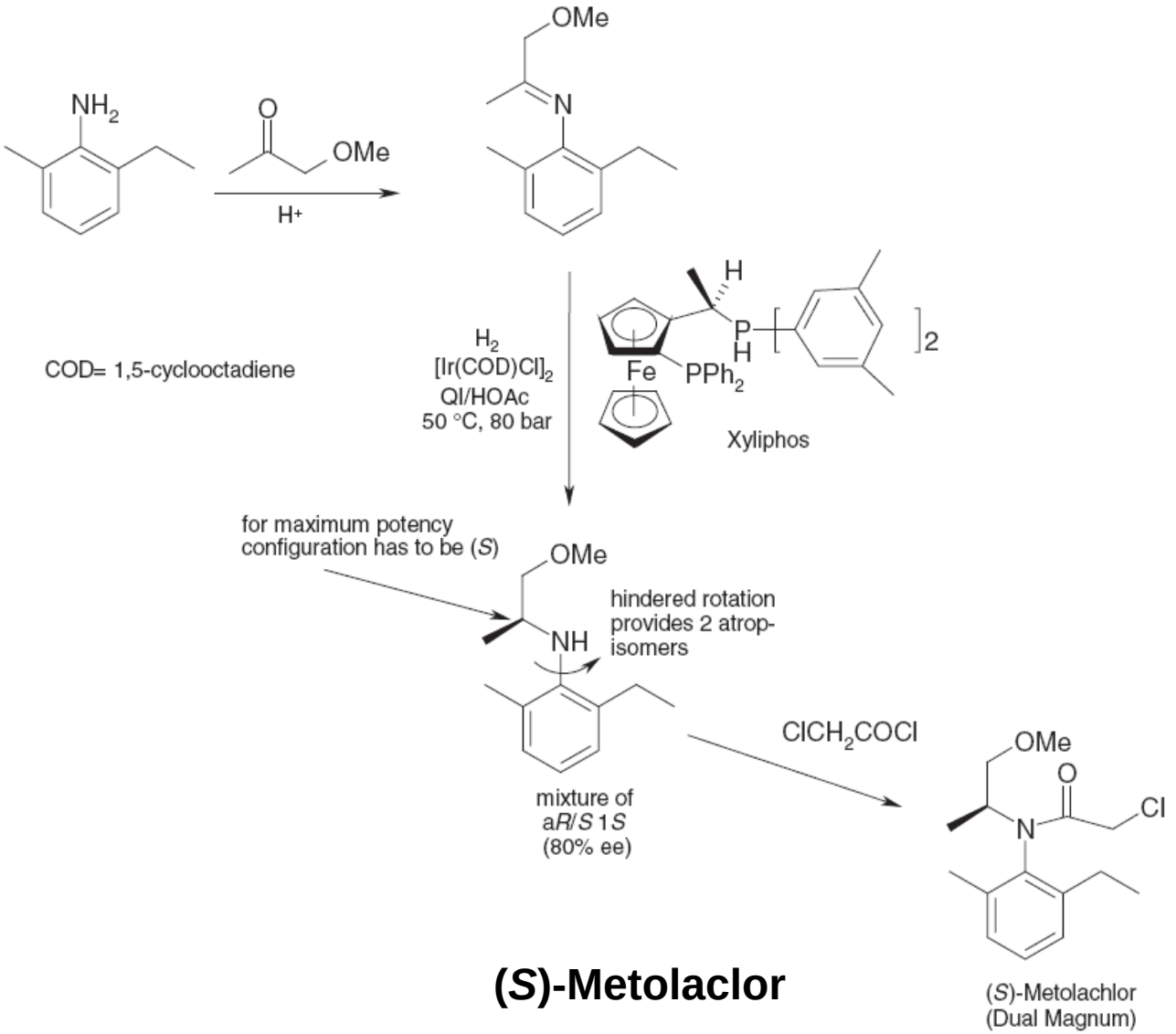


Preservação do centro estereogênico



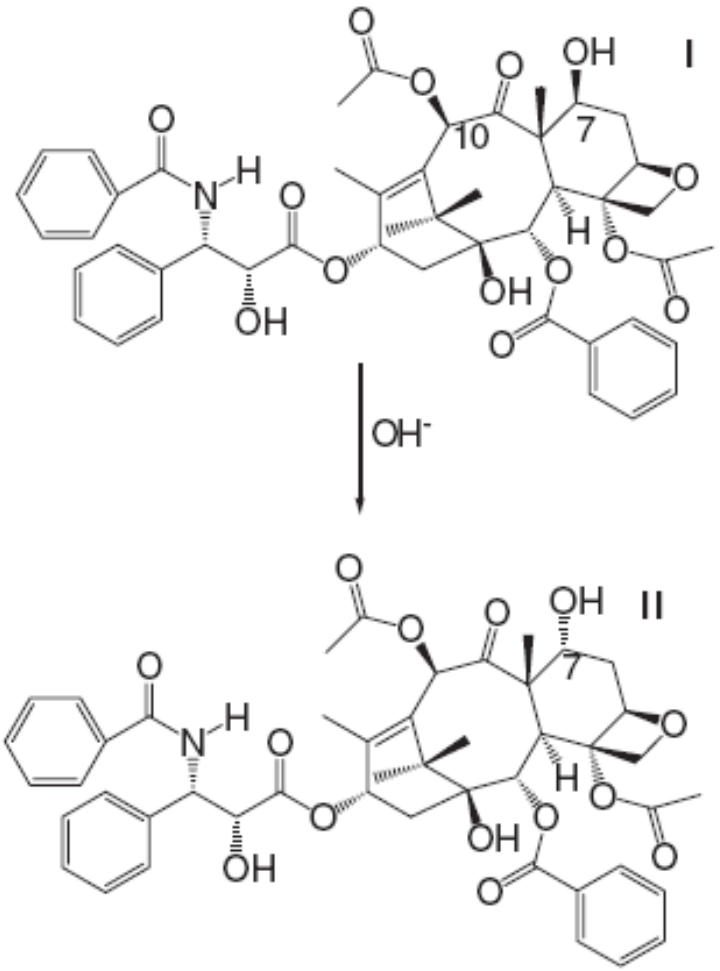
Benzazepina (antagonista D1)

Processo enantiosseletivo para herbicida



(*S*)-Metolaclor

Reação em meio básico



taxol