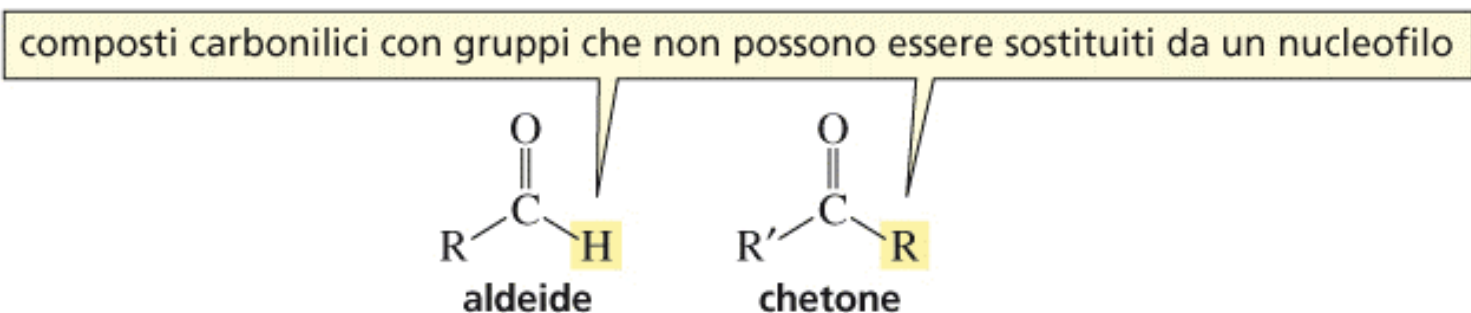


## Composti carbonilici II

Il gruppo carbonilico è sostituito da due idrogeni o residui alchilici. Se almeno uno dei due sostituenti è un atomo di idrogeno il composto è un' aldeide, se entrambi i sostituenti sono gruppi alchilici il composto è un **chetone**:

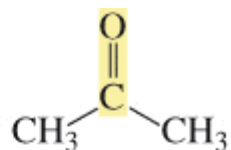


Aldeidi e chetoni non contengono gruppi che possono essere sostituiti da un nucleofilo. Le reazioni preferite saranno quindi **addizioni nucleofile** o **sostituzioni dell'atomo di ossigeno**.

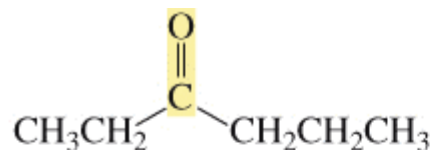
## Nomenclatura

### Chetoni

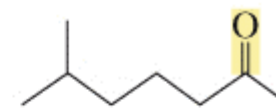
Al nome dell'alcano corrispondente si sostituisce la desinenza «o» con «one». La catena viene numerata in modo da dare il numero più basso possibile al gruppo carbonilico.



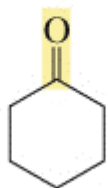
nome sistematico: **propanone**  
 nome d'uso: **acetone**  
 nome derivato: **dimetil chetone**



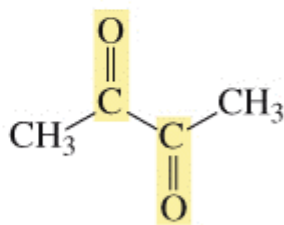
**3-esanone**  
 etil propil chetone



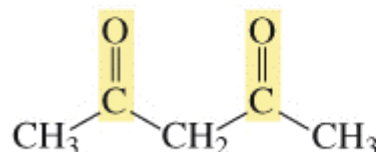
**6-metil-2-eptanone**  
 isoetil metil chetone



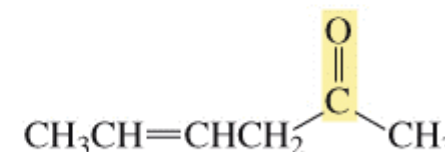
nome sistematico: **cicloesanone**  
 nome d'uso:



**butandione**



**2,4-pentandione**  
**acetilacetone**

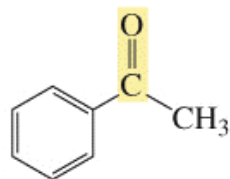


**4-esen-2-one**

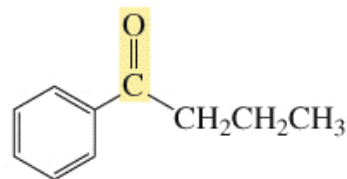
# Nomenclatura

## Chetoni

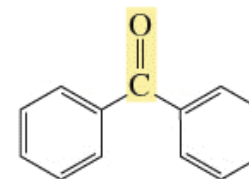
Se il gruppo carbonilico è indicato come sostituito si usa il prefisso «**OSSO**»



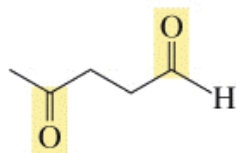
nome d'uso: **acetofenone**  
nome derivato: **metil fenil chetone**



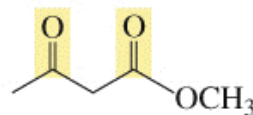
nome d'uso: **butirrofenone**  
nome derivato: **fenil propil chetone**



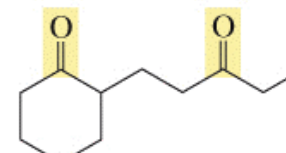
nome d'uso: **benzofenone**  
nome derivato: **difenil chetone**



nome sistematico: **4-ossopentanal**



nome sistematico: **metil 3-ossobutanoato**

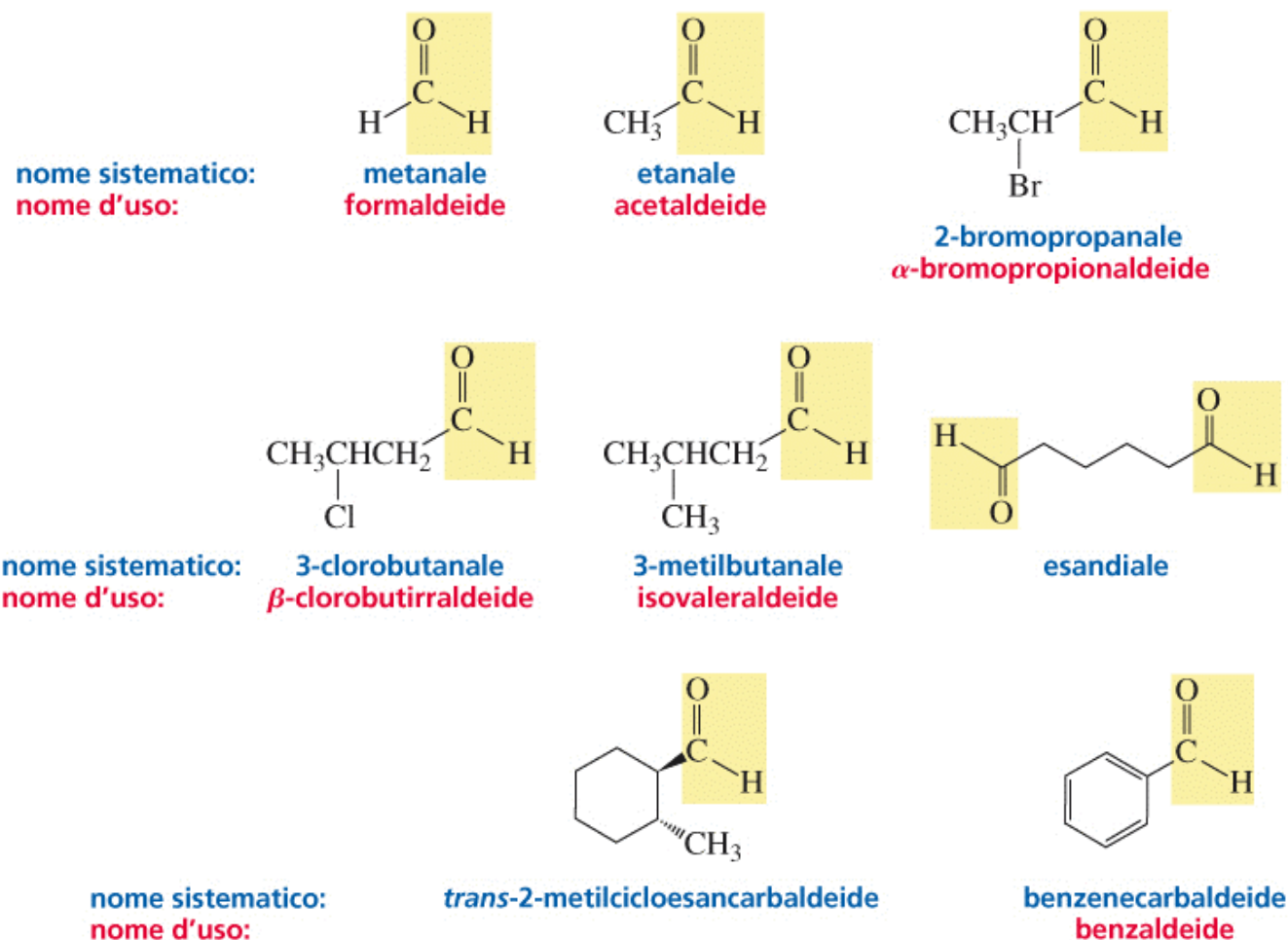


nome sistematico: **2-(3-ossopentil)-cicloesano**

# Nomenclatura

## Aldeidi

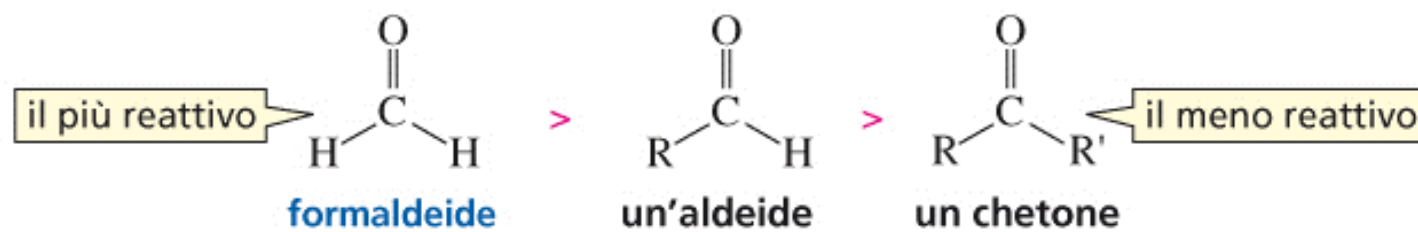
Al nome dell'alcano corrispondente si sostituisce la desinenza «o» con «ale». Se si indica il gruppo carbonilico come sostituente si usa il prefisso «osso» o il suffisso «carbaldeide»



## Le reattività

I gruppi alchilici donano elettroni

reattività relative

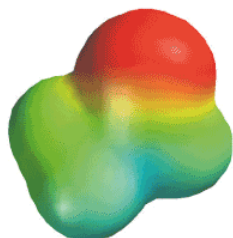


## Le reattività

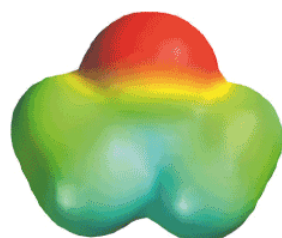
I gruppi alchilici producono ingombro sterico



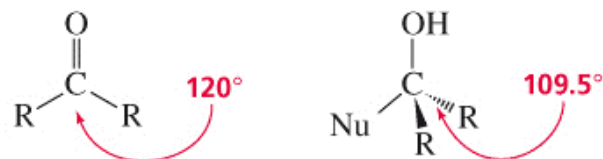
formaldeide



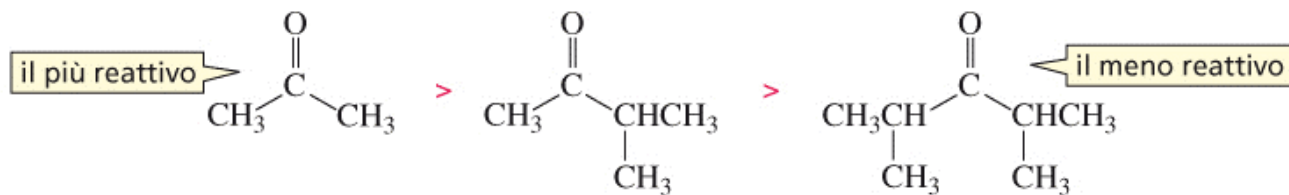
acetaldeide



acetone

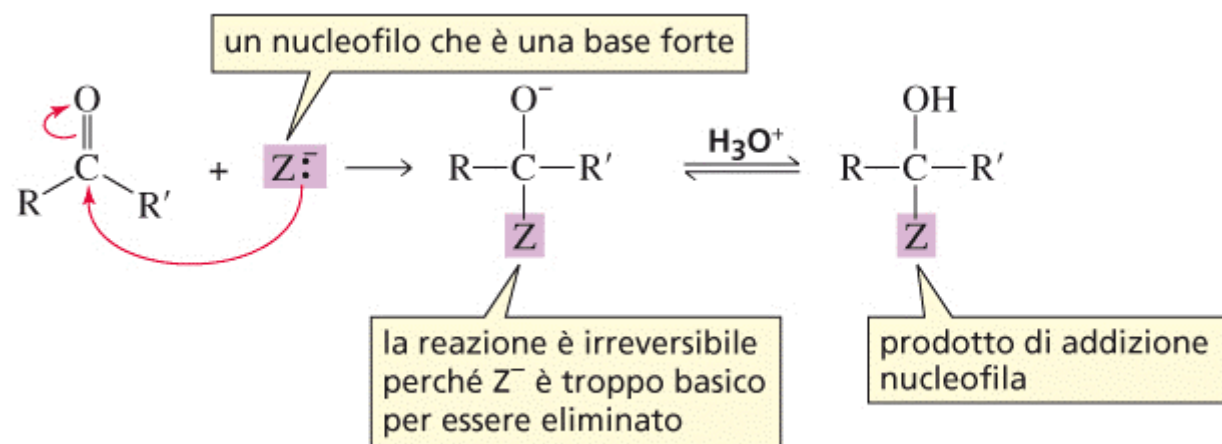


reattività relative



## Le reazione

Addizione nucleofila acilica

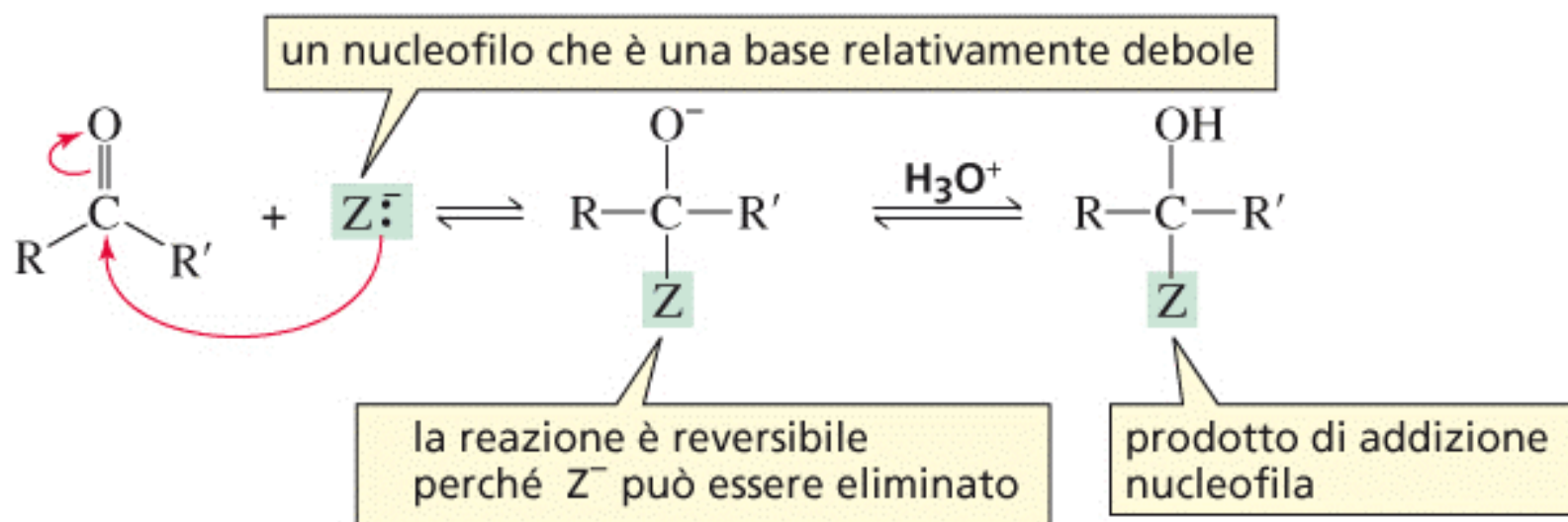


Aldeidi e chetoni non contengono un gruppo uscente, la reazione con i nucleofili diventa una **addizione** di HZ al doppio legame C=O. Rispetto alla corrispondente reazione degli alcheni, il meccanismo vede il doppio legame agire da elettrofilo (orbitale  $\pi^*$ ) e non da nucleofilo (orbitale  $\pi$ ).

**Se Z è un nucleofilo molto basico la reazione è irreversibile**

## Le reazione

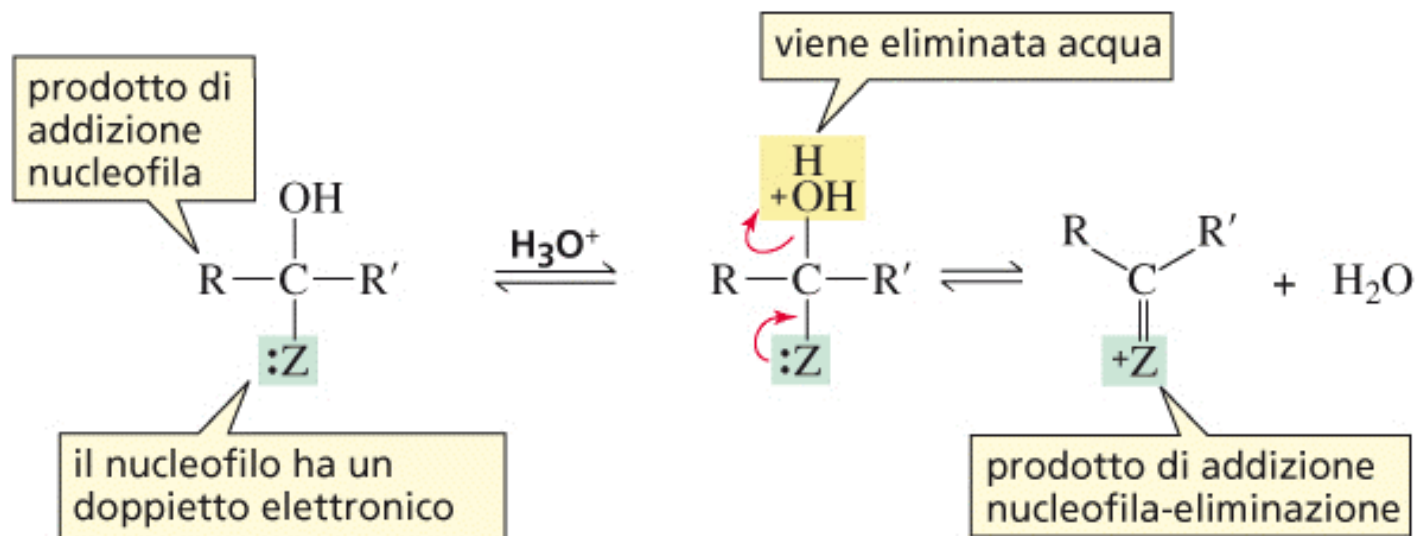
Addizione nucleofila acilica



Se Z è un nucleofilo moderatamente basico la reazione è reversibile

## Le reazione

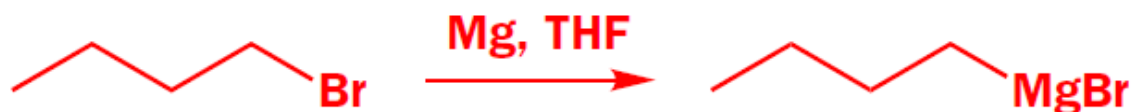
Addizione nucleofila acilica



Se Z dispone di doppietti elettronici non condivisi, **può verificarsi la sostituzione dell'ossigeno carbonilico in ambiente acido**

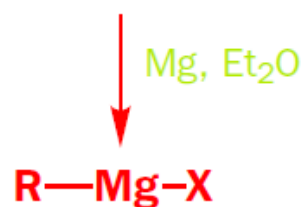
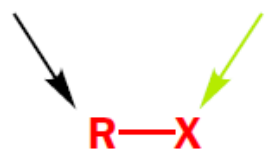
## Addizione al carbonile

Composti organometallici: i reattivi di Grignard ed i litioalchili



R can be alkyl  
or aryl

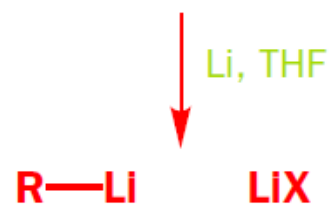
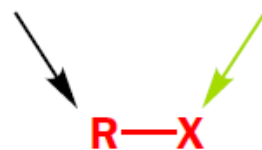
X can be I, Br,  
or Cl



alkylmagnesium halide  
(Grignard reagent)

R can be alkyl  
or aryl

X can be I, Br,  
or Cl

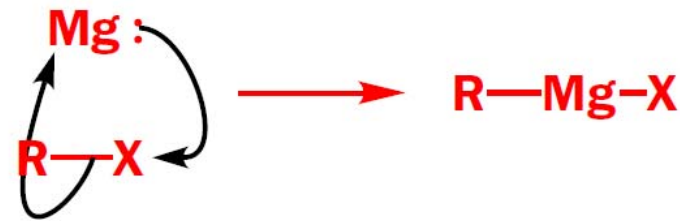
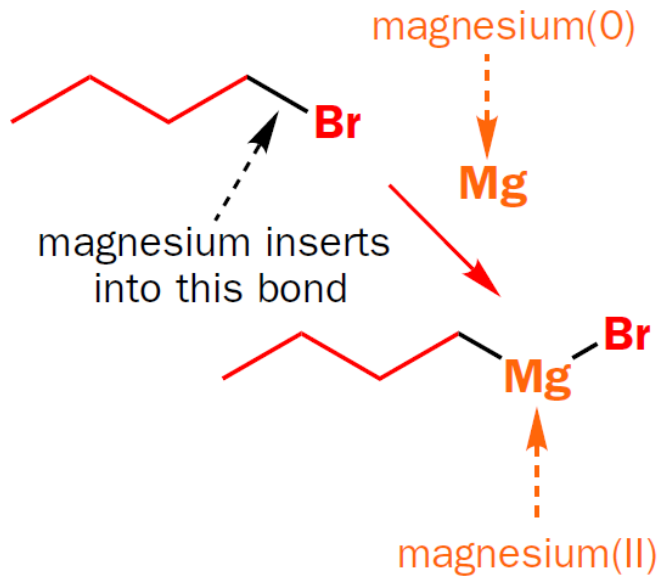


Organolithium compound

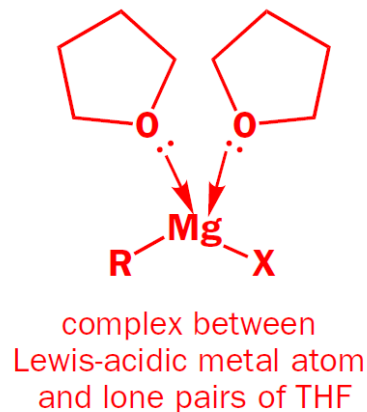
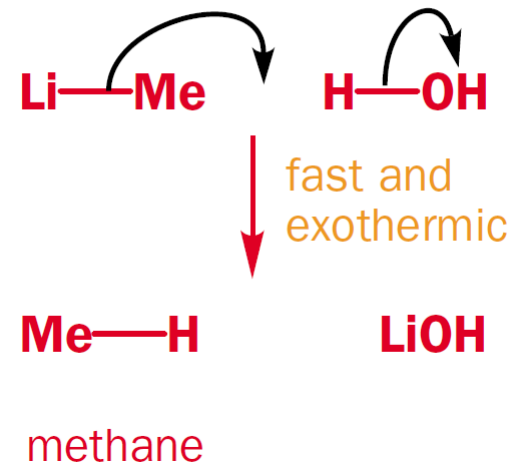
## Addizione al carbonile

Composti organometallici: i reattivi di Grignard ed i litioalchili

oxidative insertion



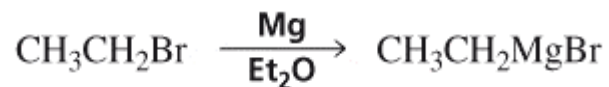
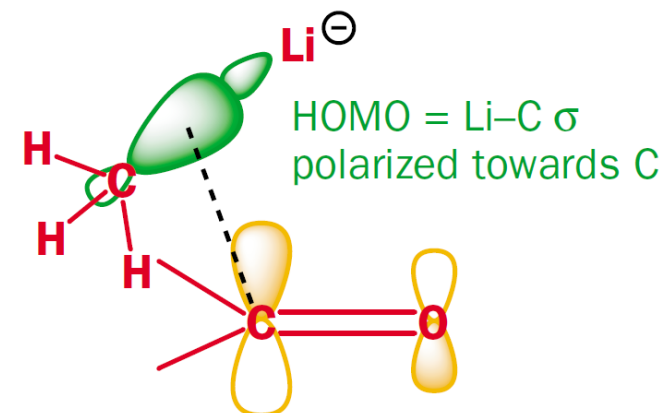
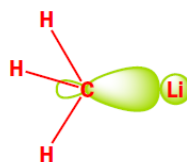
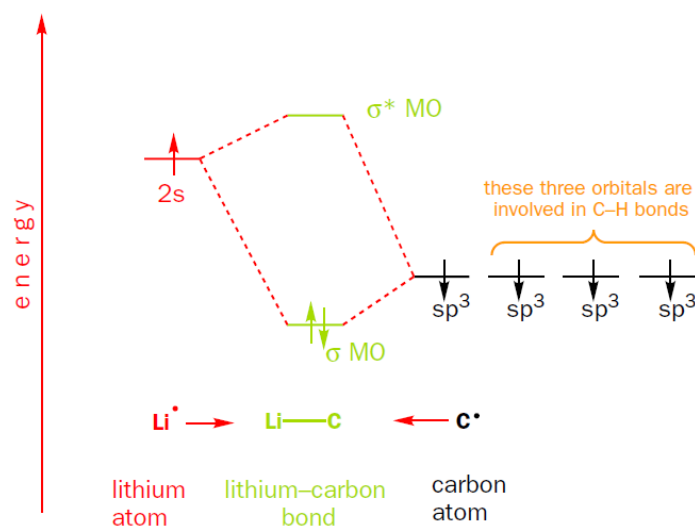
organometallics are destroyed by water



## Addizione al carbonile

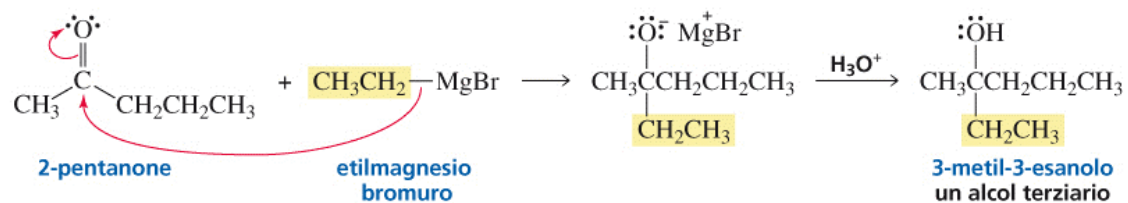
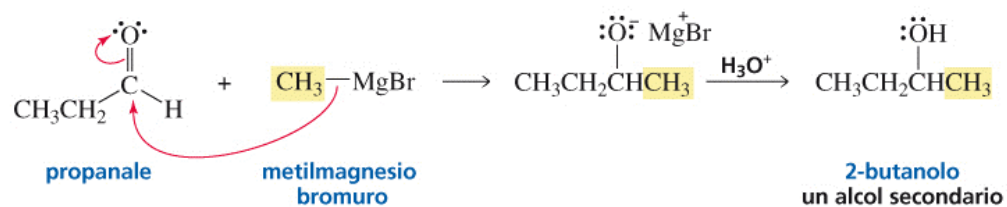
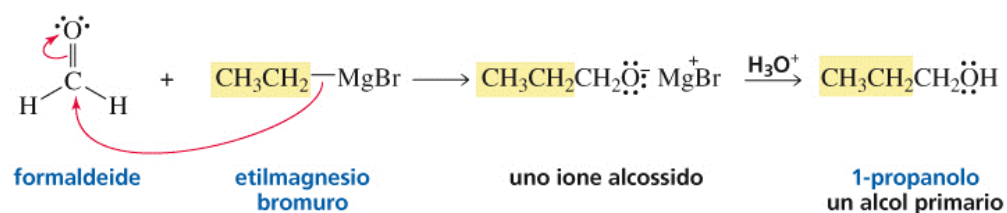
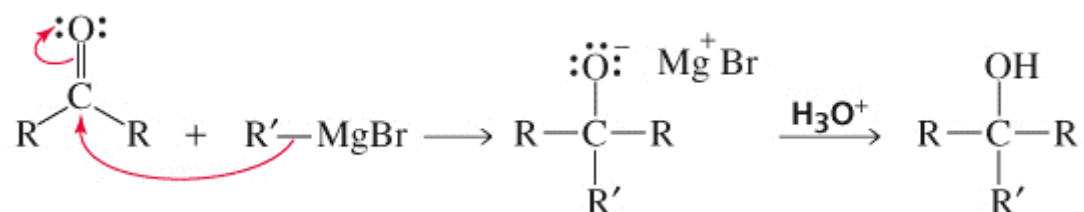
Composti organometallici: i reattivi di Grignard ed i litioalchili

orbital diagram for the C-Li bond of MeLi



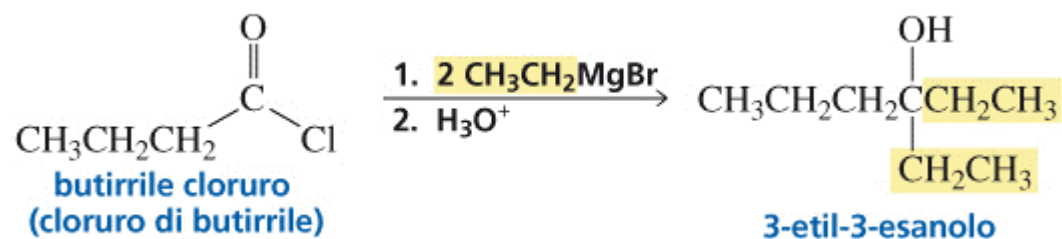
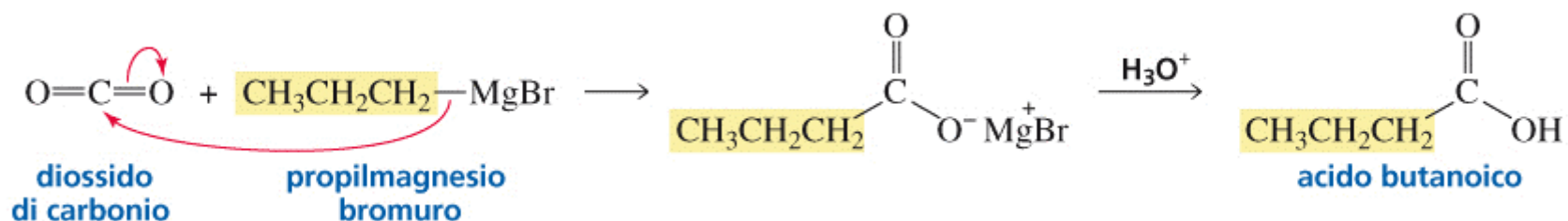
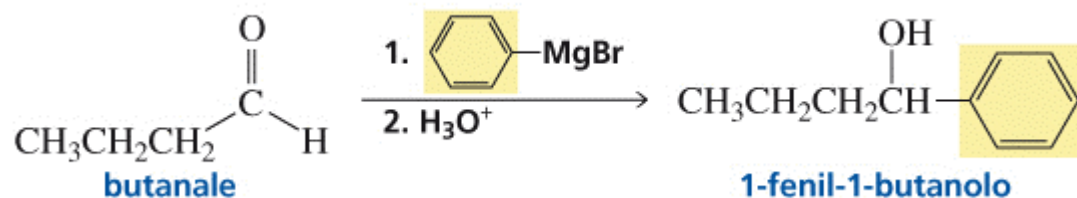
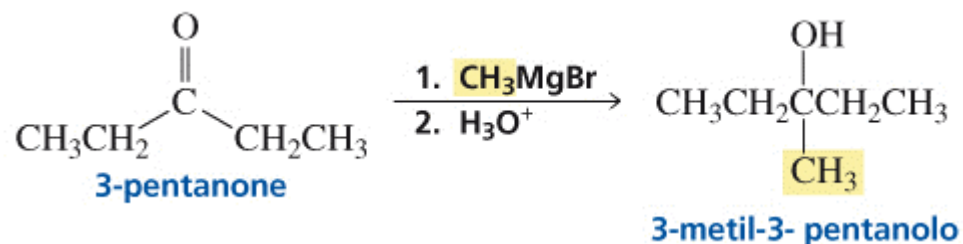
## Addizione al carbonile

Reattivi di Grignard: alcoli da chetoni e aldeidi



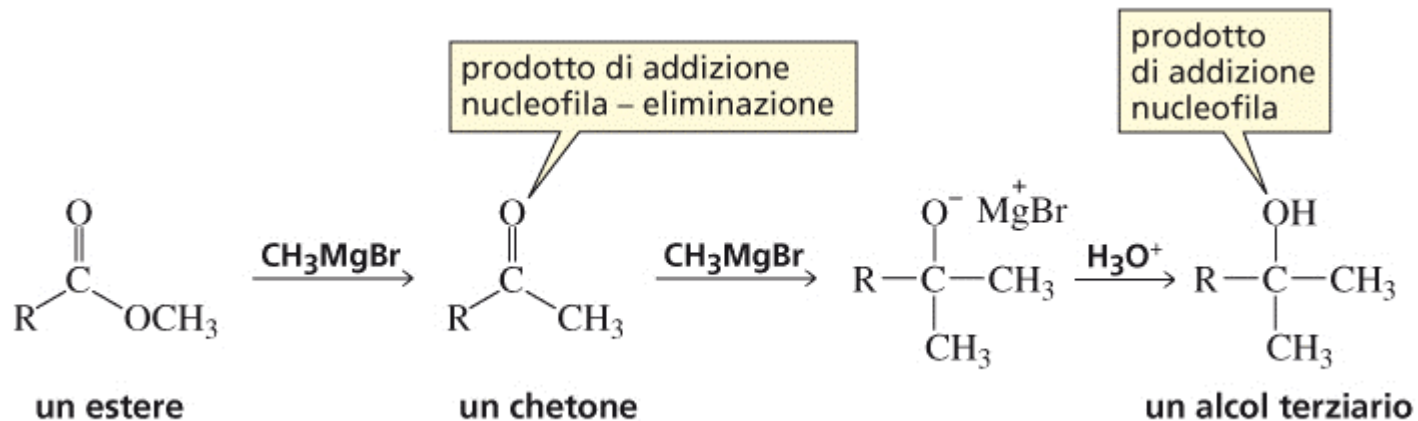
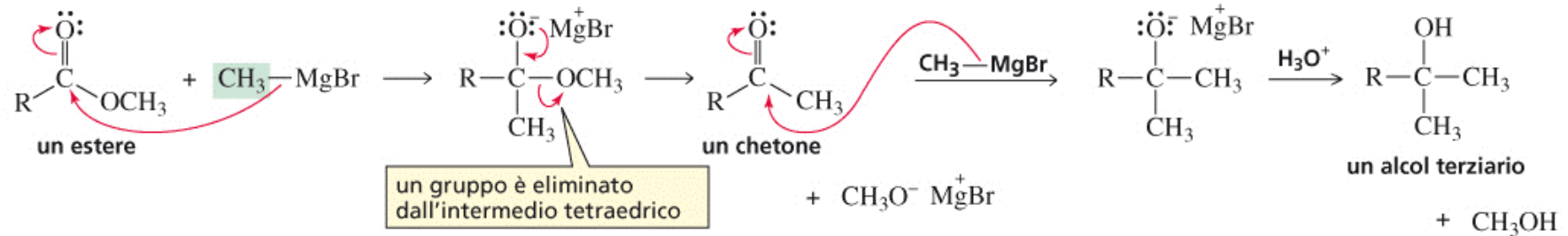
## Addizione al carbonile

Reattivi di Grignard: acidi da anidride carbonica e alcoli da alogenuri acilici



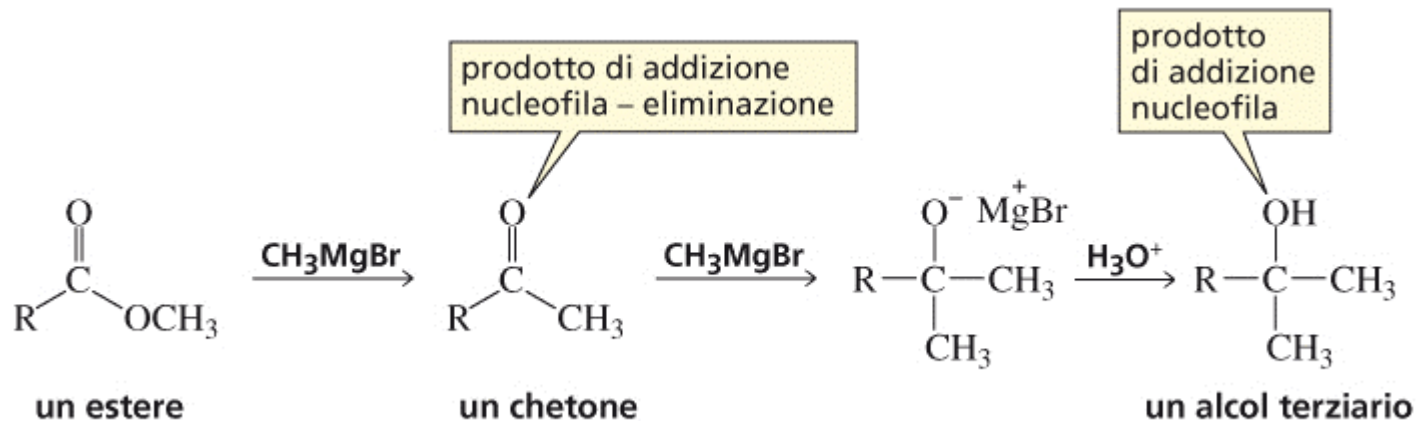
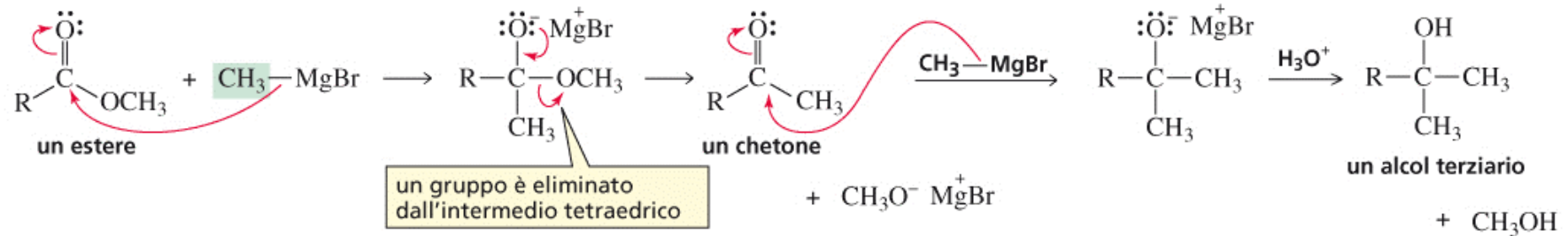
## Addizione al carbonile

Composti organometallici: reazioni con esteri



## Addizione al carbonile

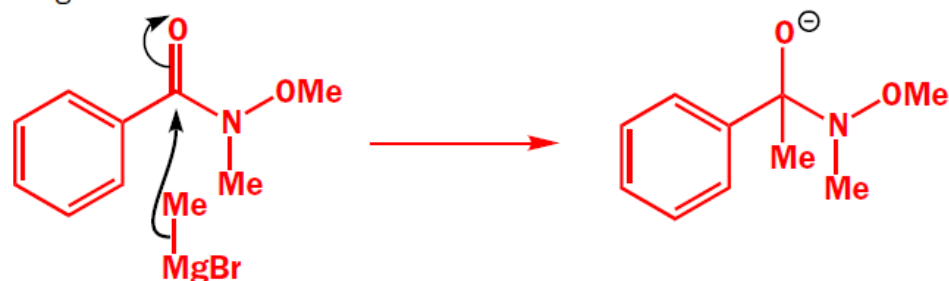
Composti organometallici: reazioni con esteri



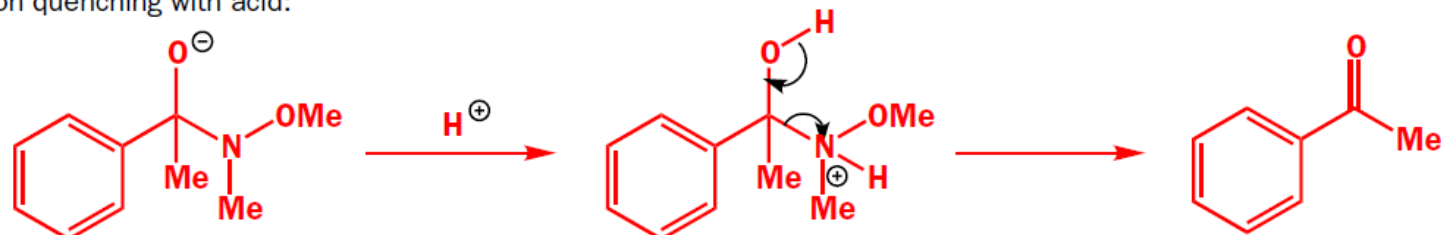
## Addizione al carbonile

Composti organometallici: reazioni con ammidi e nitrili

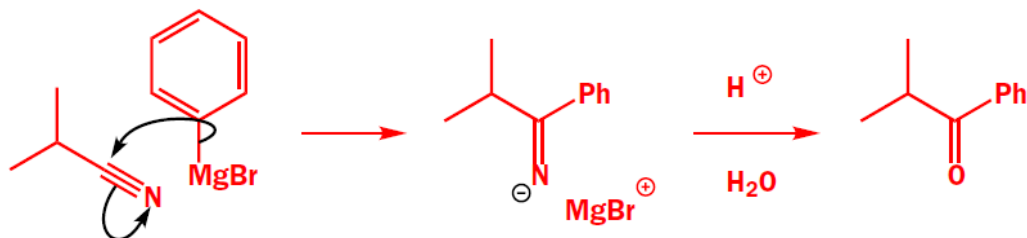
during the reaction:



on quenching with acid:

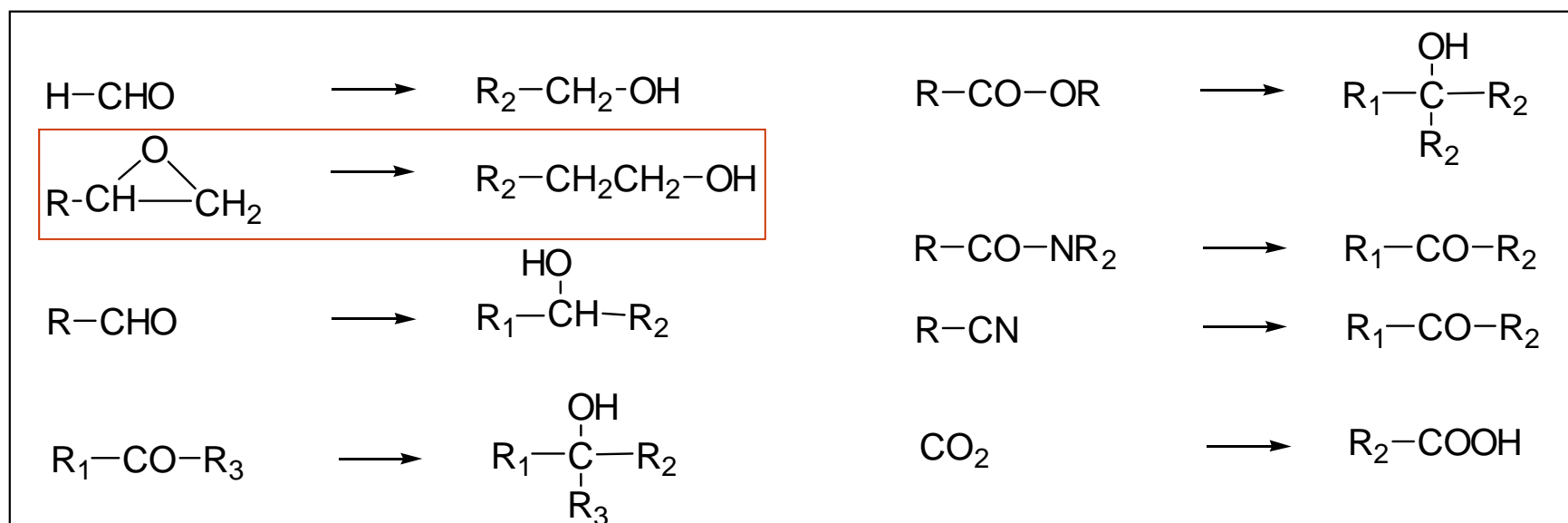
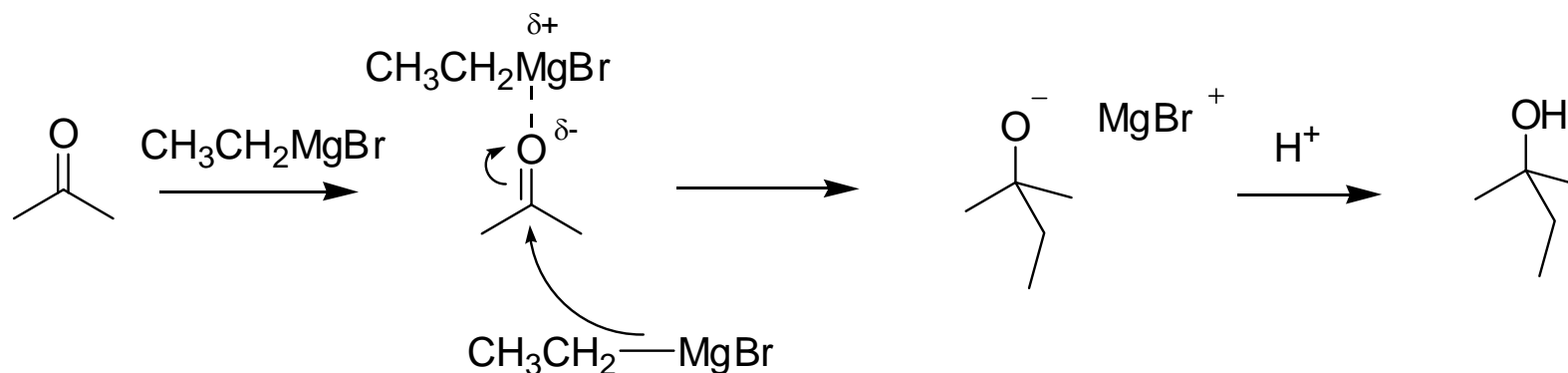


In condizioni basiche l'ammido non è un gruppo uscente, ma lo diventa in condizioni acide.



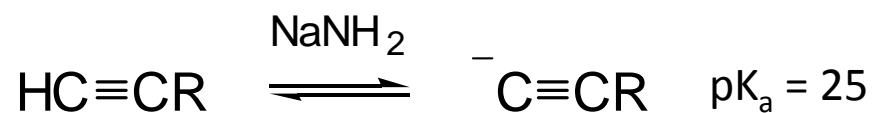
## Reazioni di addizione al gruppo carbonilico: Grignard

I reagenti di Grignard e altri composti organometallici (in particolare di litio) si aggiungono a gruppi carbonilici.

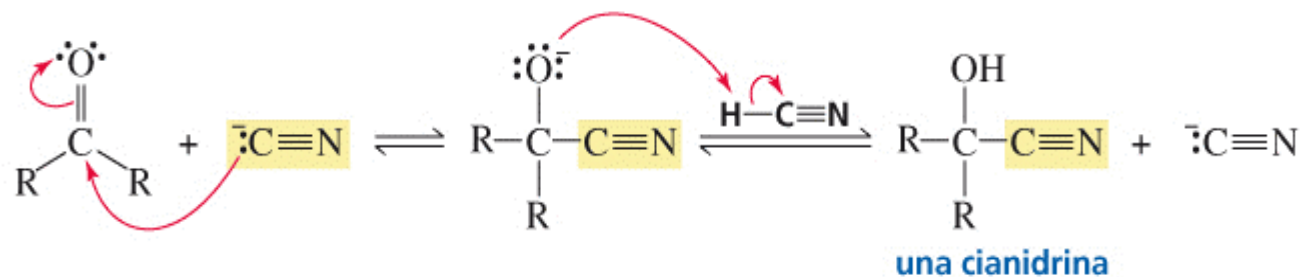
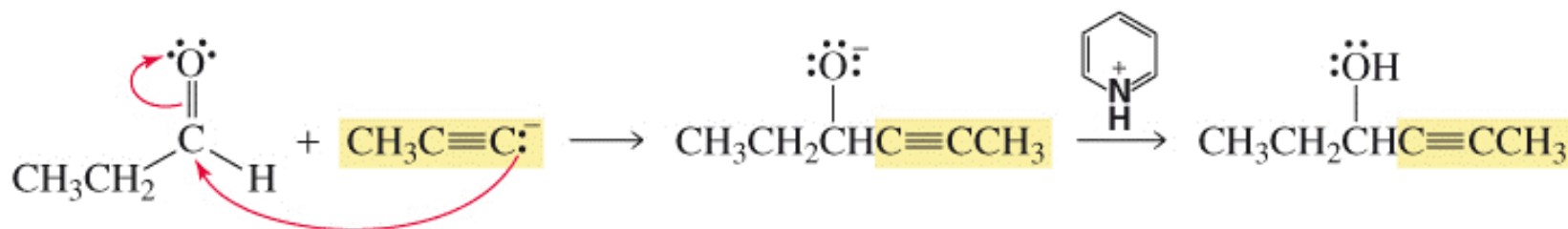


## Addizione al carbonile

Altri nucleofili al carbonio: cianuro e acetiluri

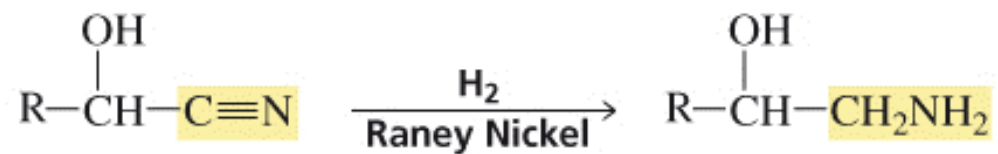
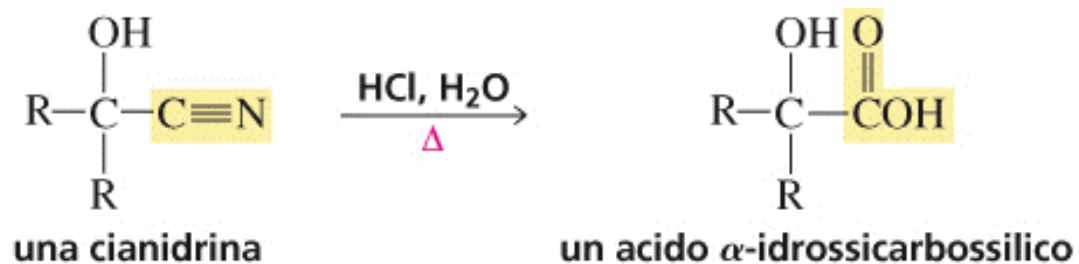


Il carbonio ibridizzato sp è più elettronegativo



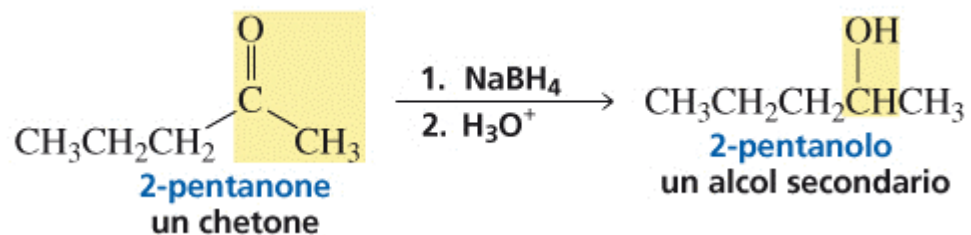
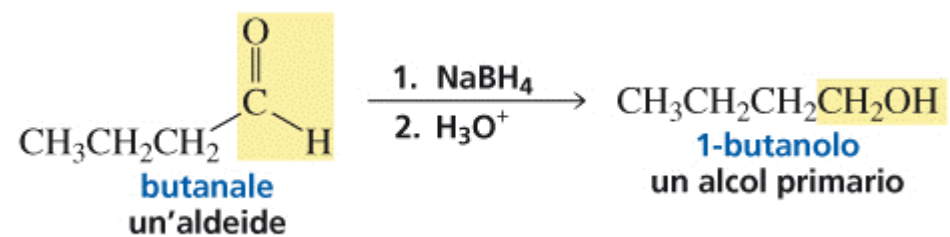
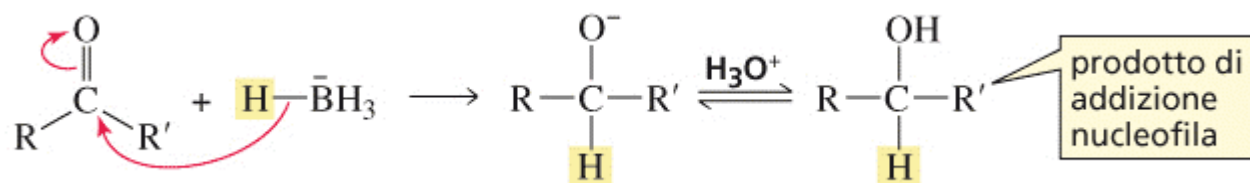
## Addizione al carbonile

Trasformazioni delle cianoidrine



## Addizione al carbonile

Riduzione: il nucleofilo  $\text{H}^-$



## Addizione al carbonile

Composti carbonilici: altri nucleofili

