CHIMICA DELLE SOSTANZE ORGANICHE NATURALI

CORSO DI STUDI
FARMACIA
AA 2016-2017

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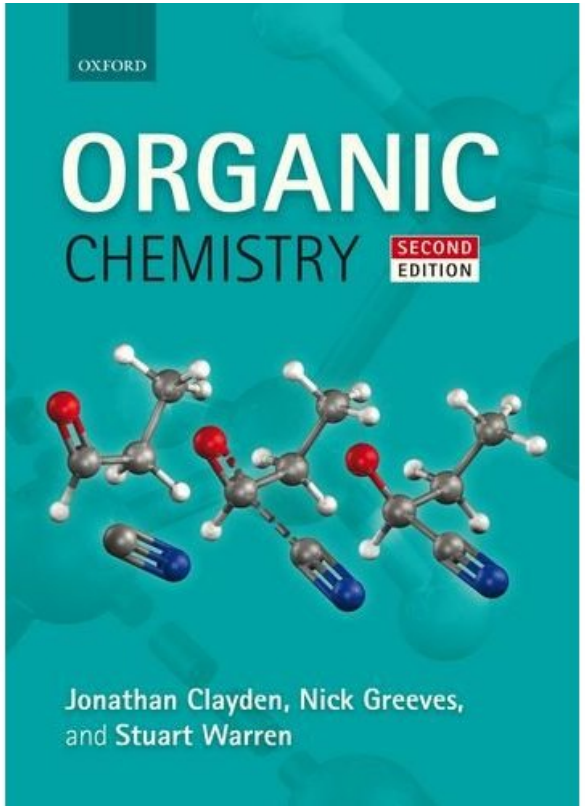
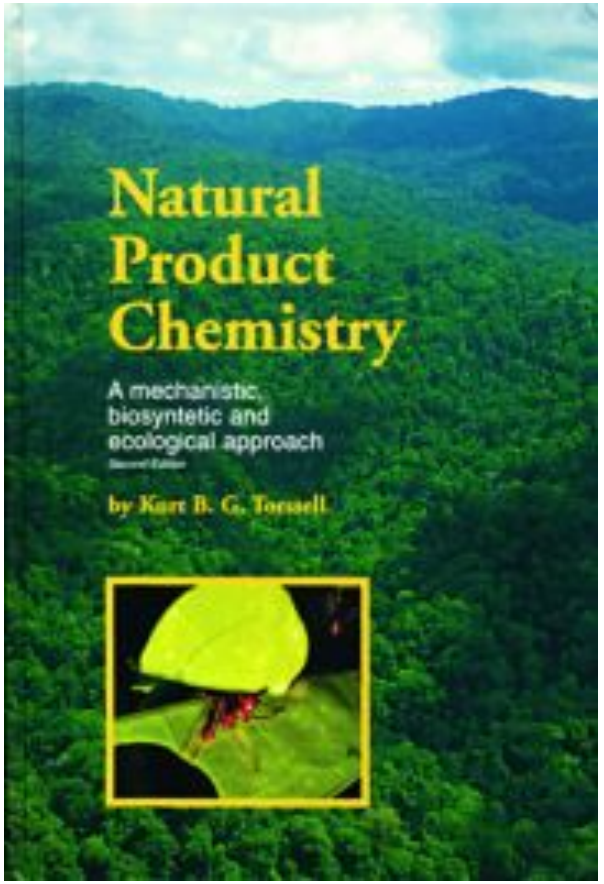
TESTI CONSIGLIATI



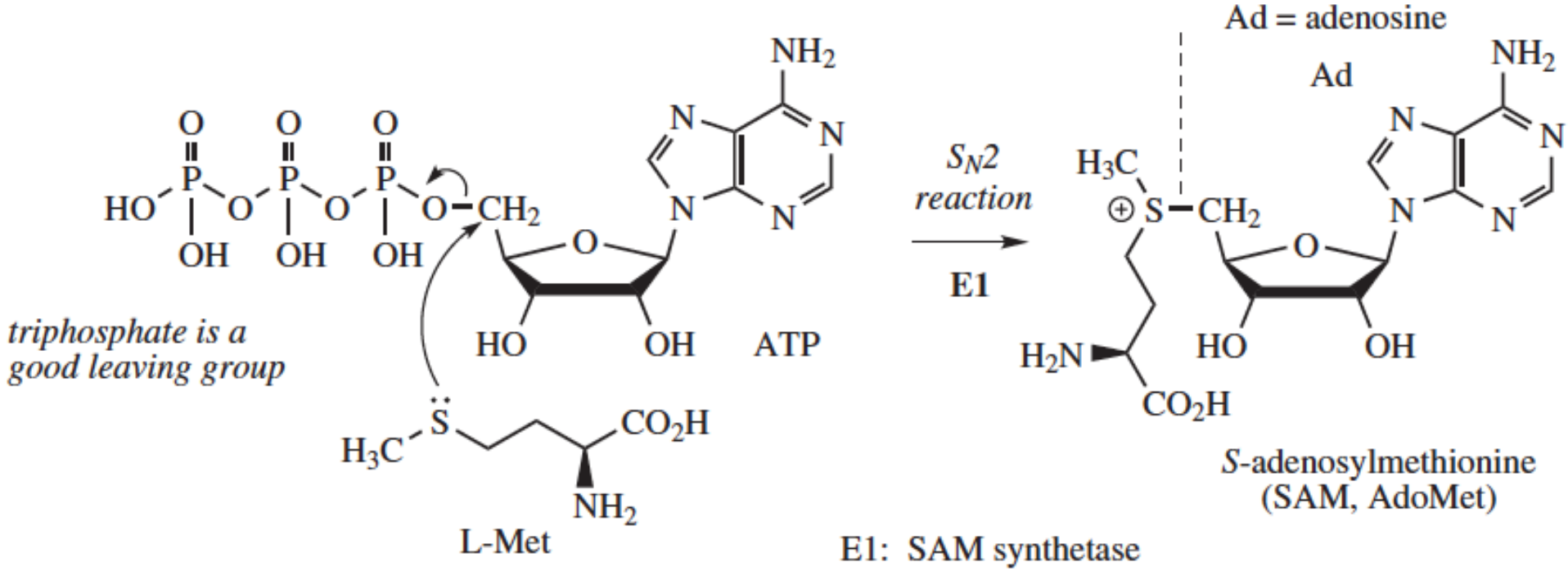


ARGOMENTI DEL CORSO

1. Ripasso di chimica organica (2 ore)
2. Meccanismi di reazione nella biosintesi delle sostanze naturali (4 ore)
3. Amminoacidi e proteine (4 ore)
4. Zuccheri (4 ore)
5. Basi azotate; DNA e RNA (2 ore)
6. La via dell'acetato, acidi grassi e polichetidi (6 ore)
7. La via dello Shikimato, amminoacidi aromatici (6 ore)
8. Terpeni e steroidi (10 ore)
9. Alcaloidi (10 ore)

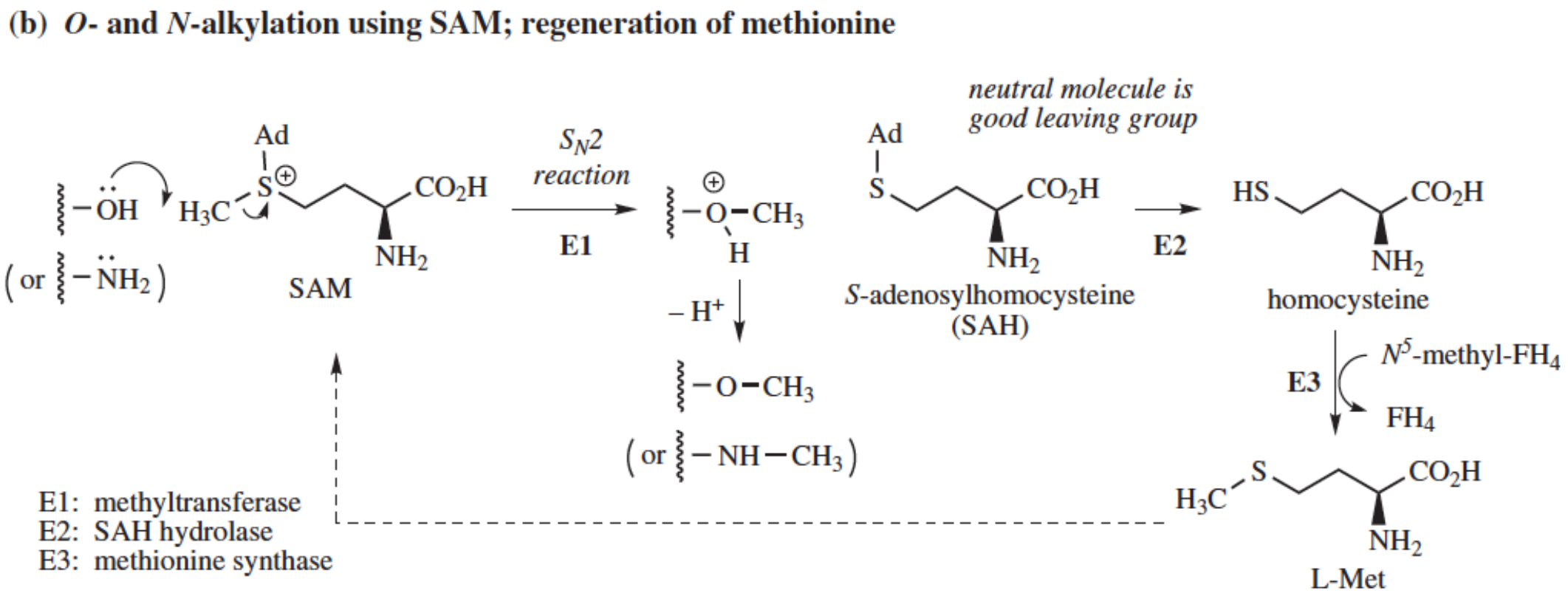
Alkylation reactions: nucleophilic substitution

(a) formation of SAM



E1: SAM synthetase

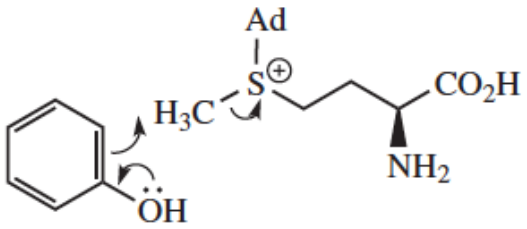
Meccanismi di reazione nella biosintesi delle sostanze naturali



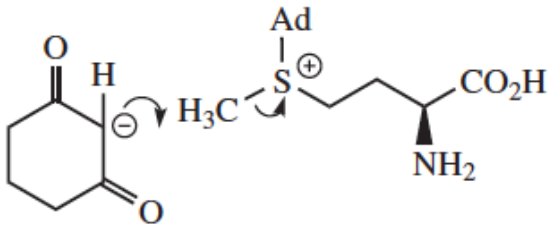
Meccanismi di reazione nella biosintesi delle sostanze naturali

(c) *C*-alkylation using SAM

ortho (and para) positions are activated by OH

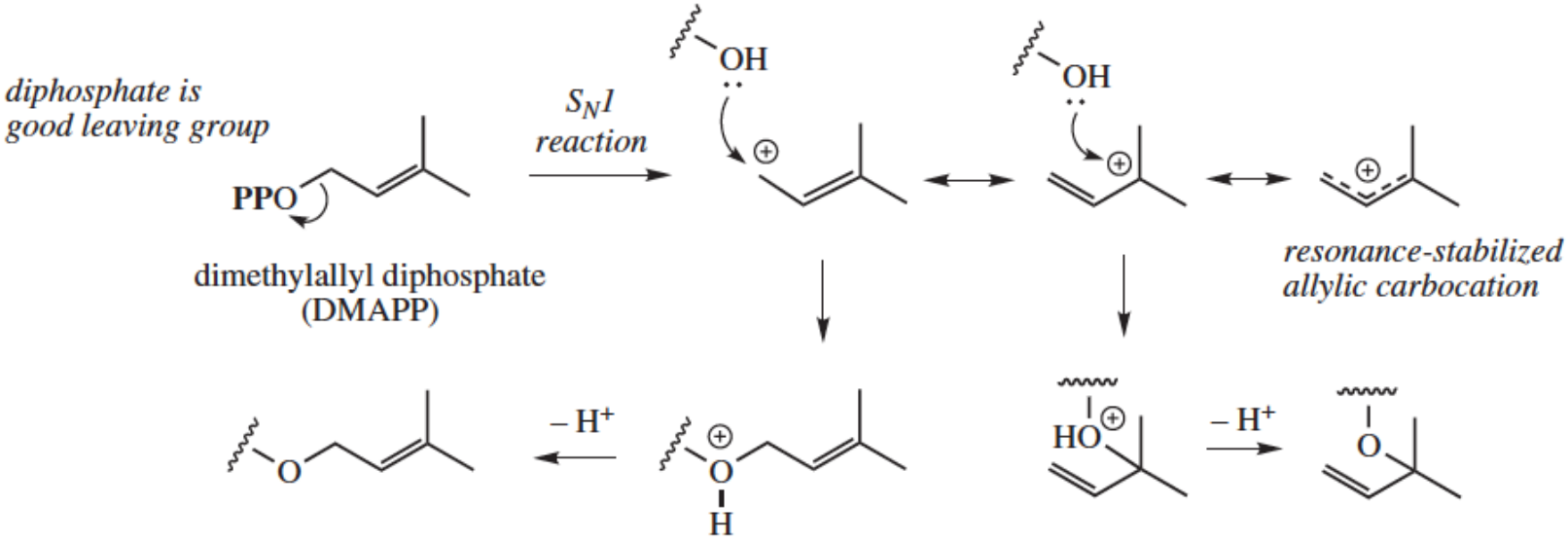


carbonyl groups increase acidity and allow formation of enolate anion



(d) *O*-alkylation using DMAPP

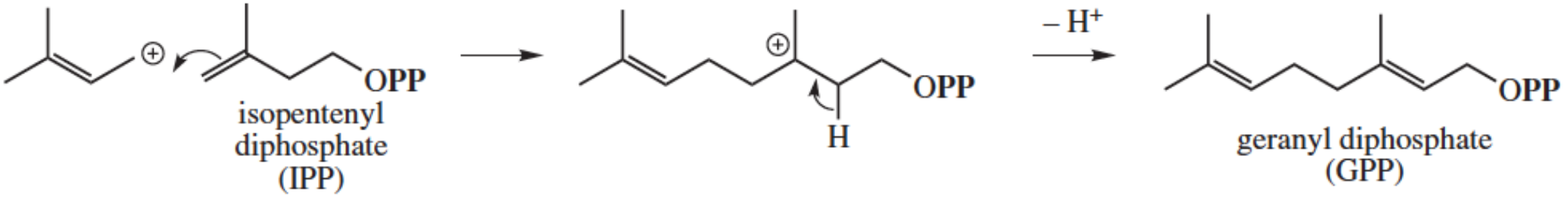
diphosphate is good leaving group



Alkylation reactions: electrophilic addition

(a) inter- and intra-molecular additions

electrophilic addition of cation onto alkene: intermolecular addition

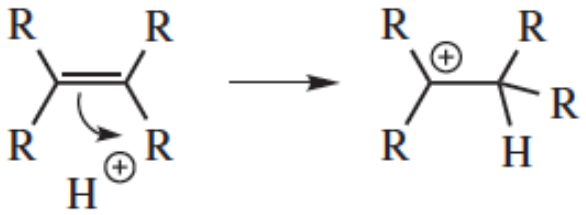


intramolecular addition: cyclization

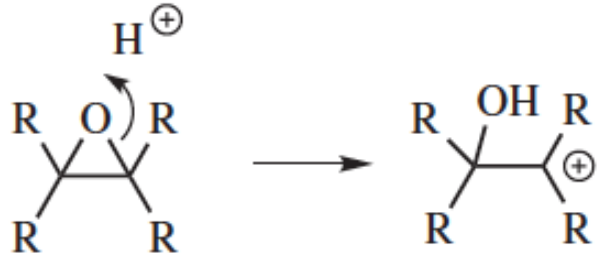
Meccanismi di reazione nella biosintesi delle sostanze naturali

(b) generation of carbocation

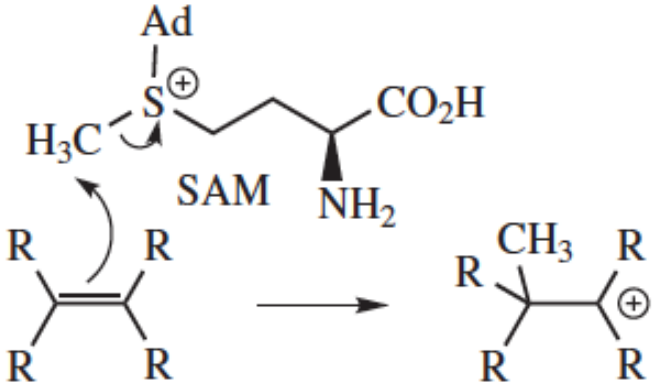
loss of leaving group



protonation of alkene

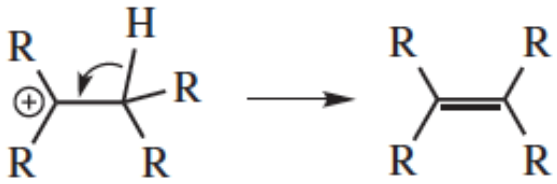


protonation and ring opening of epoxide

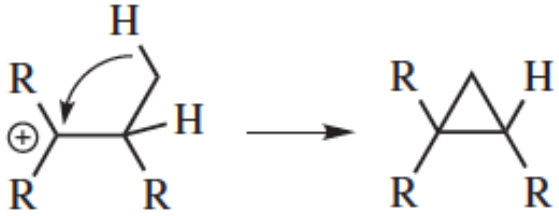


methylation of alkene via SAM

(c) discharge of carbocation



loss of proton

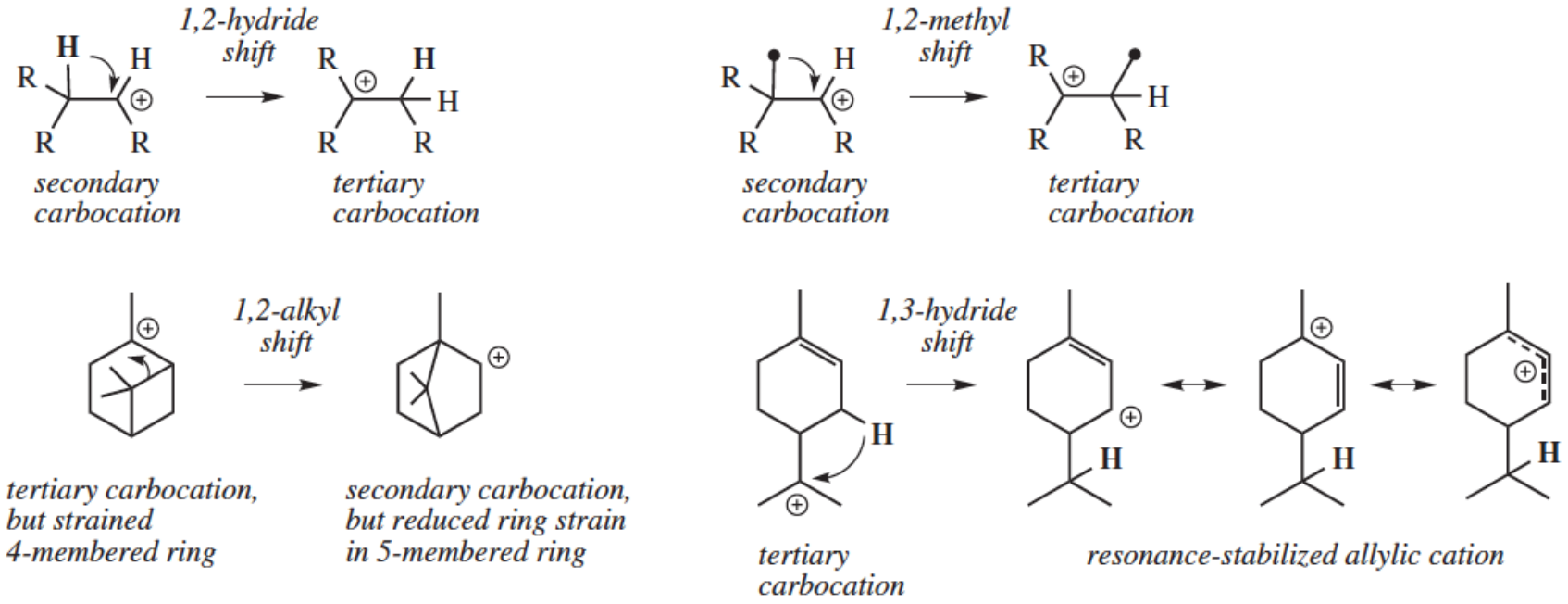


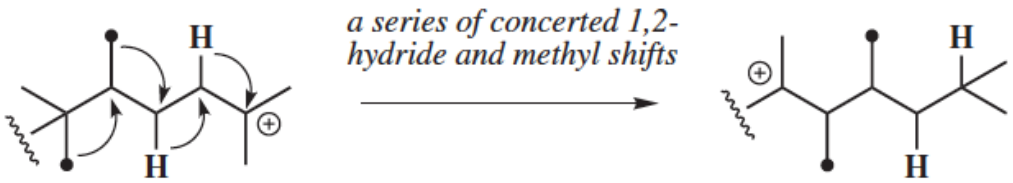
cyclization / loss of proton

quenching with nucleophile (water)

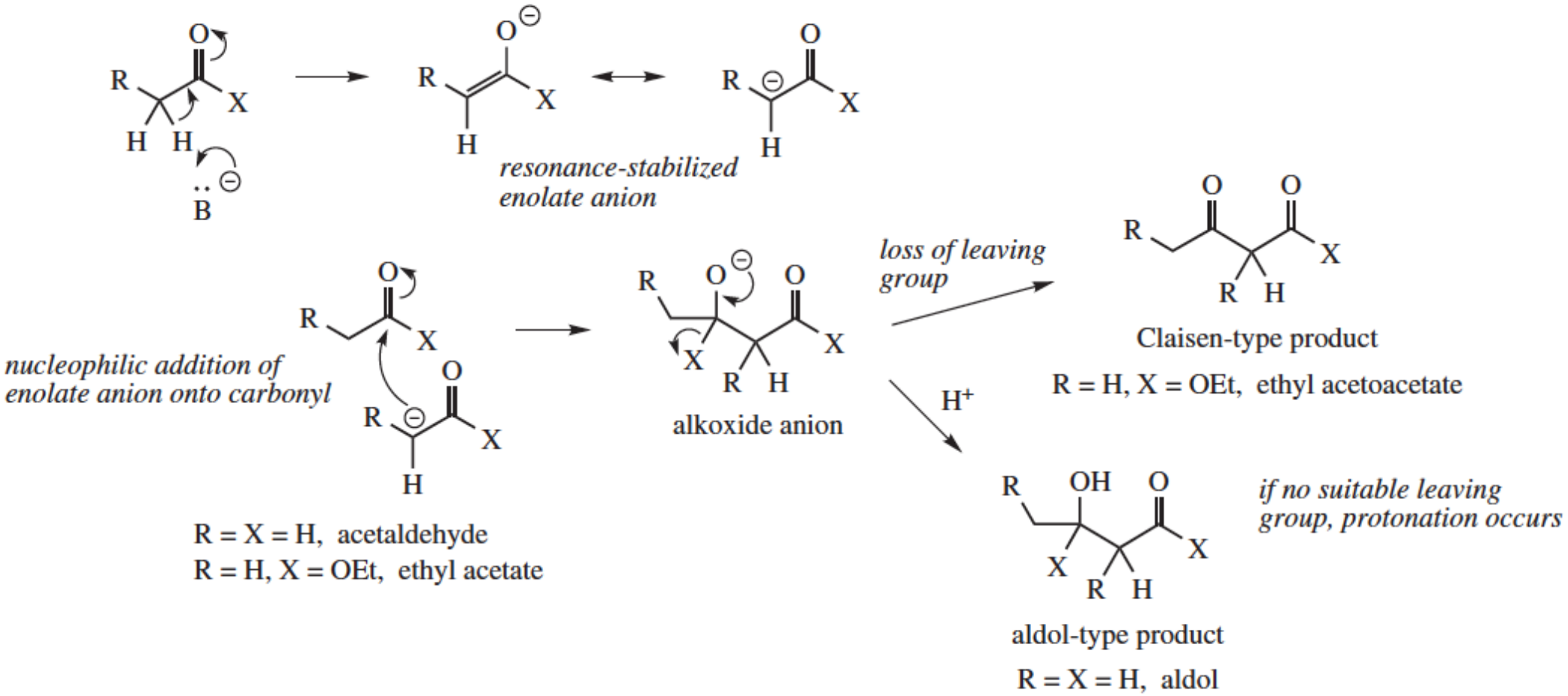
Meccanismi di reazione nella biosintesi delle sostanze naturali

Wagner–Meerwein rearrangements

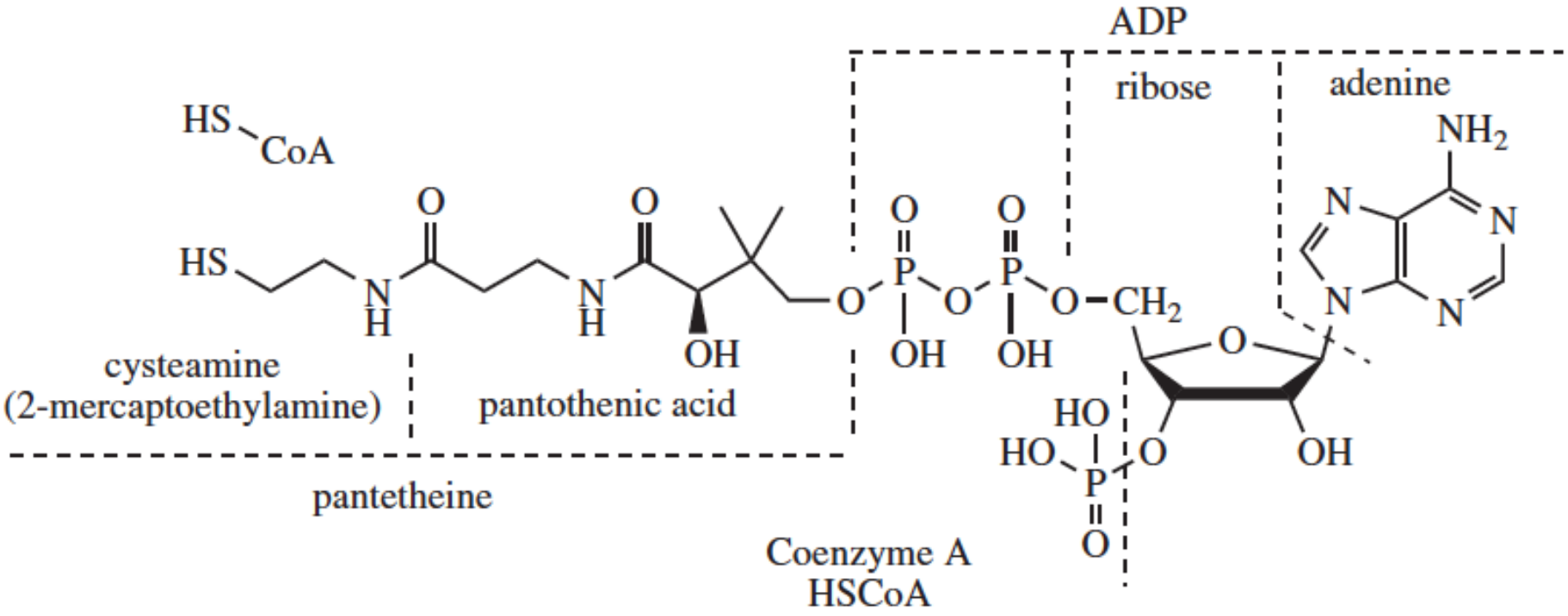




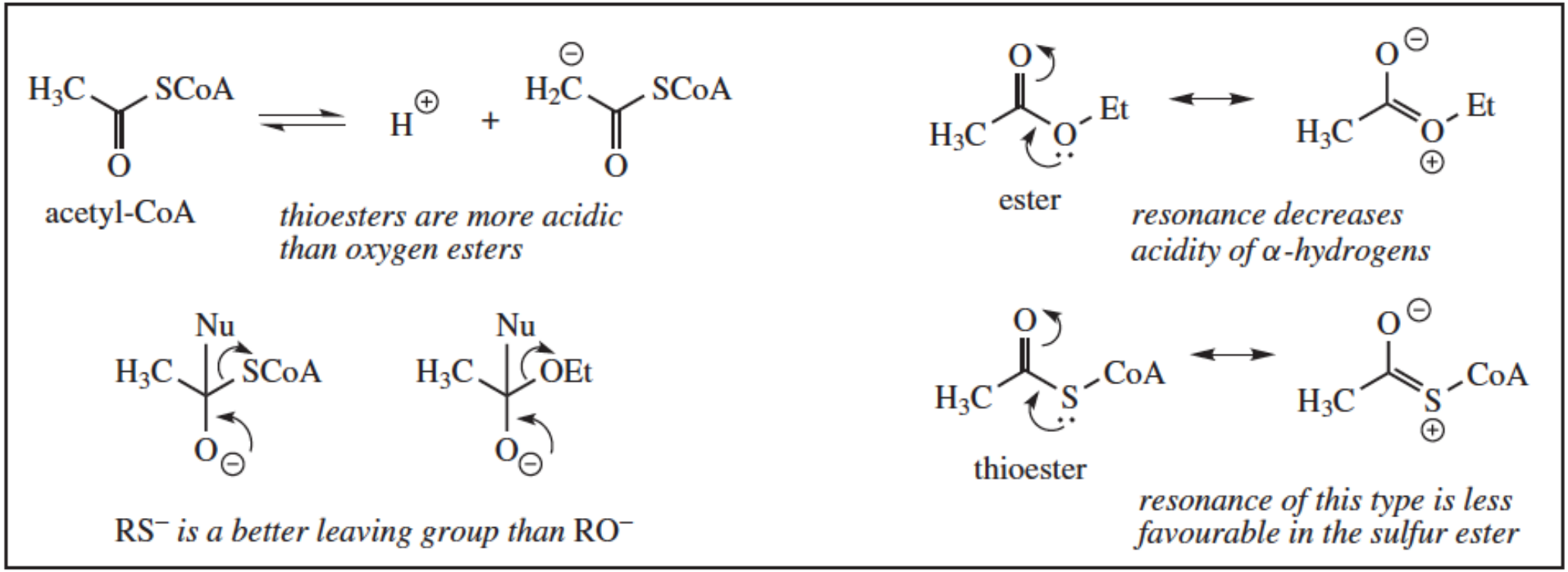
Aldol and Claisen reactions



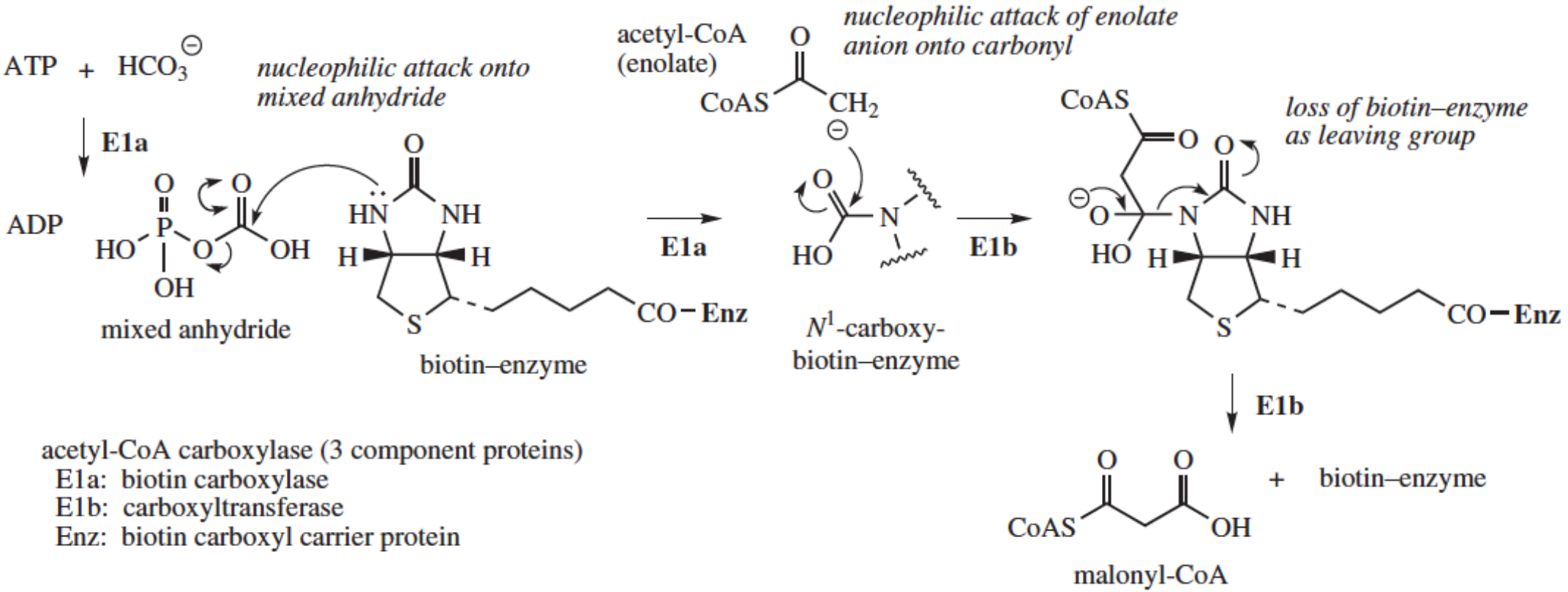
Coenzima A


ADP
ribose
adenine
HS
CoA
HS
cysteamine
(2-mercaptoethylamine)
pantothenic acid
pantetheine
Coenzyme A
HSCoA

Meccanismi di reazione nella biosintesi delle sostanze naturali

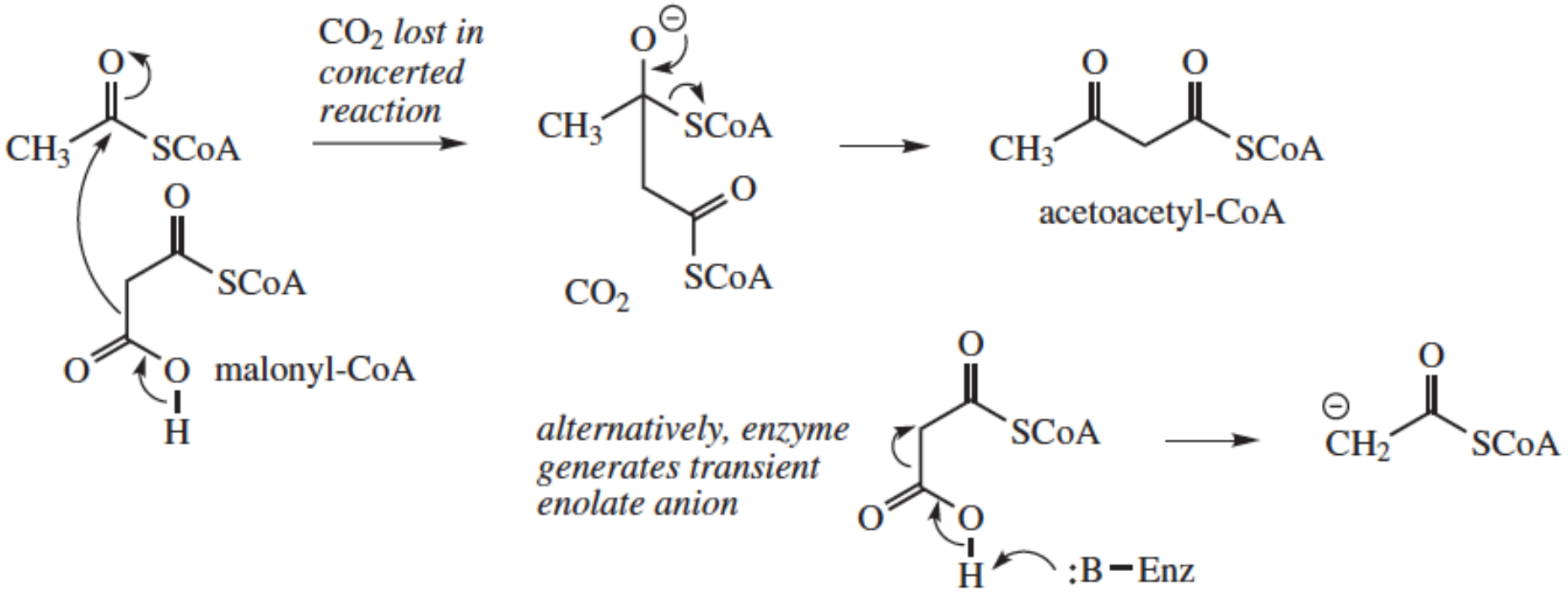


Meccanismi di reazione nella biosintesi delle sostanze naturali



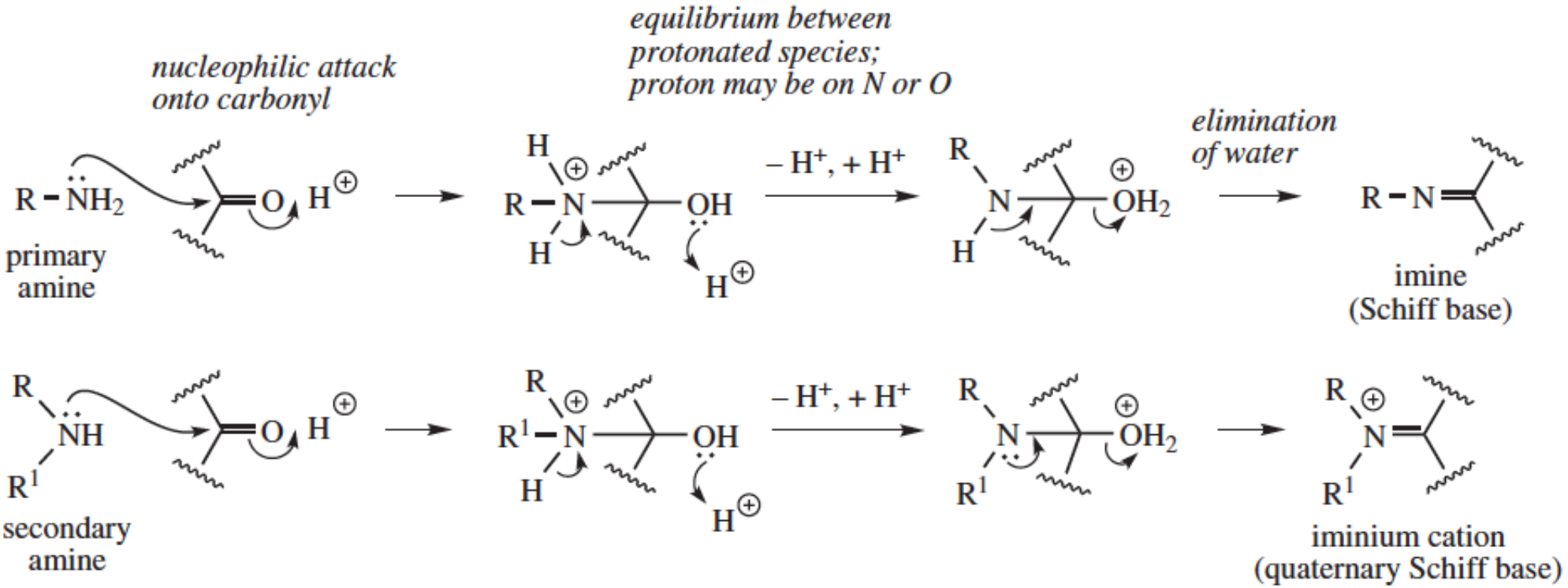
acetyl-CoA carboxylase (3 component proteins)
E1a: biotin carboxylase
E1b: carboxyltransferase
Enz: biotin carboxyl carrier protein

Meccanismi di reazione nella biosintesi delle sostanze naturali

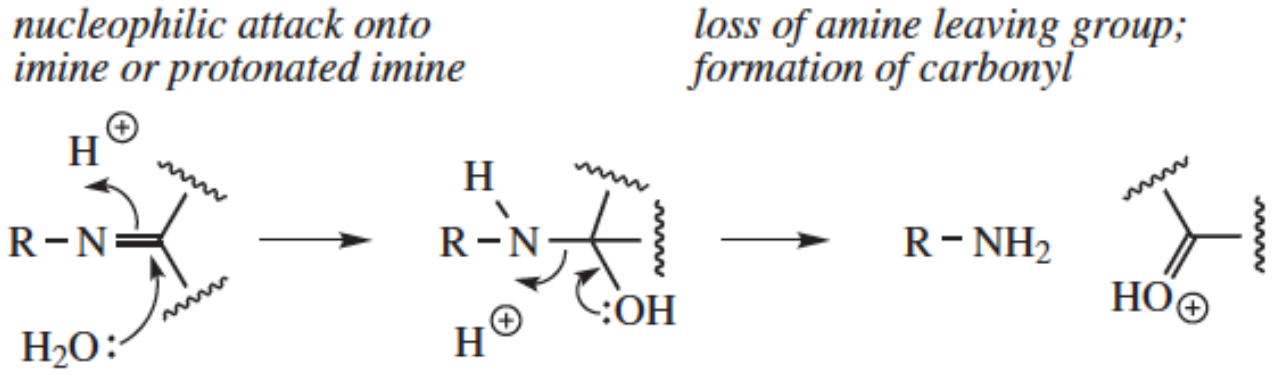


Meccanismi di reazione nella biosintesi delle sostanze naturali

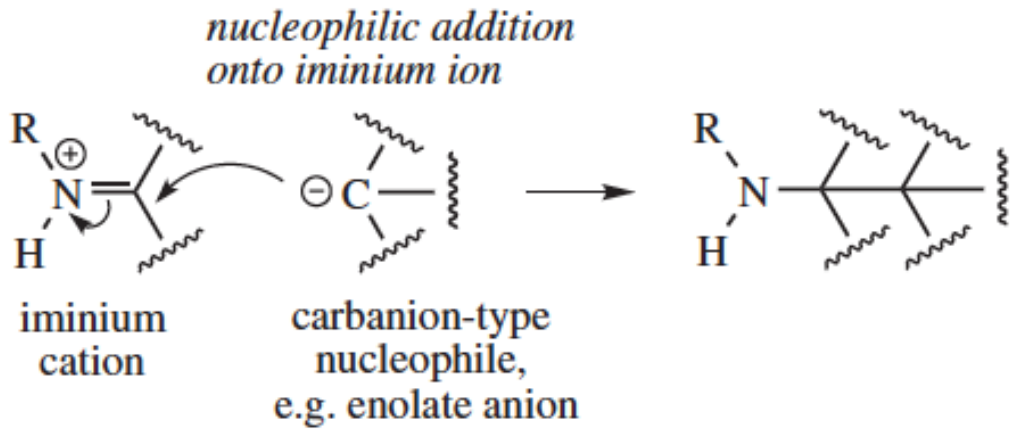
(a) Imine formation



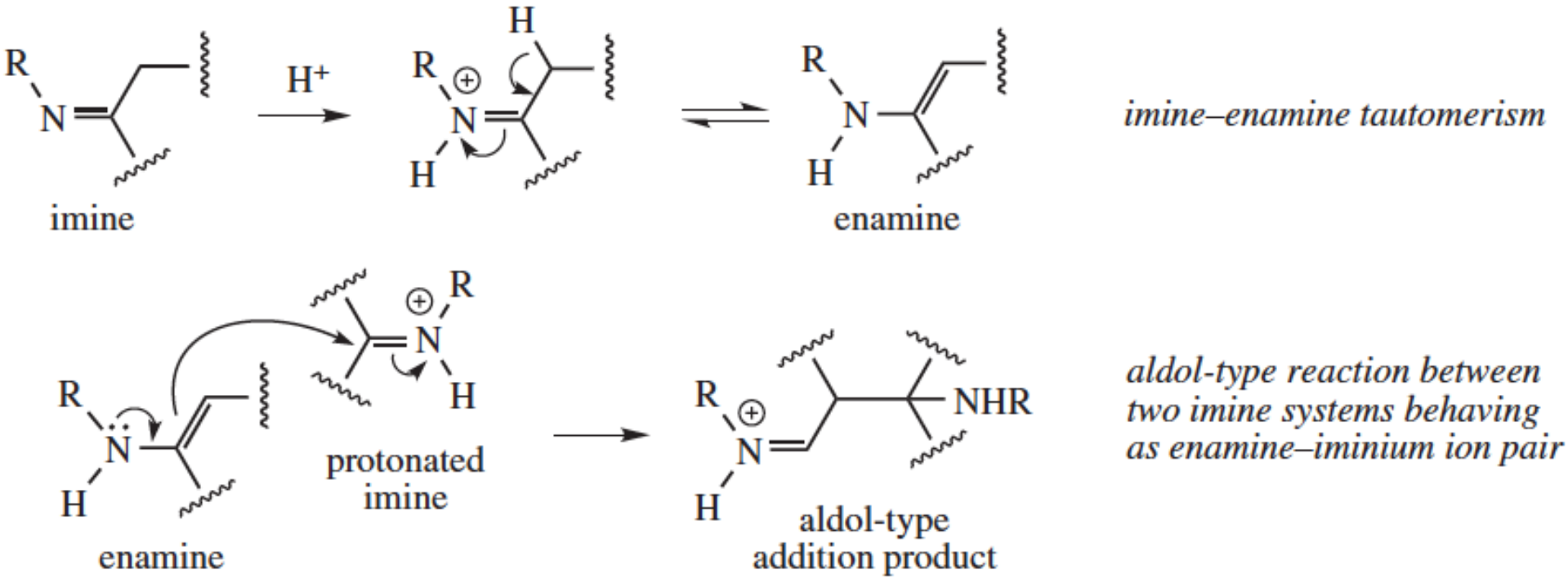
(b) Imine hydrolysis



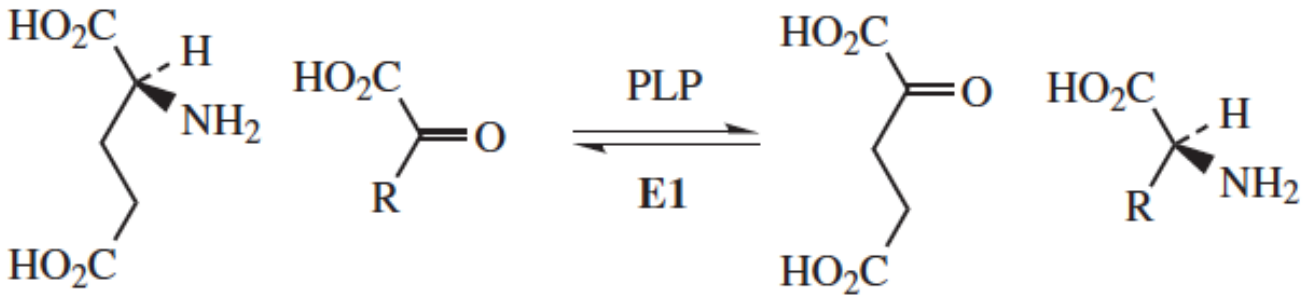
(c) Mannich reaction



Meccanismi di reazione nella biosintesi delle sostanze naturali



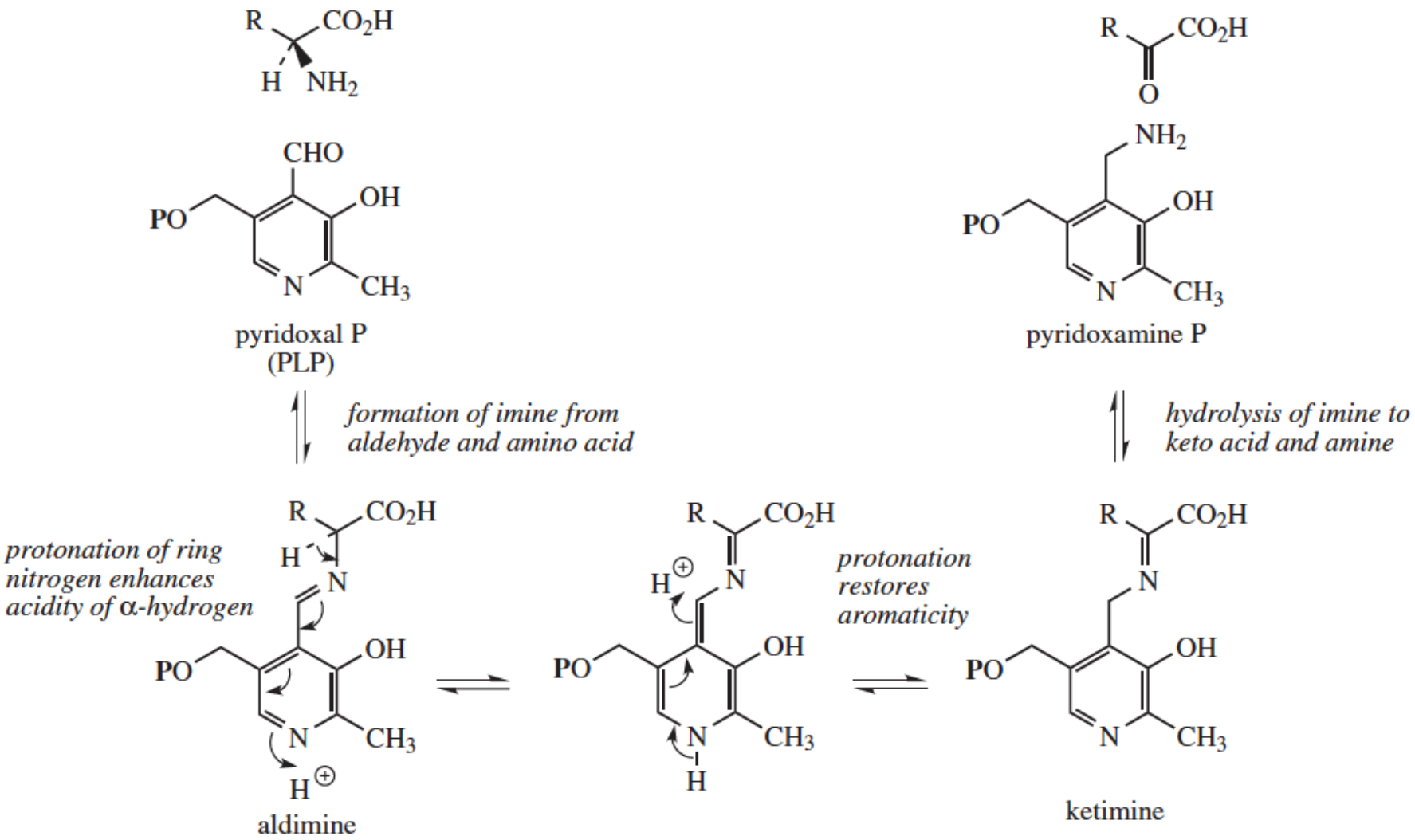
Transamination



glutamic acid keto acid 2-oxoglutaric acid amino acid

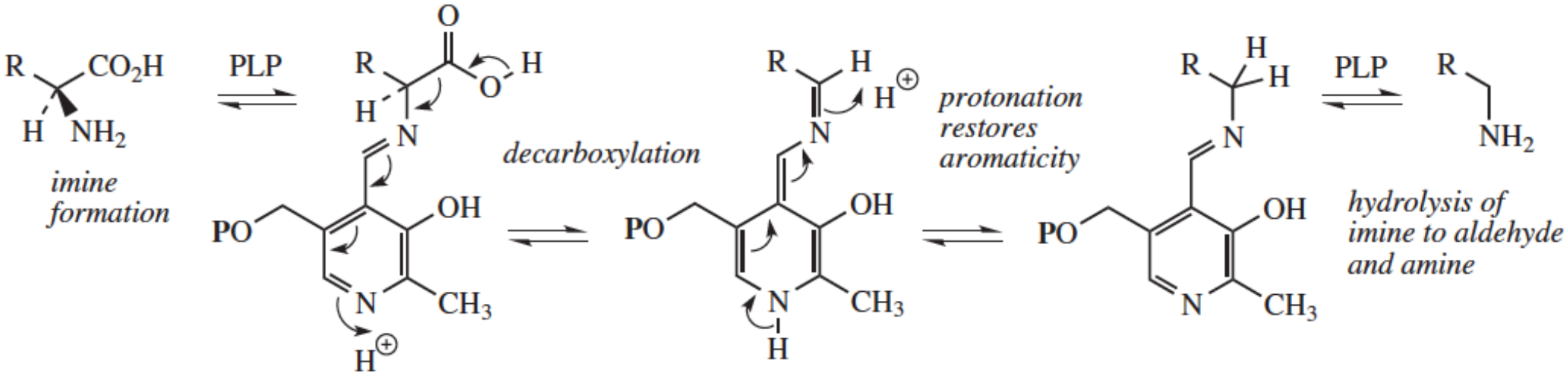
E1: glutamate transaminase

Meccanismi di reazione nella biosintesi delle sostanze naturali



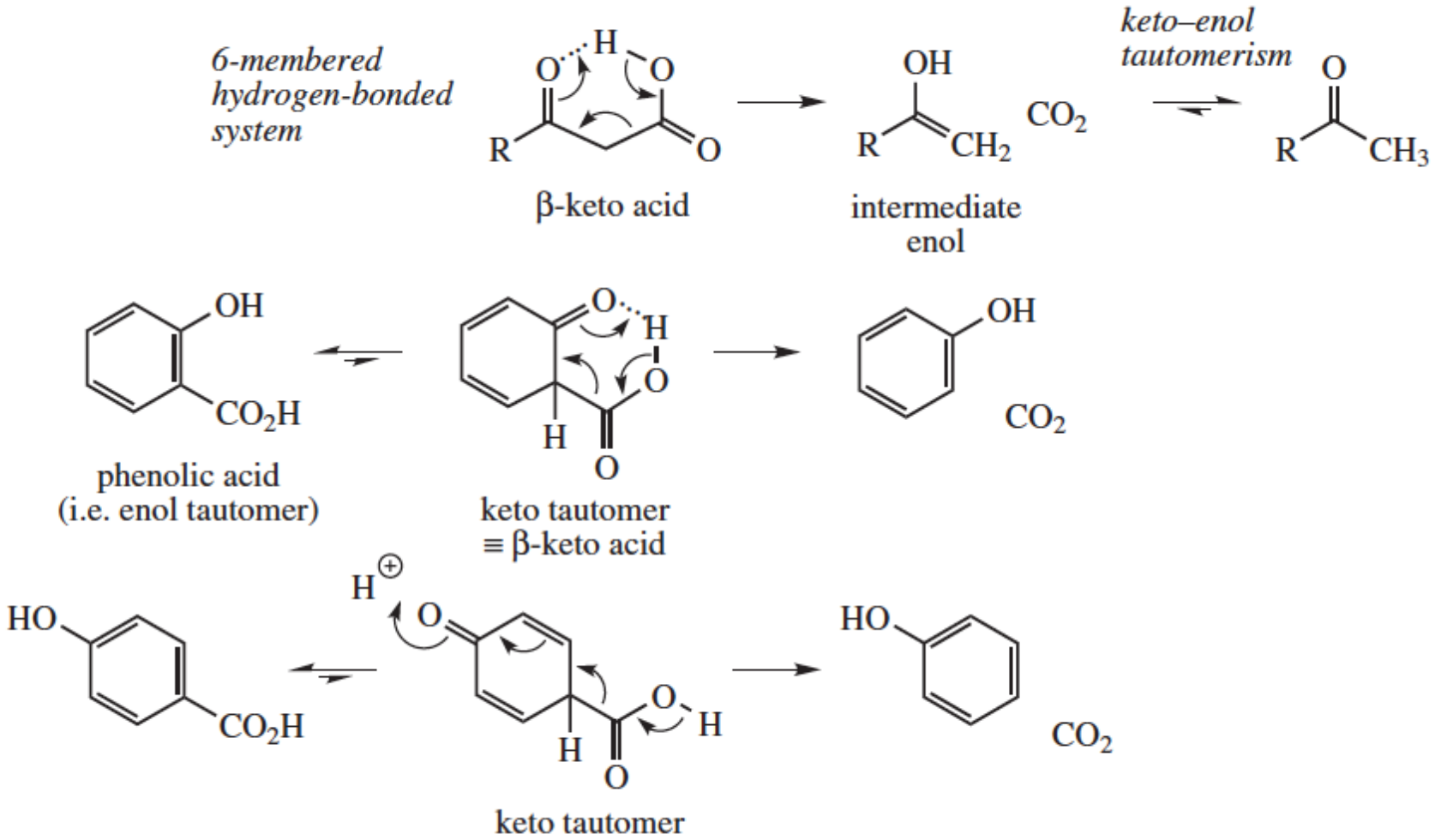
Decarboxylation reactions

(a) α-amino acids



Meccanismi di reazione nella biosintesi delle sostanze naturali

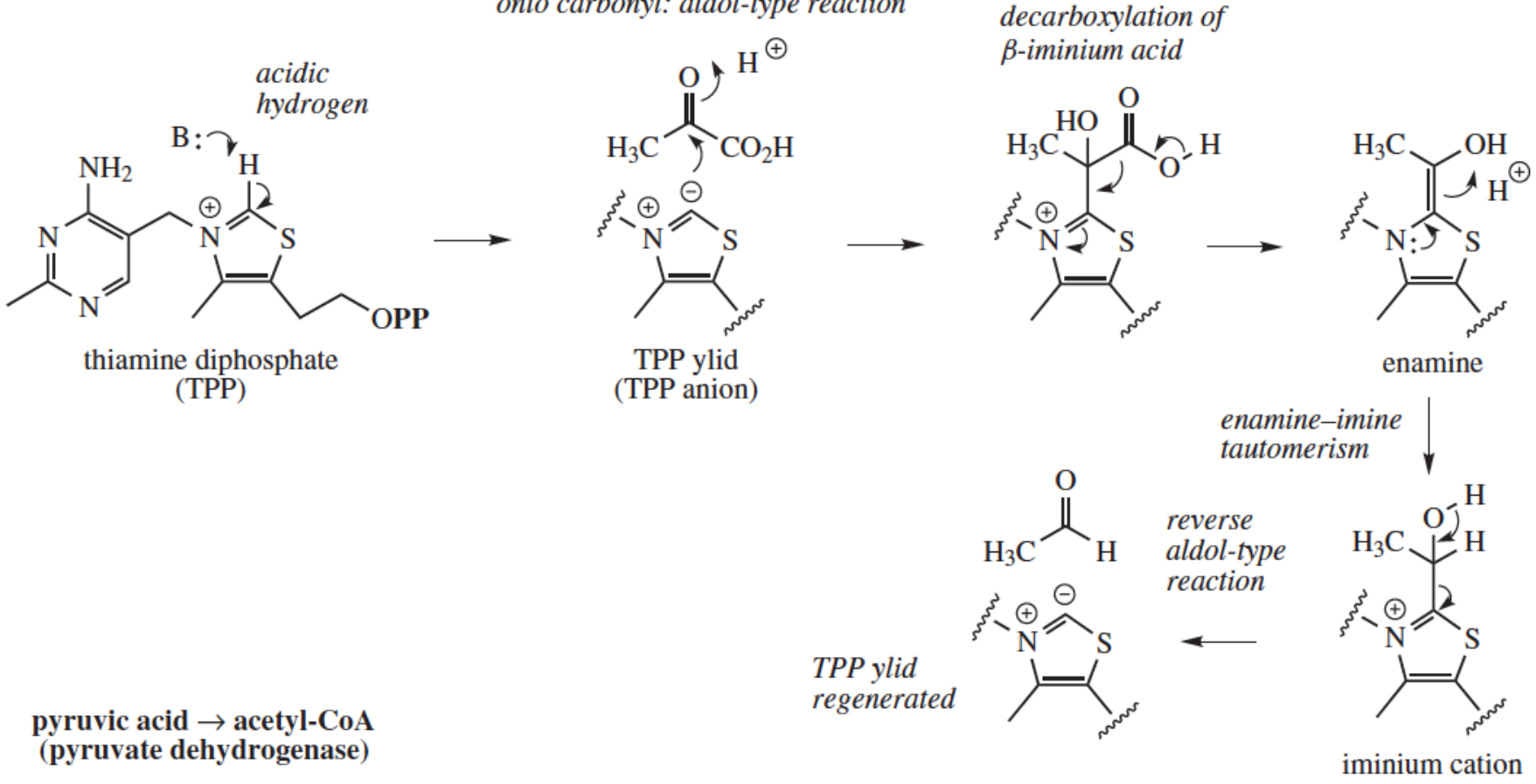
(b) β-keto acids



Meccanismi di reazione nella biosintesi delle sostanze naturali

(c) α-keto acids

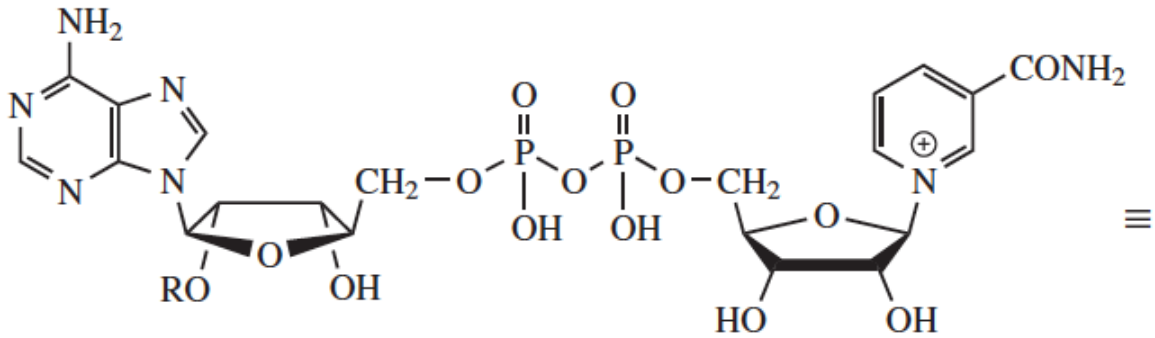
pyruvic acid → acetaldehyde (pyruvate decarboxylase)



pyruvic acid → acetyl-CoA (pyruvate dehydrogenase)

Meccanismi di reazione nella biosintesi delle sostanze naturali

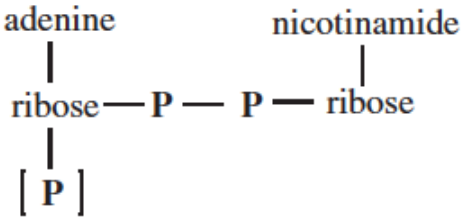
Dehydrogenases: NAD$^+$ and NADP$^+$

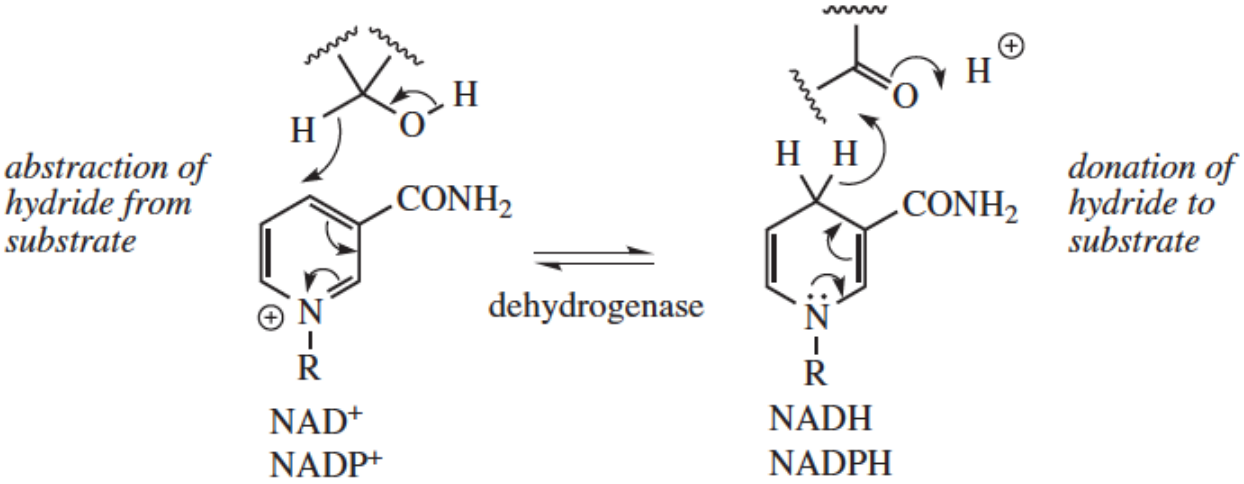


R = H, NAD$^+$

R = **P**, NADP$^+$

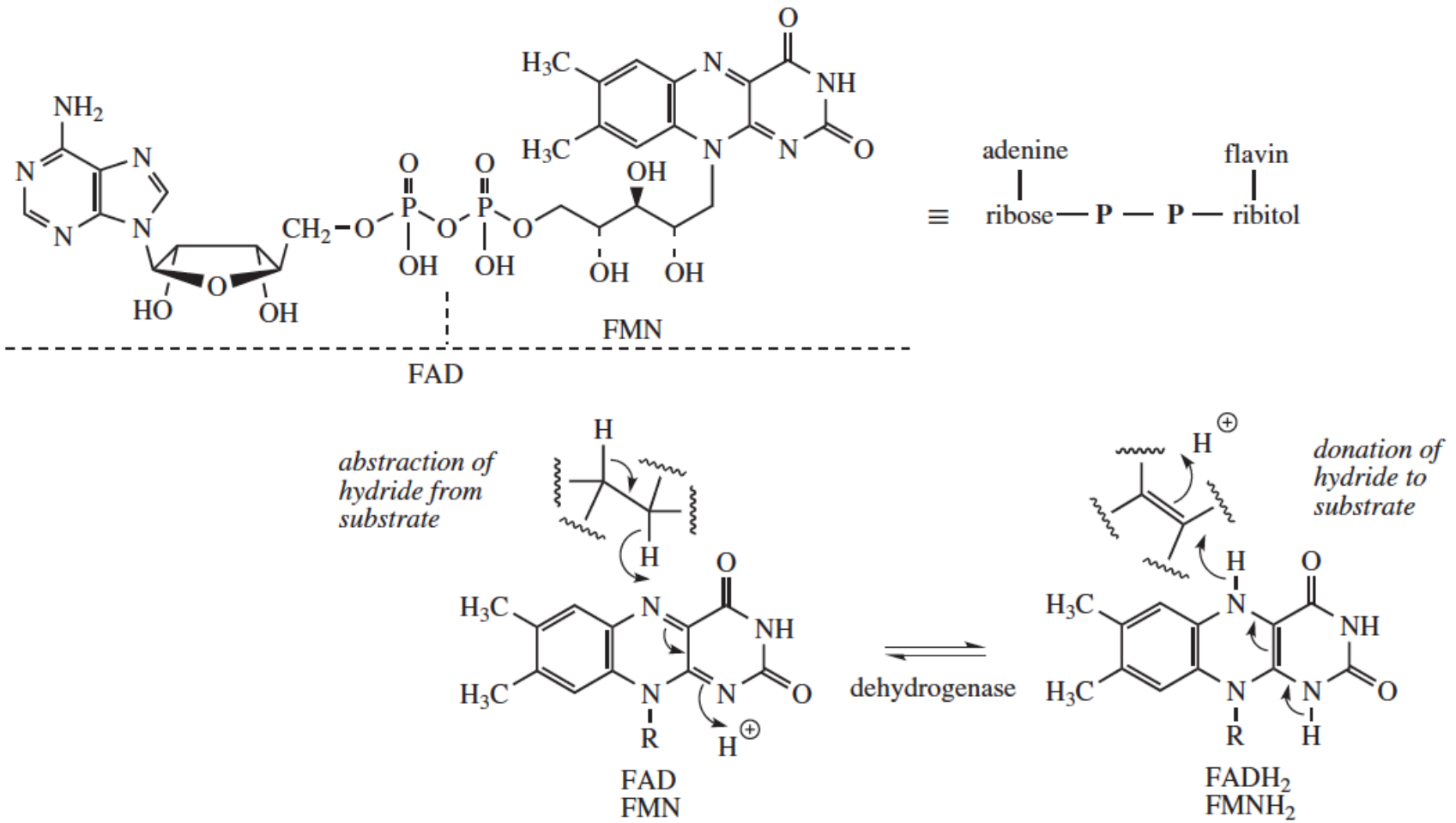
≡



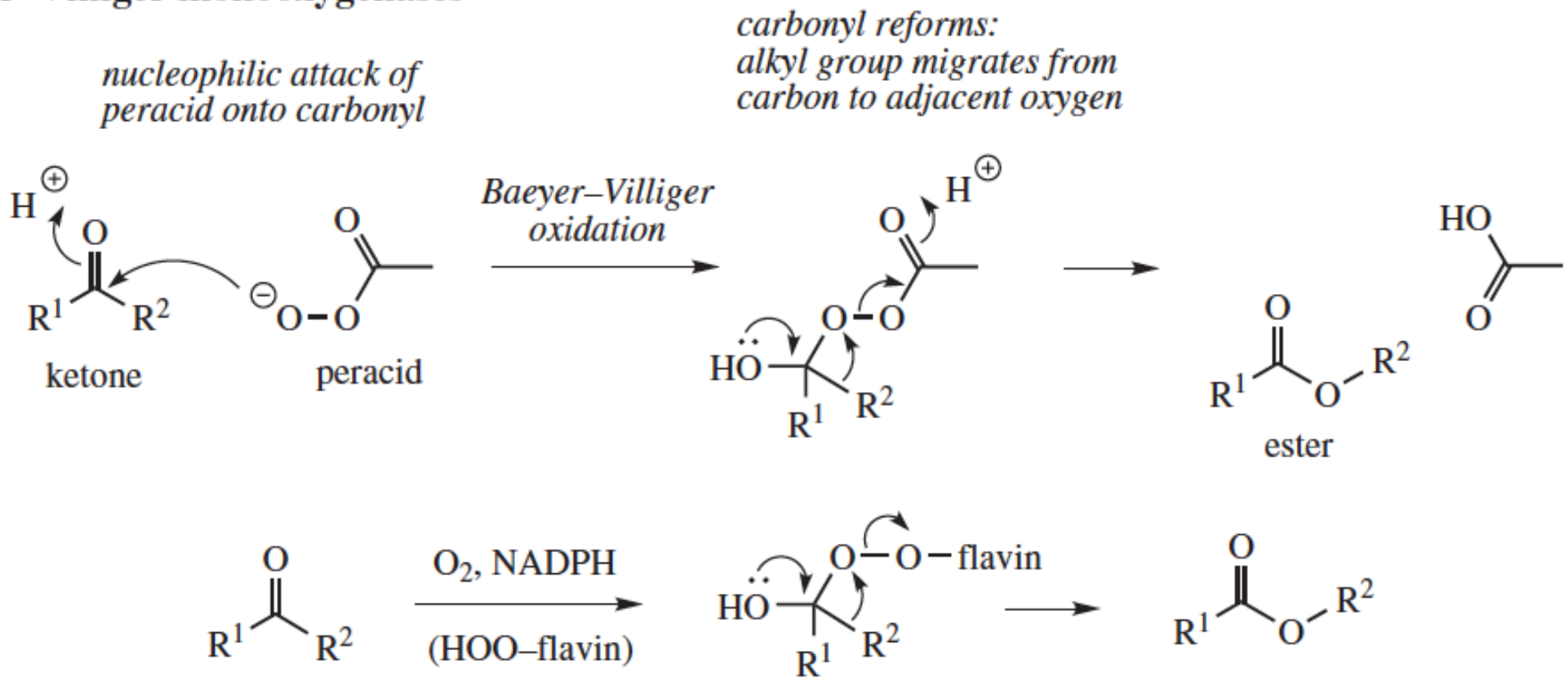


Meccanismi di reazione nella biosintesi delle sostanze naturali

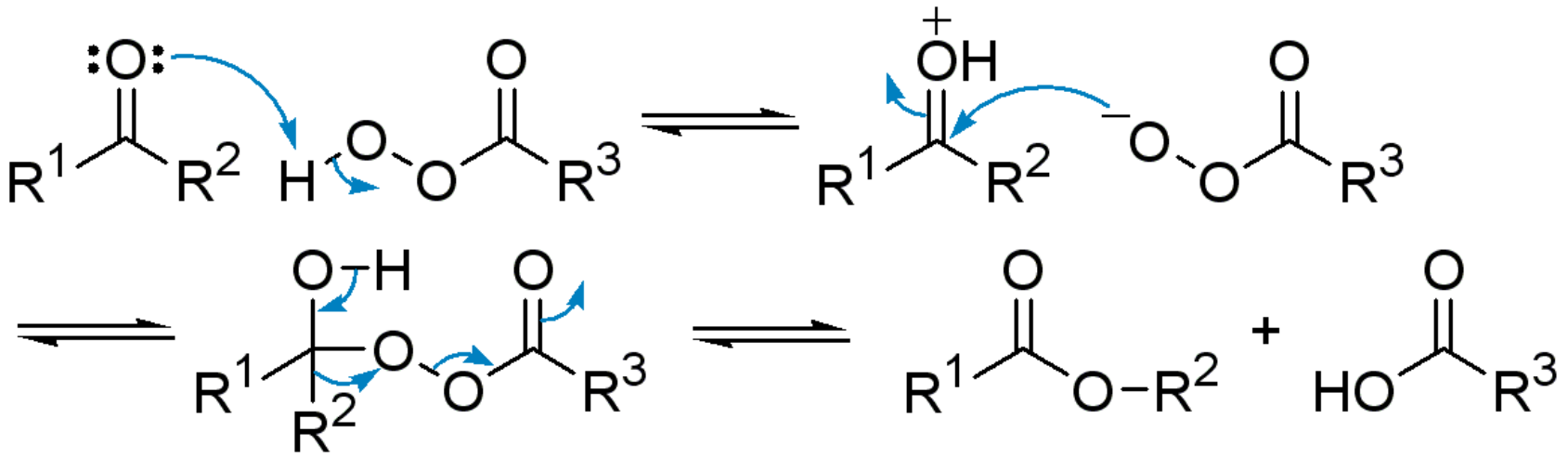
Dehydrogenases: FAD and FMN



Baeyer–Villiger monooxygenases

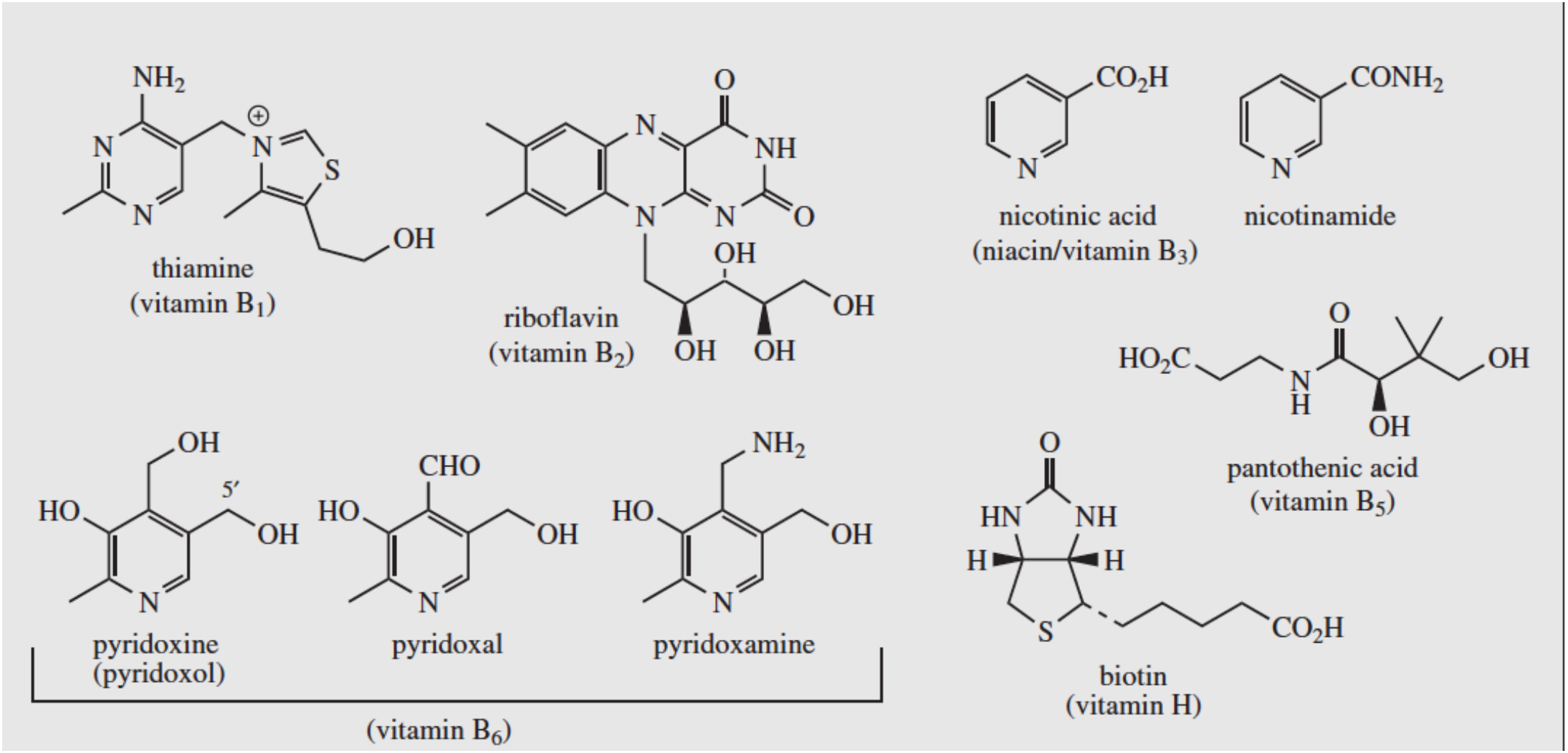


Meccanismi di reazione nella biosintesi delle sostanze naturali



https://it.wikipedia.org/wiki/Reazione_di_Baeyer-Villiger

Meccanismi di reazione nella biosintesi delle sostanze naturali



CONCLUSIONI

Non cercate di ricordare a **MEMORIA** le strutture, non è utile e si perde solo tempo, la parte importante da sapere sono i **MECCANISMI DI REAZIONE** che possono essere applicati in tutte le biosintesi e non solo.

Una volta acquisiti i meccanismi con cui le reazioni avvengono li potete usare per capire e commentare tutte le biosintesi che incontrerete durante questo corso ed anche nei corsi di Biochimica, Chimica farmaceutica I e II.

La memoria può aiutare ma NON deve essere l'unica cosa che vi deve guidare nello studio.

CAPITO il MECCANISMO tutto è consequenziale ed automatico; **POCHE REGOLE CHIARE** vi permetteranno di seguire con facilità tutto questo corso e superarlo in tutta tranquillità.