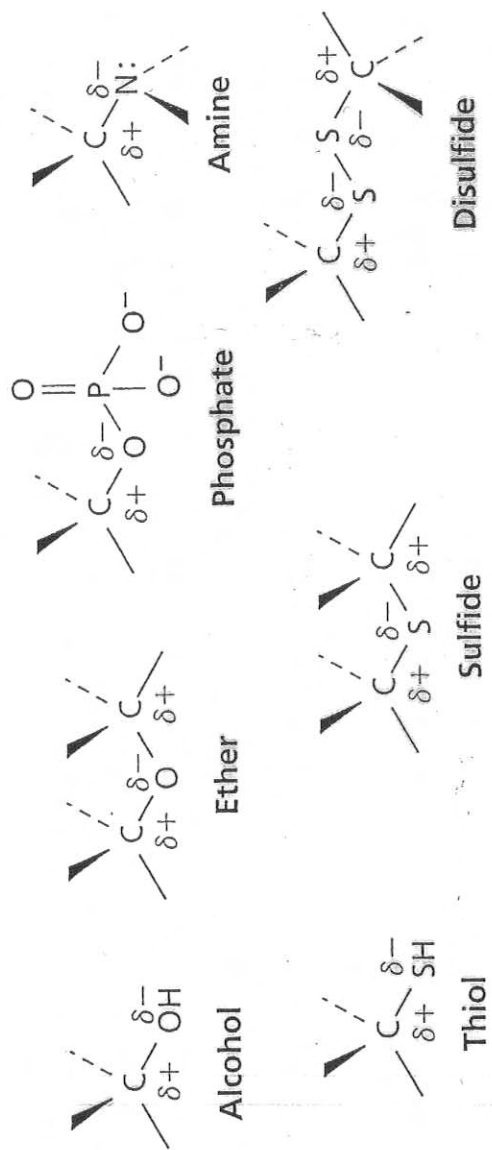
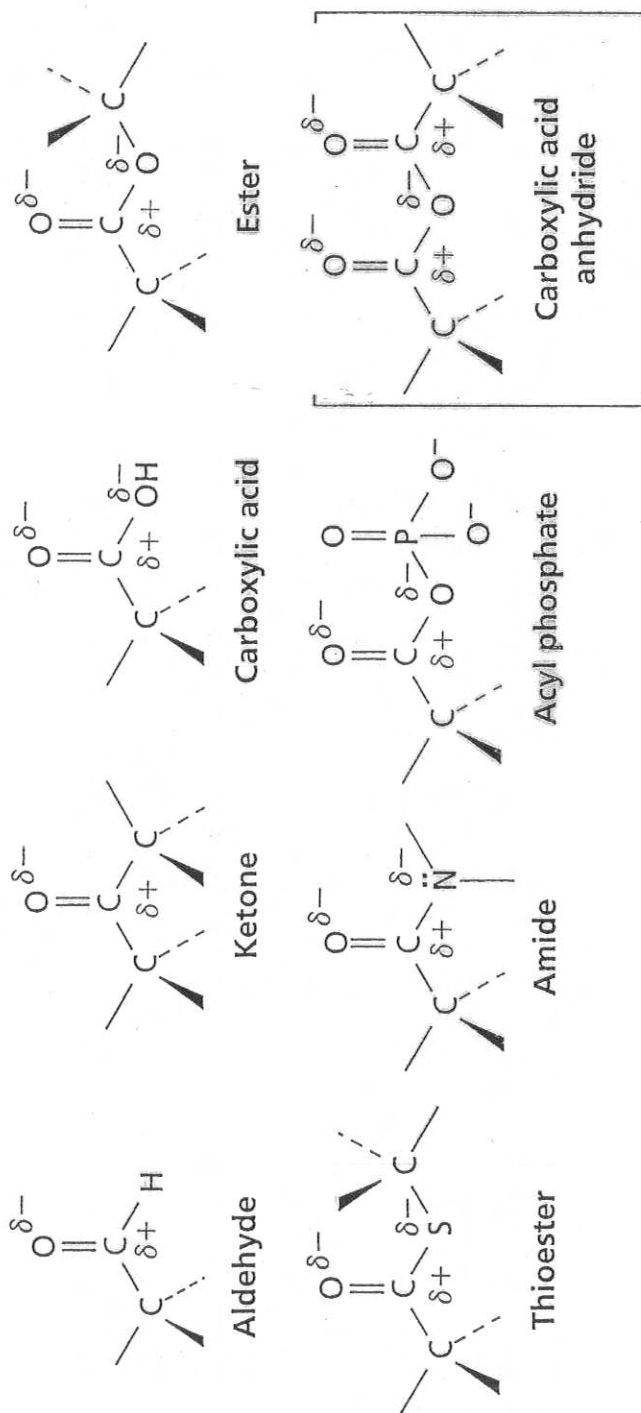


Οξέα και βάσεις κατά τον Lewis

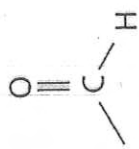
Οξύ	Βάση	Άμεσο προϊόν εξουδετερώσεως*	Τελικό σταθερό προϊόν
HCl	OH ₂	(HCl ← OH ₂)	H ₃ O ⁺ + Cl ⁻
CO ₂	OH ⁻	(O ₂ C ← OH ⁻)	HCO ₃ ⁻
Ag ⁺	2NH ₃	$ \left(\begin{array}{c} \text{NH}_3 \\ \swarrow \\ \text{Ag}^+ \\ \searrow \\ \text{NH}_3 \end{array} \right) $	Ag(NH ₃) ₂ ⁺
Ag ⁺	2CN ⁻	$ \left(\begin{array}{c} \text{CN}^- \\ \swarrow \\ \text{Ag}^+ \\ \searrow \\ \text{CN}^- \end{array} \right) $	Ag(CN) ₂ ⁻
SO ₃	CaO	(O ₃ S ← OCa)	Ca ²⁺ + SO ₄ ²⁻
SnCl ₄	2Cl ⁻	$ \left(\begin{array}{c} \text{Cl}^- \\ \swarrow \\ \text{SnCl}_4 \\ \searrow \\ \text{Cl}^- \end{array} \right) $	SnCl ₆ ²⁻
Cu ²⁺	4NH ₃	((H ₃ N →) ₄ Cu ²⁺)	Cu(NH ₃) ₄ ²⁺
AlCl ₃	:N \bigcirc	(Cl ₃ Al ← N \bigcirc)	ένωση προσθήκης



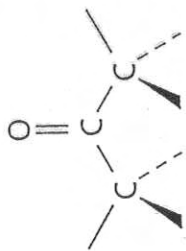
1 Polarity patterns of some common functional groups. The electronegative atom bears a partial negative charge (δ^-), and the carbon atom bears a partial positive charge (δ^+).



Polarity patterns in some carbonyl-containing functional groups. The carbonyl carbon atom is electron-poor ($\delta+$) and the oxygen atom is electron-rich ($\delta-$).

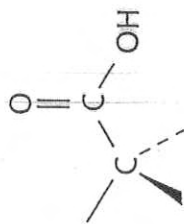


Aldehyde

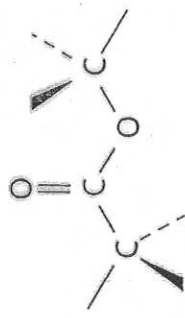


Ketone

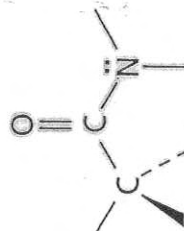
No leaving group is attached to the carbonyl carbon, so a substitution reaction is difficult.



Carboxylic acid

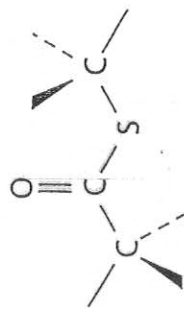


Ester

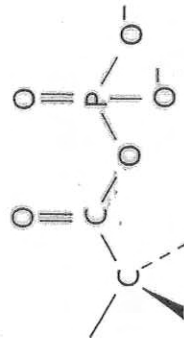


Amide

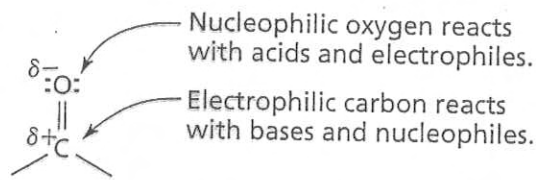
A potential leaving group is attached to the carbonyl carbon, so a substitution reaction is possible.



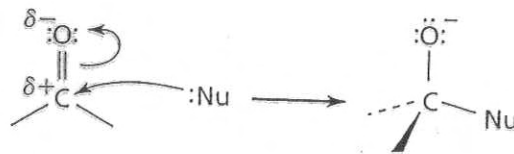
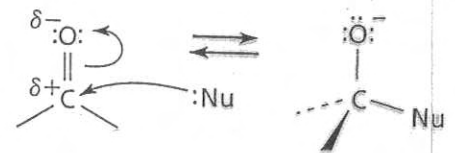
Thioester



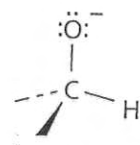
Acyl phosphate



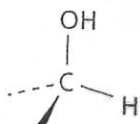
A nucleophilic addition reaction



(a) $:\text{Nu} = :\text{H}^-$

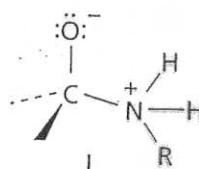


H^+



Alcohol

(b) $:\text{Nu} = \text{RNH}_2$



OH



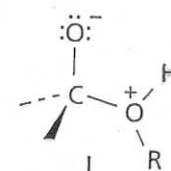
Carbinolamine

NR



Imine
(Schiff base)

(c) $:\text{Nu} = \text{ROH}$



OH



Hemiacetal

ROH

OR



Acetal

Some typical nucleophilic addition reactions of aldehydes and ketones. (a) With a hydride ion as nucleophile, protonation of the alkoxide intermediate leads to an alcohol. (b) With an amine as nucleophile, proton transfer and loss of water leads to an imine. (c) With an alcohol as nucleophile, proton transfer leads to a hemiacetal, and further reaction with a second equivalent of alcohol leads to an acetal.

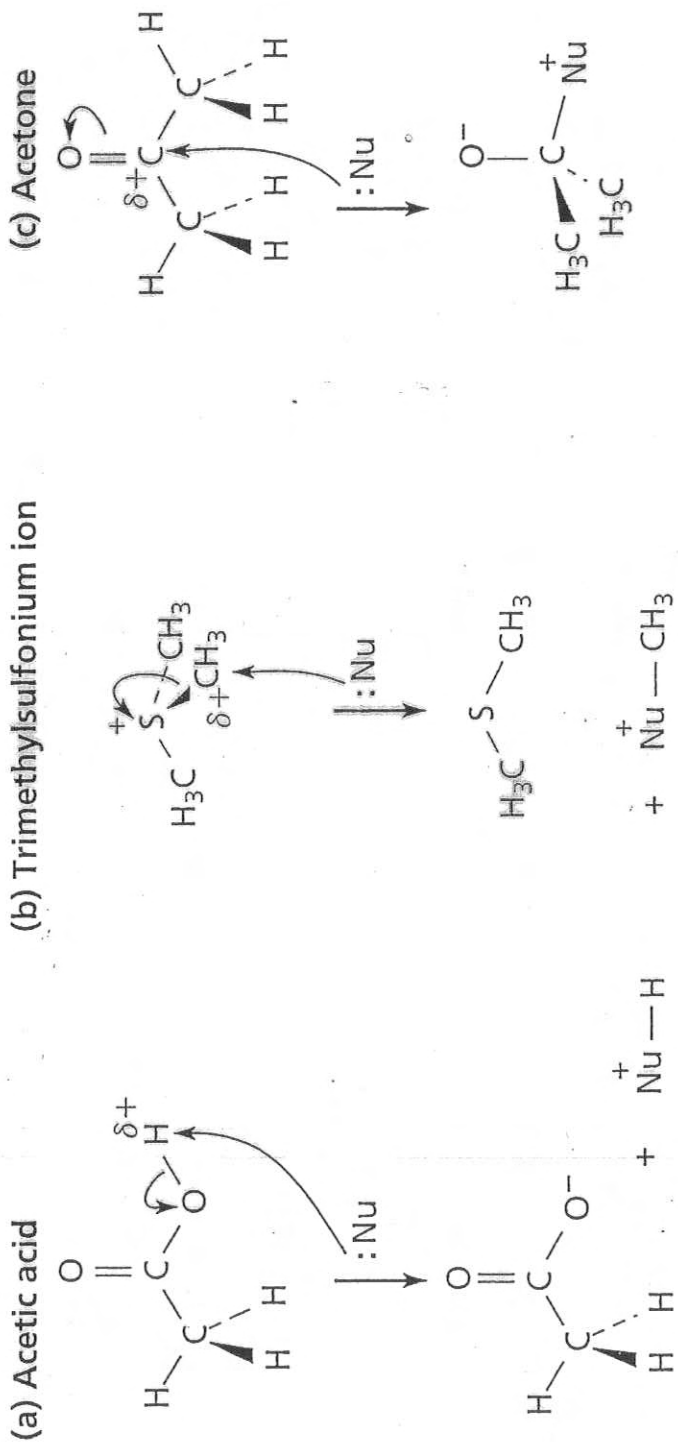
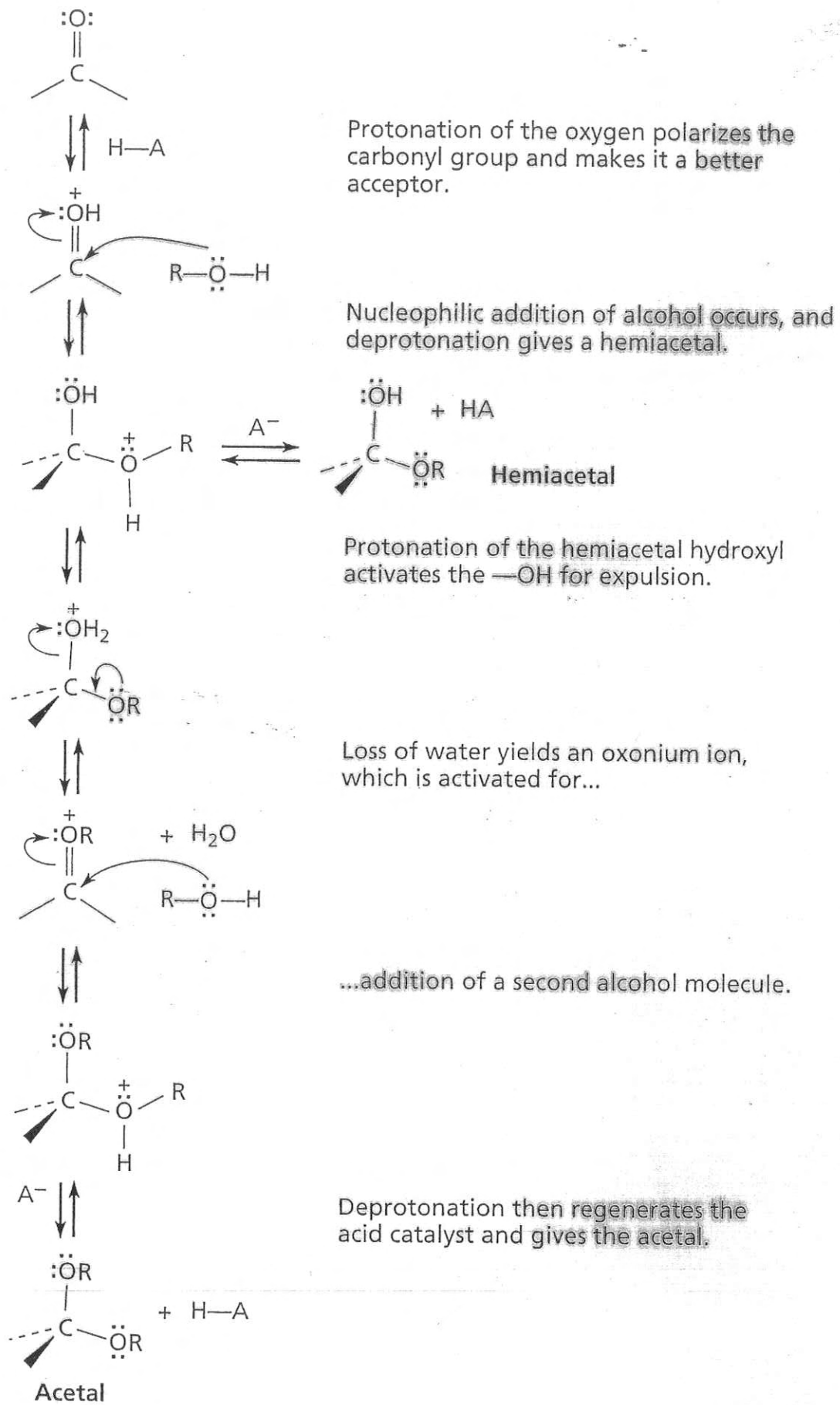


FIGURE 1.3 Some electrophiles and their reactions with nucleophiles (:Nu).



Protonation of the oxygen polarizes the carbonyl group and makes it a better acceptor.

Nucleophilic addition of alcohol occurs, and deprotonation gives a hemiacetal.

Protonation of the hemiacetal hydroxyl activates the —OH for expulsion.

Loss of water yields an oxonium ion, which is activated for...

...addition of a second alcohol molecule.

Deprotonation then regenerates the acid catalyst and gives the acetal.

Mechanism of acid-catalyzed hemiacetal and acetal formation by reaction of an aldehyde or ketone with an alcohol.

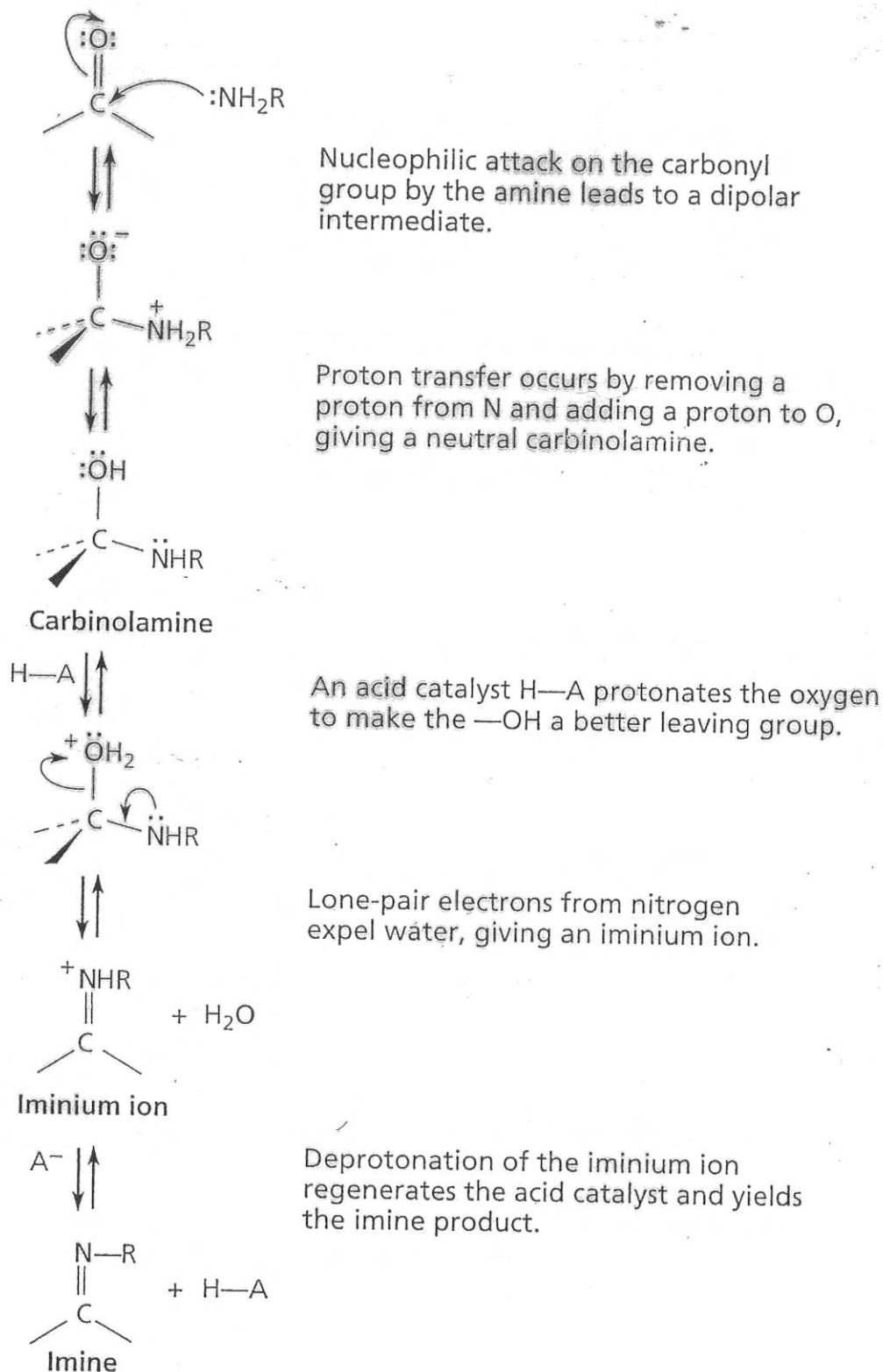
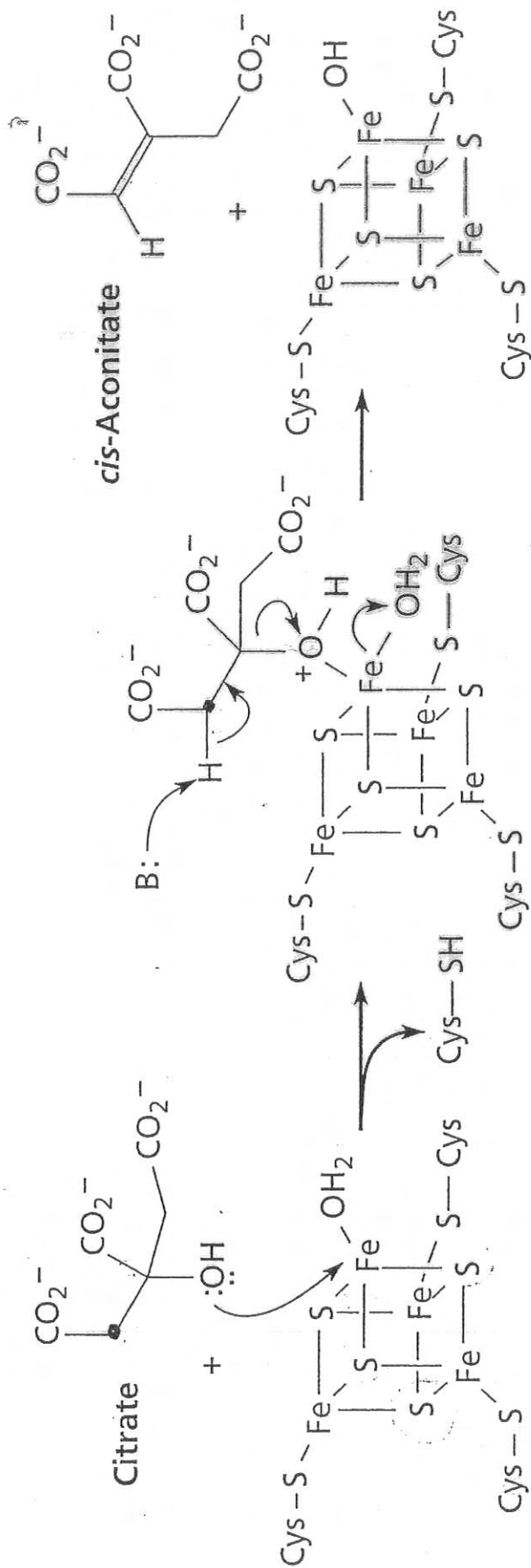


FIGURE 9.1. Mechanism of acid-catalyzed imine (Schiff base) formation by reaction of an aldehyde or ketone with a primary amine, RNH_2 .



An iron-sulfur cluster
(Cys = cysteine)