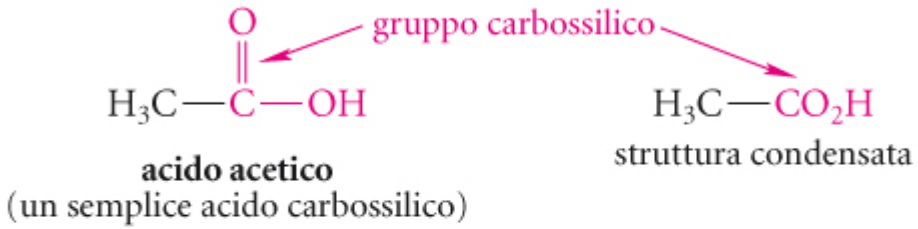
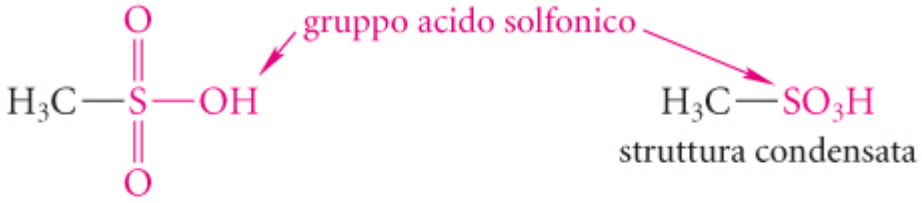
ACIDI CARBOSSILICI



acido acetico
(un semplice acido carbossilico)



acido metansolfonico
(un acido solfonico semplice)

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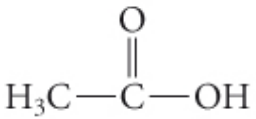
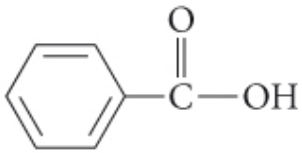
NOMENCLATURA



prefisso (Tabella 19.1, p. 890): acet. *acido* acet + *ico* = **acido acetico**



acido benzo + *ico* = **acido benzoico**

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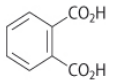
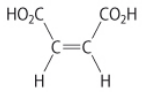
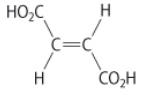
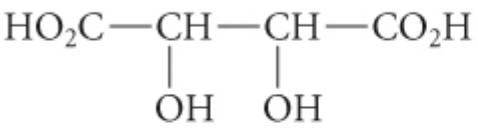
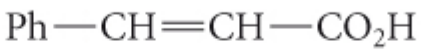
TABELLA 20.1 Nomi e strutture di alcuni acidi carbossilici

Nome sistematico	Nome d'uso	Struttura
acido metanoico*	acido formico	HCO_2H
acido etanoico*	acido acetico	CH_3CO_2H
acido propanoico	acido propionico	$CH_3CH_2CO_2H$
acido butanoico	acido butirrico	$CH_3CH_2CH_2CO_2H$
acido 2-metilpropanoico	acido isobutirrico	$(CH_3)_2CHCO_2H$
acido pentanoico	acido valerico (valerianico)	$CH_3(CH_2)_3CO_2H$
acido 3-metilbutanoico	acido isovalerico (isovalerianico)	$(CH_3)_2CHCH_2CO_2H$
2,2-acido dimetilpropanoico	acidp pivalico	$(CH_3)_3CCO_2H$
acido esanoico	acido caproico	$CH_3(CH_2)_4CO_2H$
acido ottanoico	acido caprilico	$CH_3(CH_2)_6CO_2H$
acido decanoico	acido caprico	$CH_3(CH_2)_8CO_2H$
acido dodecanoico	acido laurico	$CH_3(CH_2)_{10}CO_2H$
acido tetradecanoico	acido miristico	$CH_3(CH_2)_{12}CO_2H$
acido esadecanoico	acido palmitico	$CH_3(CH_2)_{14}CO_2H$
acido ottadecanoico	acido stearico	$CH_3(CH_2)_{16}CO_2H$
acido 2-propenoico*	acido acrilico	$H_2C{=}CHCO_2H$
acido 2-butenoico*	acido crotonico	$CH_3CH{=}CHCO_2H$
acido benzoico	acido benzoico	$PhCO_2H$
	Acidi dicarbossilici	
acido etandioico*	acido ossalico	$HO_2C{-}CO_2H$
acido propandioico*	acido malonico	$HO_2CCH_2CO_2H$
acido butandioico*	acido succinico	$HO_2C(CH_2)_2CO_2H$
acido pentandioico*	acido glutarico	$HO_2C(CH_2)_3CO_2H$
acido esandioico*	acido adipico	$HO_2C(CH_2)_4CO_2H$
acido eptandioico*	acido pimelico	$HO_2C(CH_2)_5CO_2H$
acido 1,2-benzendicarbossilico*	acido ftalico	
acido (Z)-2-butendioico*	acido maleico	
acido (E)-2-butendioico*	acido fumarico	

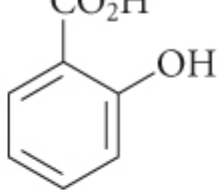
* Si utilizza quasi sempre il nome d'uso.



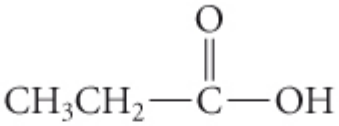
acido tartarico



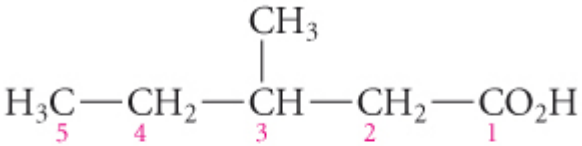
acido cinnamico



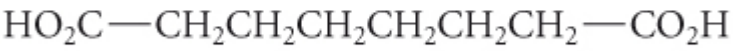
acido salicilico



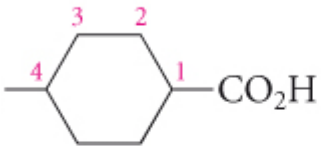
acido propanø + *oico* = **acido propanoico**



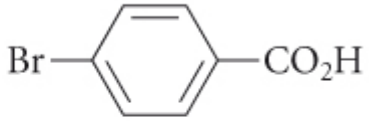
acido 3-metilpentanoico



acido ottandioico



acido 4-metilcicloesancarbossilico



acido 4-bromobenzoico
o acido *p*-bromobenzoico

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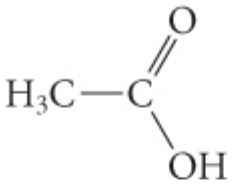
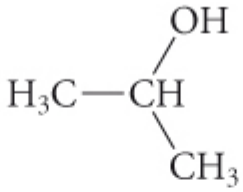
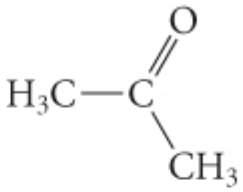
PROPRIETA' FISICHE



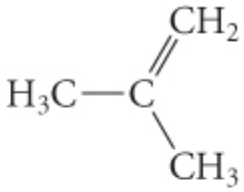
acido acetico



alcol isopropilico

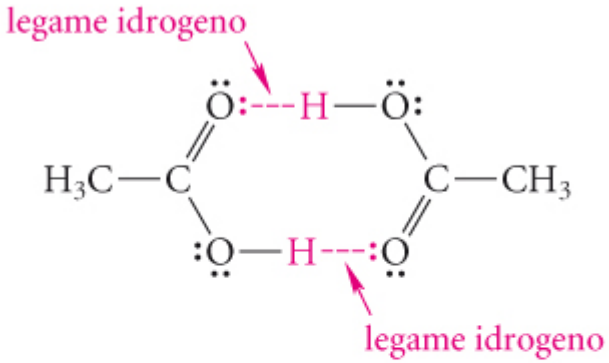


acetone



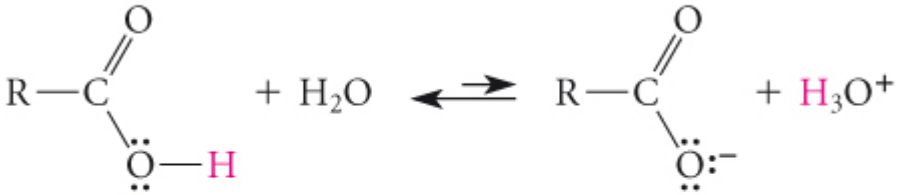
isobutilene

punto di ebollizione	117.9 °C	82.3 °C	56.5 °C	−6.9 °C

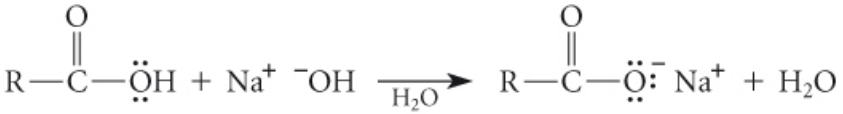


dimero dell'acido acetico

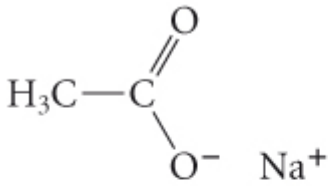
EQUILIBRIO ACIDO-BASE



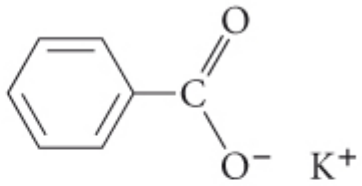
acido carbossilico — ione carbossilato



più solubile in acqua dell'acido carbossilico

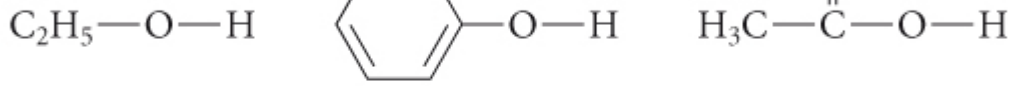


acetato di sodio
(acetico + *ato* = **acetato**)

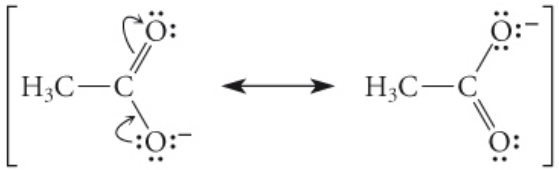


benzoato di potassio

Acidità crescente



pK_a	15.9	9.95	4.76



strutture di risonanza dello ione acetato

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TABELLA 20.2 Valori di pK_a di alcuni acidi carbossilici

Acido*	pK_a
formico	3.75
acetico	4.76
propionico	4.87
2,2-dimetilpropanoico (pivalico)	5.05
acrilico	4.26
cloroacetico	2.85
fenilacetico	4.31
benzoico	4.18
p-metilbenzoico (*p*-toluico)	4.37
p-nitrobenzoico	3.43
p-clorobenzoico	3.98
p-metossibenzoico	4.47
2,4,6-trinitrobenzoico	0.65

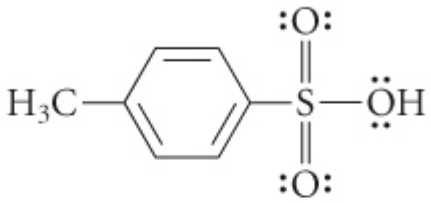
*Vedi Tabella 20.1 per le strutture.

TABELLA 20.3 Valori di pK_a di alcuni acidi dicarbossilici

Acido*	prima pK_a	seconda pK_a
carbonico	3.77‡	10.33
ossalico	1.27	4.27
malonico	2.86	5.70
succinico	4.21	5.64
glutarico	4.34	5.27
adipico	4.41	5.28
ftalico	2.95	5.41

*Vedi Tabella 20.1 per le strutture.

‡Queso valore, che tiene conto solo della quantità di H_2CO_3 presente nelle soluzioni acquose di CO_2, è il pK_a effettivo dell'acido carbonico. Un valore di 6.4, spesso citato nei libri, considera la CO_2 disciolta in acqua come se fosse tutta H_2CO_3.



acido *p*-toluensolfonico
(TsOH, o acido tosico)
un acido forte; p$K_a \approx -1$

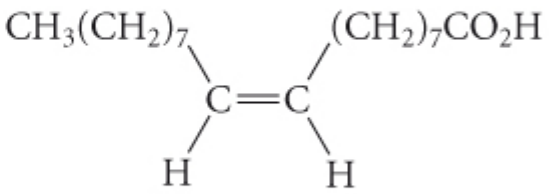
ACIDI GRASSI a LUNGA CATENA e loro SALI

$CH_3(CH_2)_{14}CO_2H$ o $CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CO_2H$

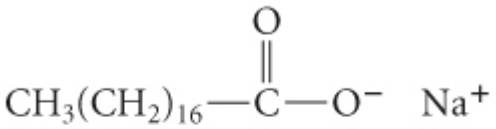
acido palmitico
(dall'olio di palma)

$CH_3(CH_2)_{16}CO_2H$

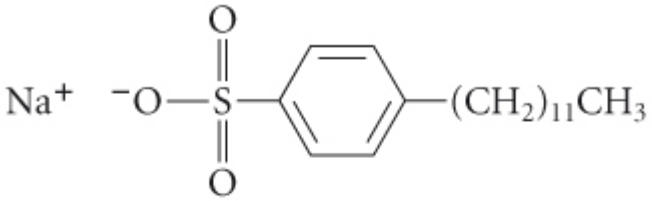
acido stearico
(dal Greco *stear*, sego o grasso di bue)



acido oleico



stearato di sodio
(un sapone)



4-dodecil-1-benzensolfonato di sodio
(un detergente sintetico)

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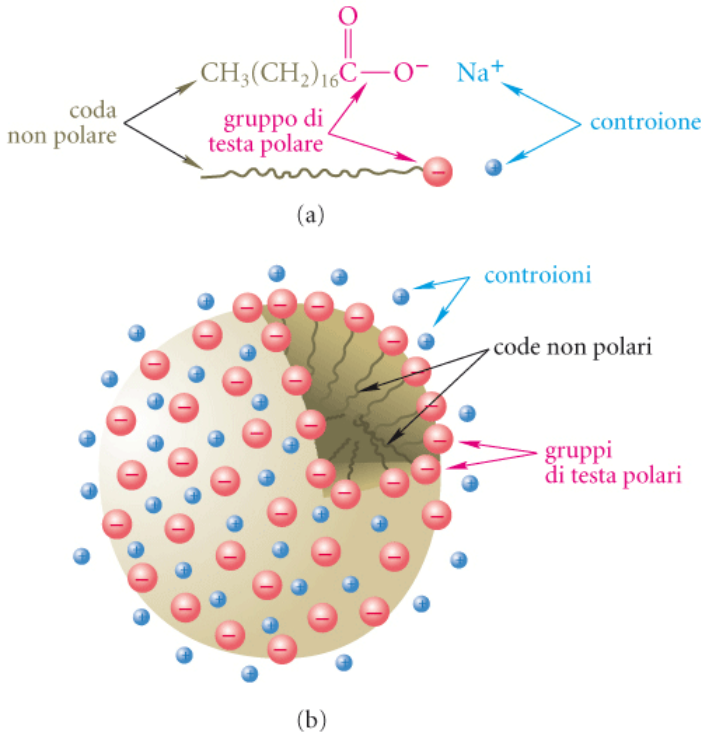
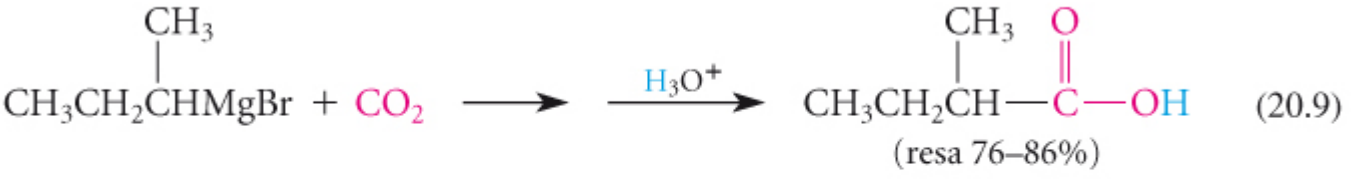
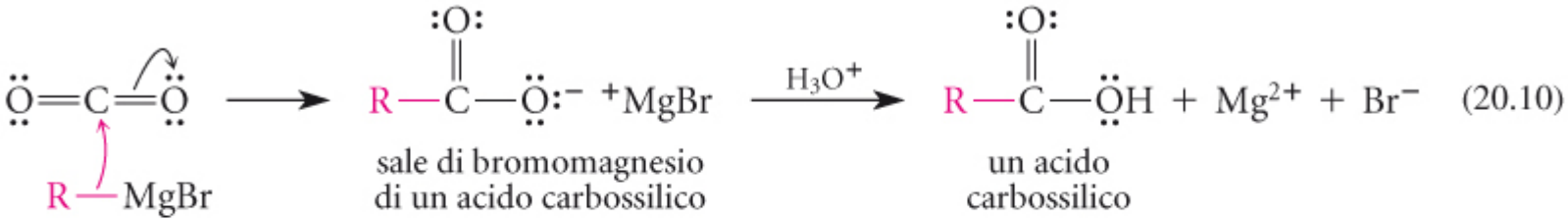


Figura 20.3 (a) Rappresentazione schematica di un sapone. Il gruppo di testa polare (il gruppo carbossilato) è rappresentato da un sfera rossa, la coda non polare da una linea ondulata e il controione da una sfera blu. (b) Spaccato della struttura di una micella. Ogni micella contiene 50–150 molecole ed è più o meno sferica. Nota che i gruppi che formano le teste polari sono direzionati verso l'esterno della micella, in contatto con l'acqua, mentre le code non polari interagiscono tra di loro e si posizionano all'interno della micella, lontane dall'acqua.

SINTESI ACIDI CARBOSSILICI





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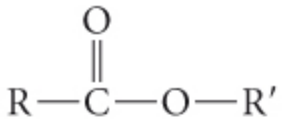
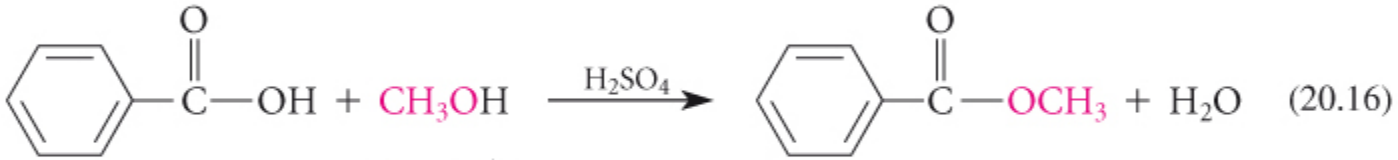
REAZIONE di ESTERIFICAZIONE



struttura generale
di un estere

(R = H, alchile o arile; R′ = alchile o arile)



(20.16)

acido benzoico

metanolo
(largo eccesso;
usato come solvente)

benzoato di metile
(un estere; resa 85-95%)

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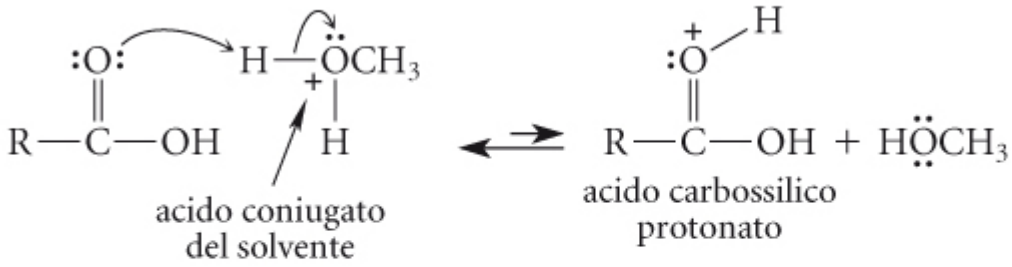
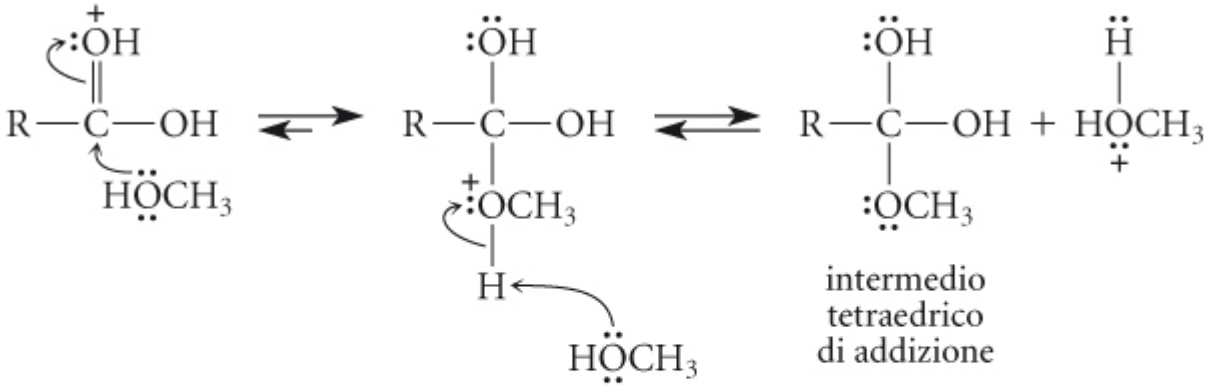
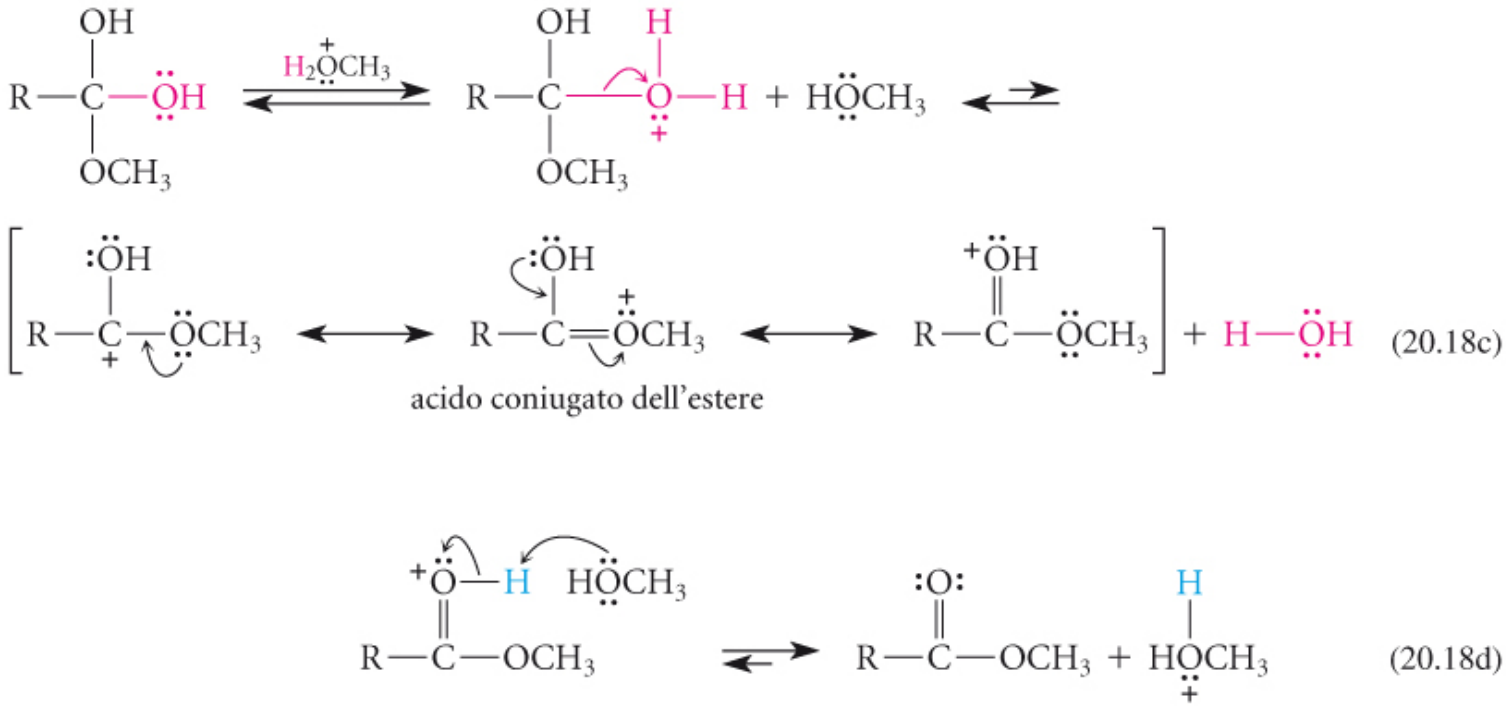

acido coniugato
del solvente
acido carbossilico
protonato

(20.18a)


intermedio
tetraedrico
di addizione

(20.18b)



! Estensione del meccanismo di addizione al carbonile !

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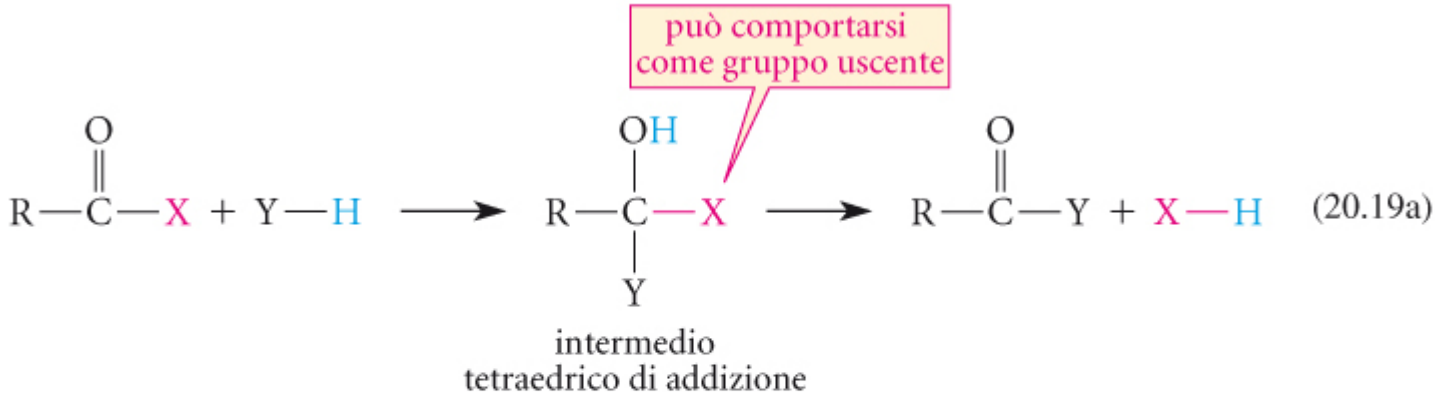
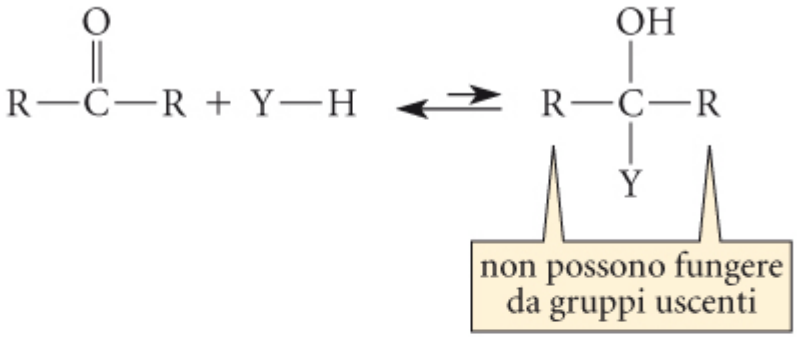
! Sostituzione al carbonio carbonilico!

Sostituzione al carbonio carbonilico

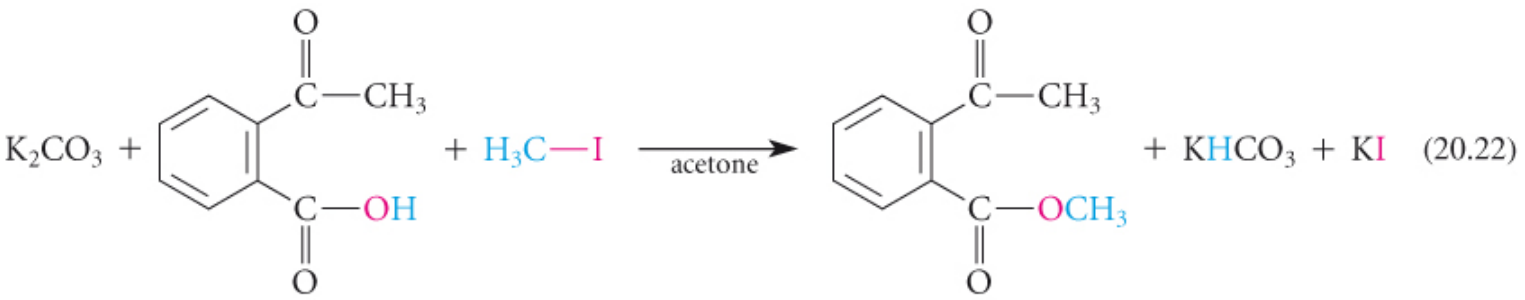


Sostituzione al C=O = addizione al C=O + eliminazione

Sostituzione al carbonio carbonilico non possibile per aldeidi e chetoni



ESTERIFICAZIONE *via* ALCHILAZIONE



acido 2-acetilbenzoico

2-acetilbenzoato di metile
(resa 65%)

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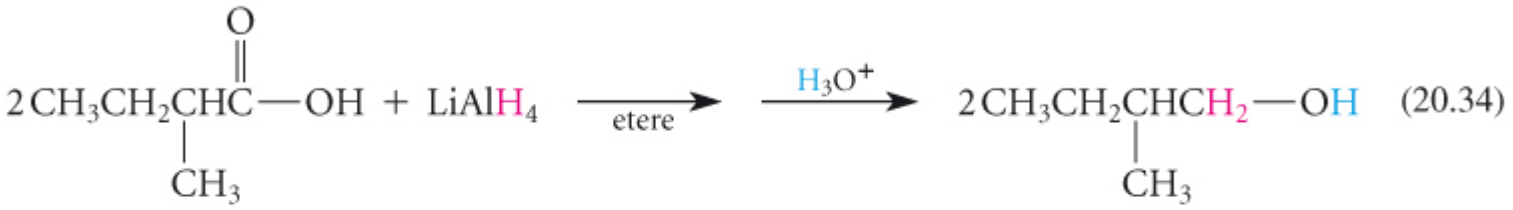
EdiSES

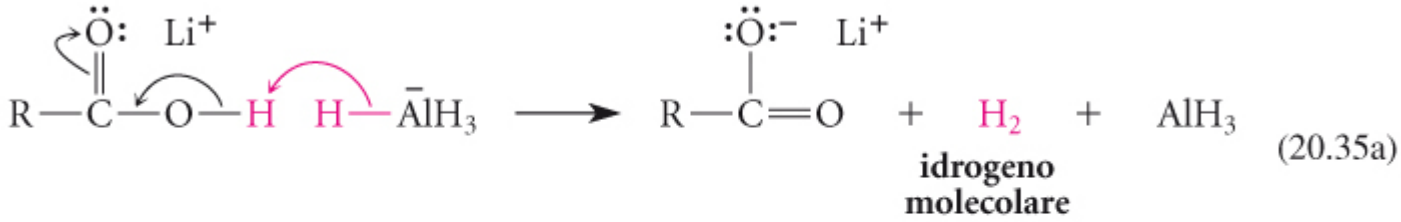
RIDUZIONE ACIDI ad ALCOLI PRIMARI



acido 2-metilbutanoico

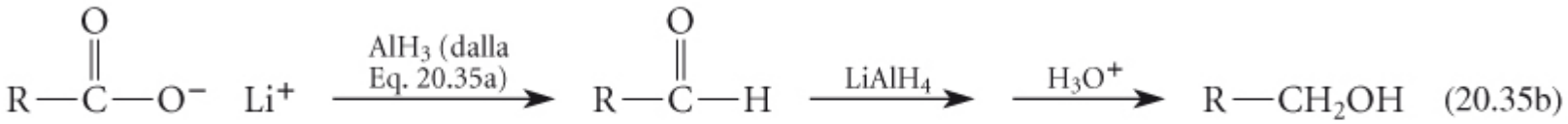
2-metil-1-butanolo
(resa 83%)

(20.34)

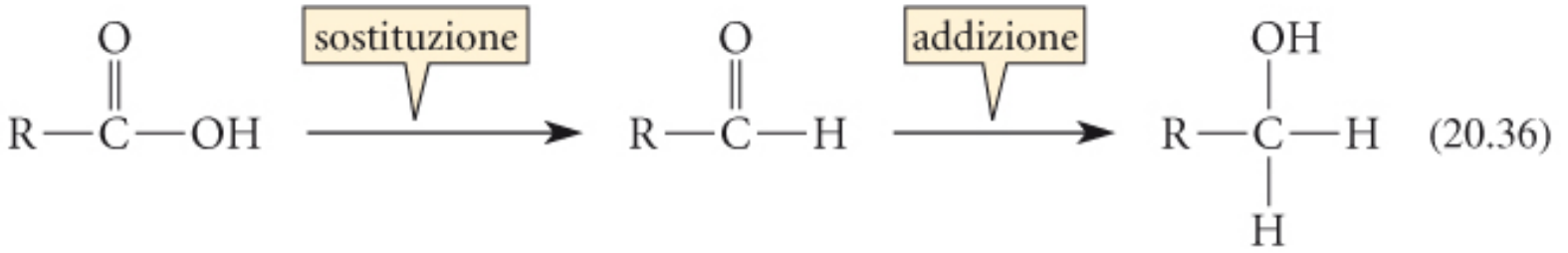


idrogeno molecolare

(20.35a)



(20.35b)



(20.36)