

الكيمياء العضوية



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Aldehydes and Ketones

Carbonyl Compounds

TABLE 18-1 Some Common Classes of Carbonyl Compounds

Class	General Formula	Class	General Formula
ketones	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{R}'$	aldehydes	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{H}$
carboxylic acids	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OH}$	acid chlorides	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{Cl}$
esters	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{O}-\text{R}'$	amides	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{NH}_2$

Use the common name of the acid.

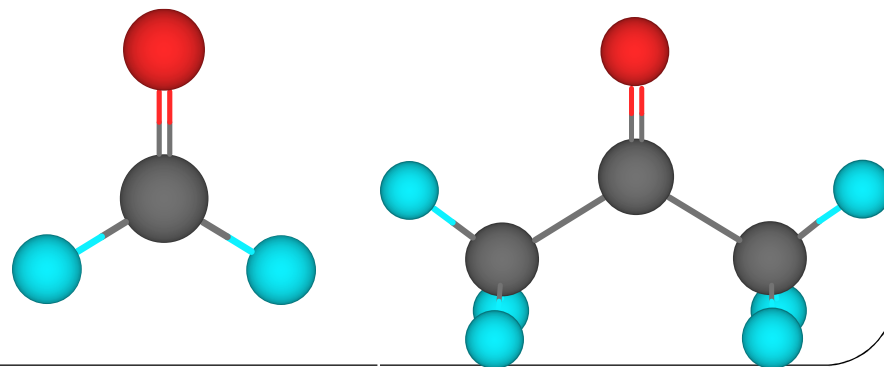
Drop *-ic acid* and add *-aldehyde*.

1 C: formic acid, formaldehyde

2 C's: acetic acid, acetaldehyde

3 C's: propionic acid, propionaldehyde

4 C's: butyric acid, butyraldehyde.



الألدهيدات والكيٲونات

Aldehydes and Ketones

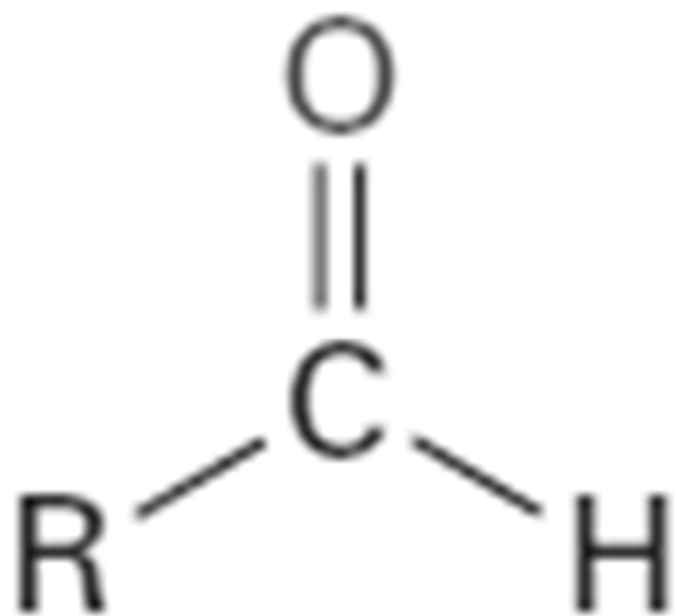
تتميز الألدهيدات والكيٲونات بوجود مجموعة الكربونيل في جزئياتها فهي مركبات واسعة الانتشار في الطبيعة حيث توجد في الكربوهيدرات وبعض الهرمونات.

الألدهيدات Aldehydes

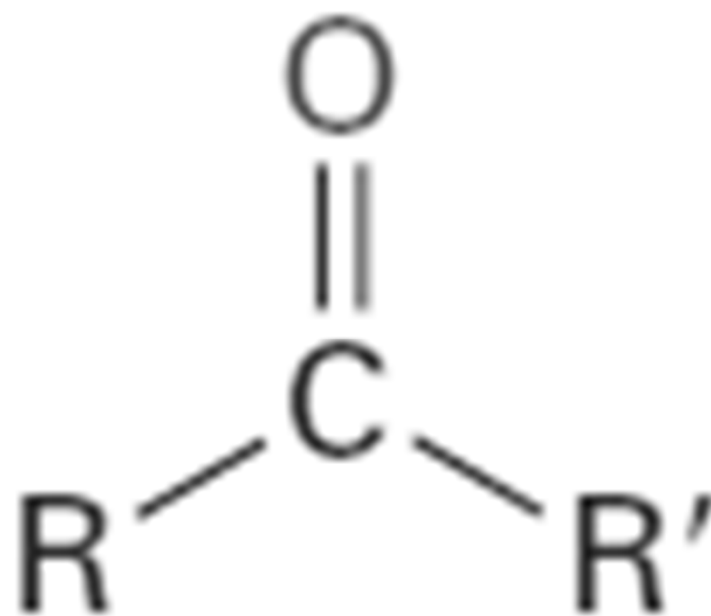
تتصل فيها مجموعة الكربونيل بذرة هيدروجين واحدة على الأقل ويطلق عليها اسم مجموعة الفورميل formyl وتكتب -CHO

الكيٲونات Ketones

تتصل فيها مجموعة الكربونيل بذرتي كربون وتعرف بمجموعة الكيٲون -C=O .



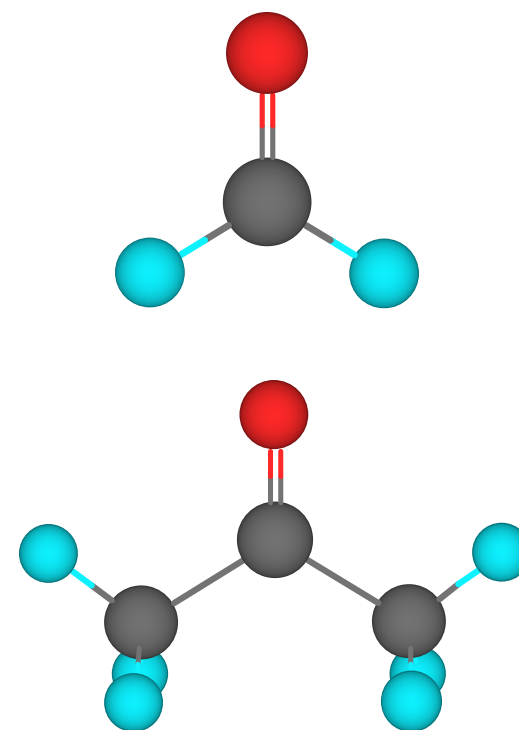
Aldehyde



Ketone

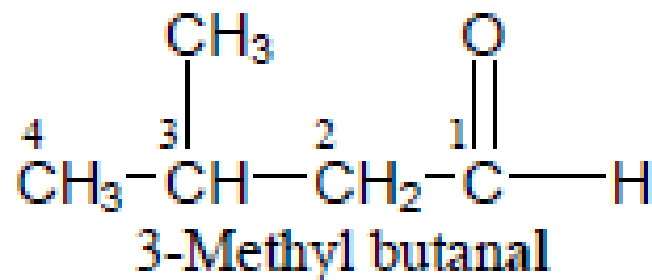
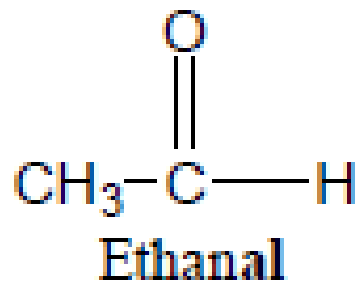
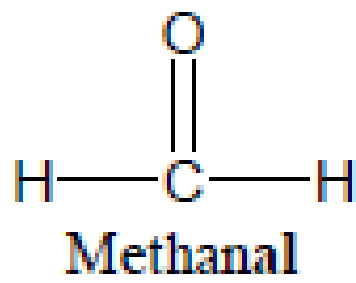
Aldehyde Common Names

- Use the common name of the acid.
- Drop *-ic acid* and add *-aldehyde*.
 - 1 C: formic acid, formaldehyde
 - 2 C's: acetic acid, acetaldehyde
 - 3 C's: propionic acid, propionaldehyde
 - 4 C's: butyric acid, butyraldehyde.



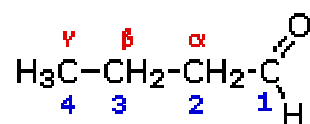
أولاً: تسمية الألدهيدات التسمية النظامية IUPAC

تسمى الألدهيدات باستبدال الحرف e من اسم الهيدركربون المقابل بالمقطع al وتستخدم الأرقام لتحديد مواقع المجموعات المستبدلة أن وجدت حيث يبدأ الترقيم من مجموعة الألدهيد:

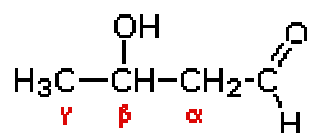


أولاً: تسمية الألدهيدات Nomenclature of Aldehydes

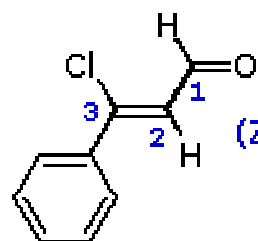
Aldehydes



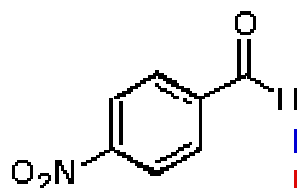
butanal
butyraldehyde



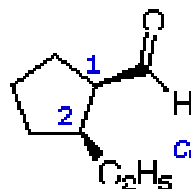
3 hydroxybutanal
 β -hydroxybutyraldehyde
or aldol



(Z)-3-chloro-3-phenyl-2-propenal



p-nitrobenzenecarbaldehyde
p-nitrobenzaldehyde

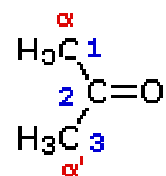


cis-2-ethylcyclopentanecarbaldehyde

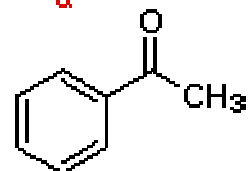


pentanedial
glutaraldehyde

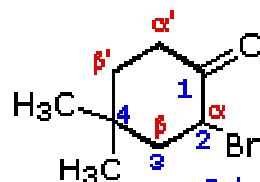
Ketones



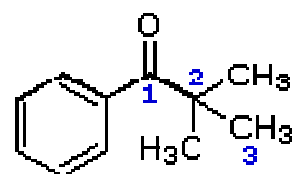
propanone
acetone



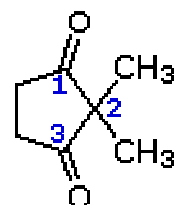
phenylethanone
acetophenone
methyl phenyl ketone



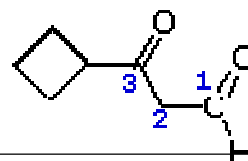
2-bromo-4,4-dimethylcyclohexanone



2,2-dimethyl-1-phenylpropanone
t-butyl phenyl ketone



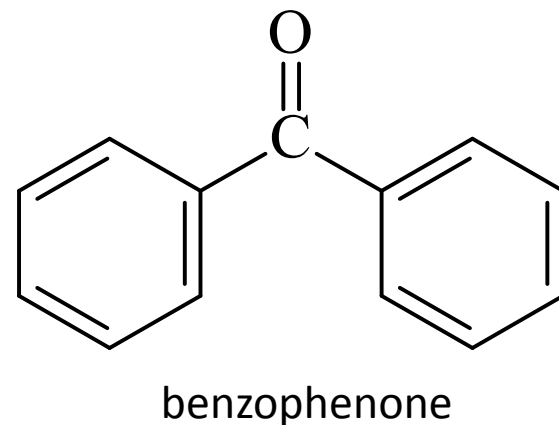
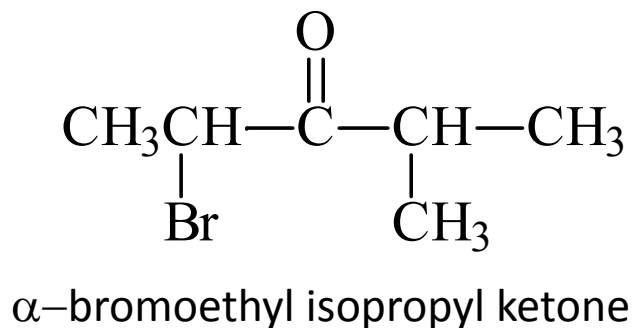
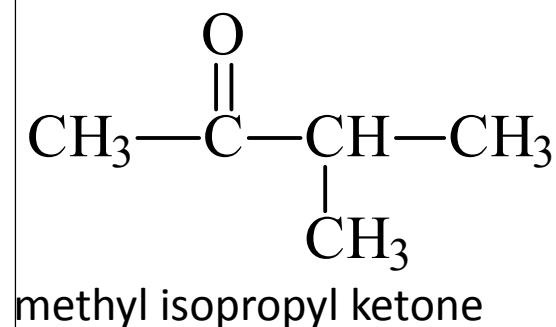
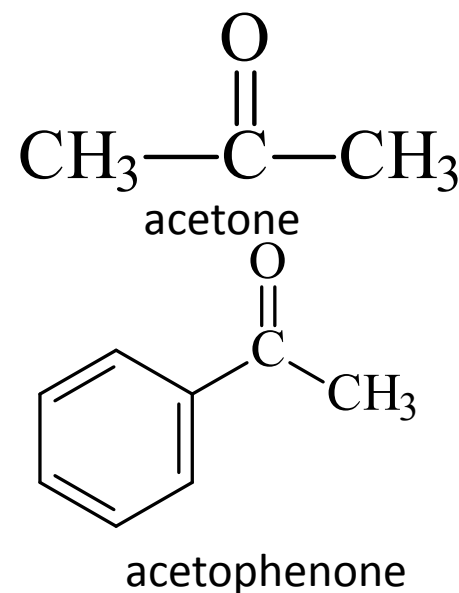
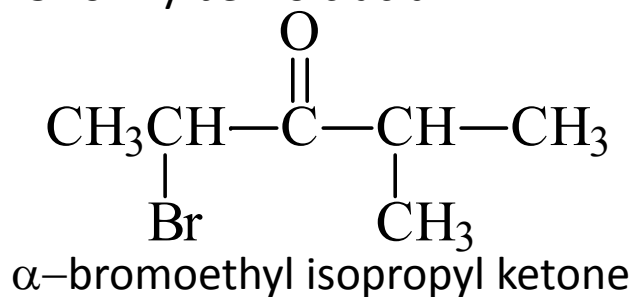
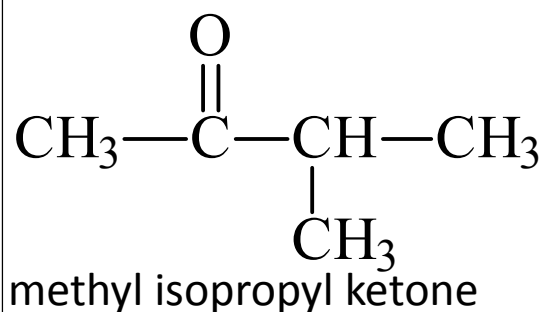
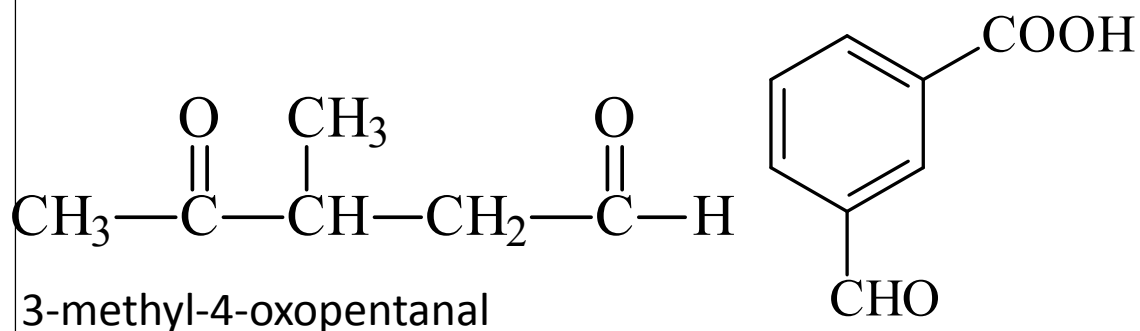
2,2-dimethyl-1,3-cyclopentanedione



3-cyclobutyl-3-oxopropanal

Name as Substituent

- functional group, C=O is *oxo-* and -CHO is *formyl*.



Preparation of Aldehydes and Ketones

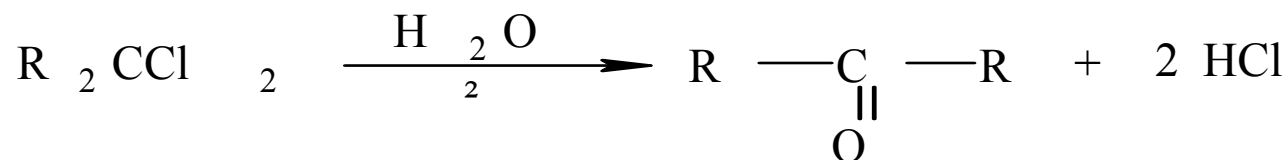
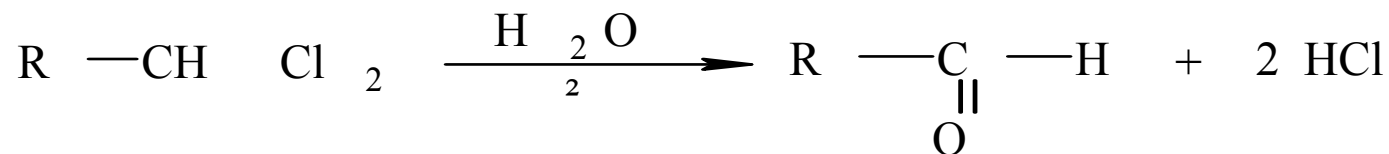
- Oxidation reactions
- Hydrolysis of Dihalides
- Hydration of Alkynes
- Reactions with Acid Derivatives and
- Reaction with Carboxylic Acids
- Reaction with Grignard

تحضير الألهيدات والكيتونات

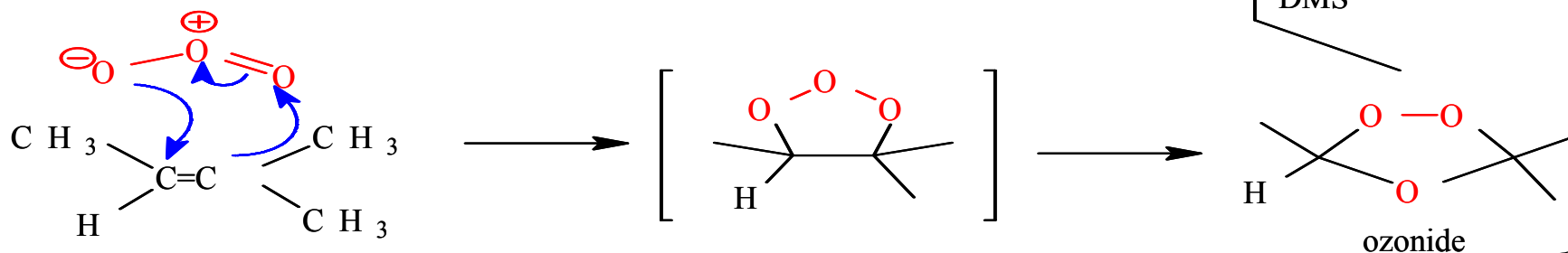
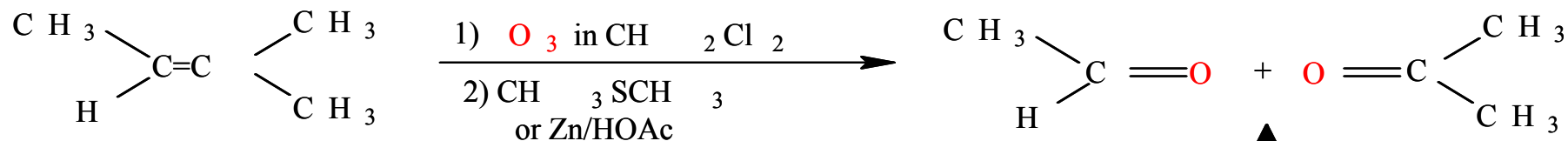
تفاعل الأكسدة للكحولات □ Oxidation reactions:



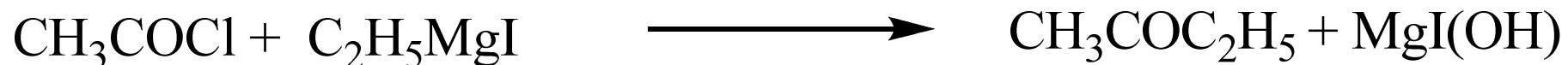
التحلل المائي لثنائي الهاليد □ Hydrolysis of Dihalides:



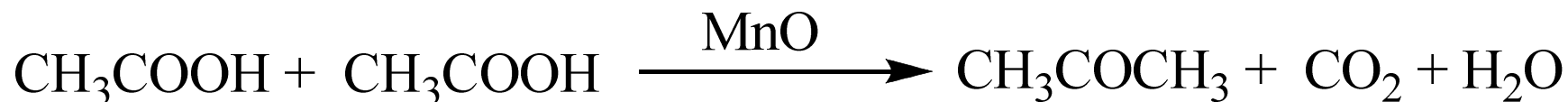
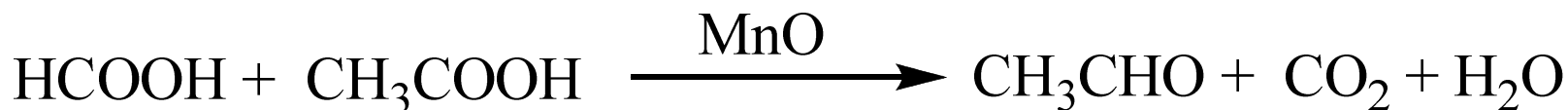
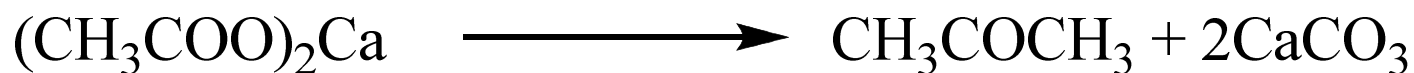
تفاعل الأوزون مع الألكينات □ ozonization of Alkynes:



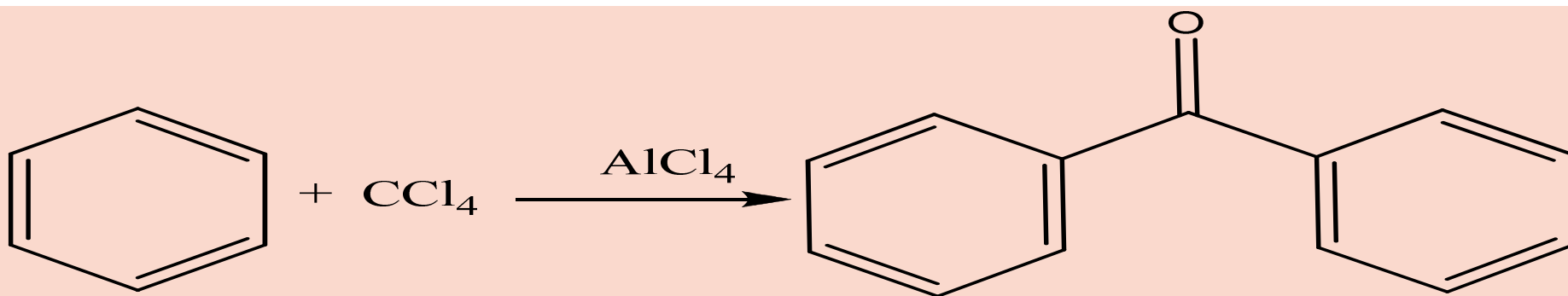
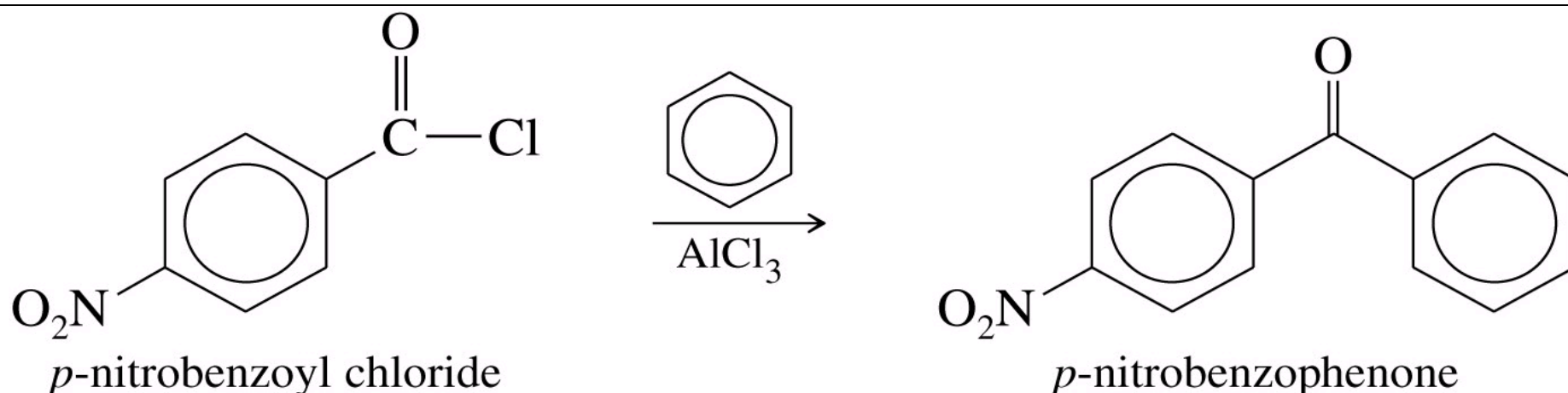
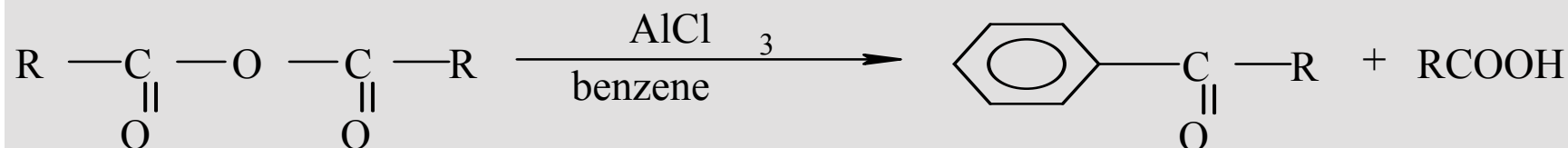
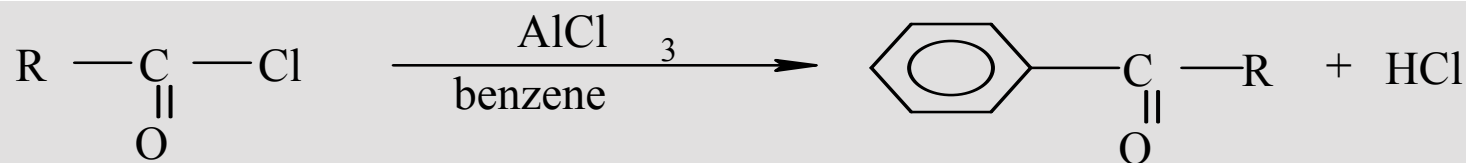
التفاعل مع جواهر جرنيلارد



التقطير الجاف لأملاح الأحماض الدهنية



تحضير الألدھيدات والكيتونات الأروماتية



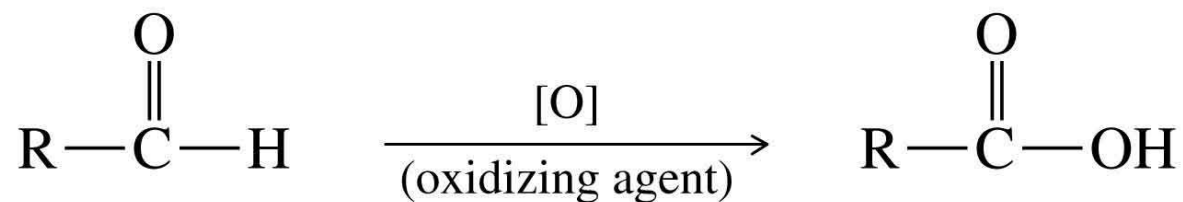
الخواص الكيميائية للألدهيدات والكي-tonات

1- تفاعلات الاختزال

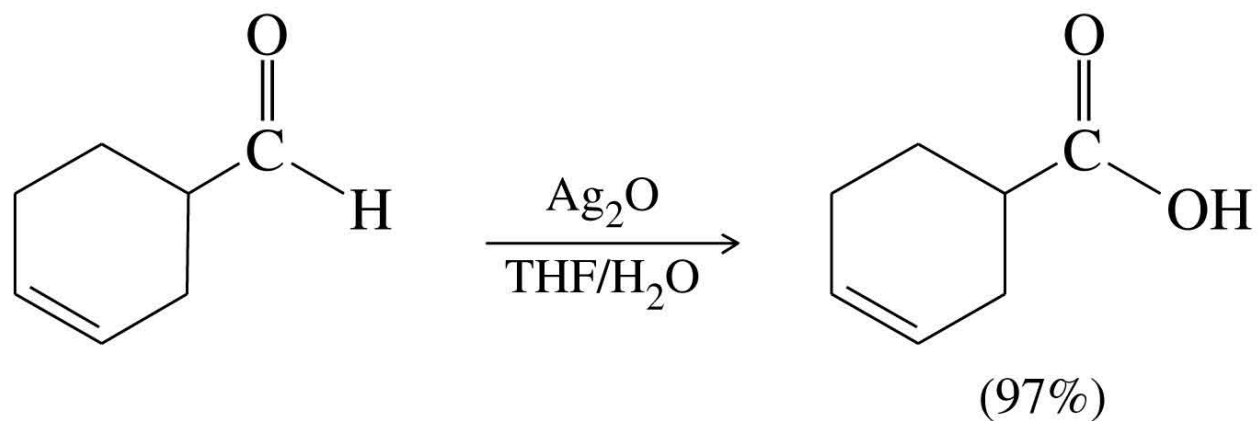
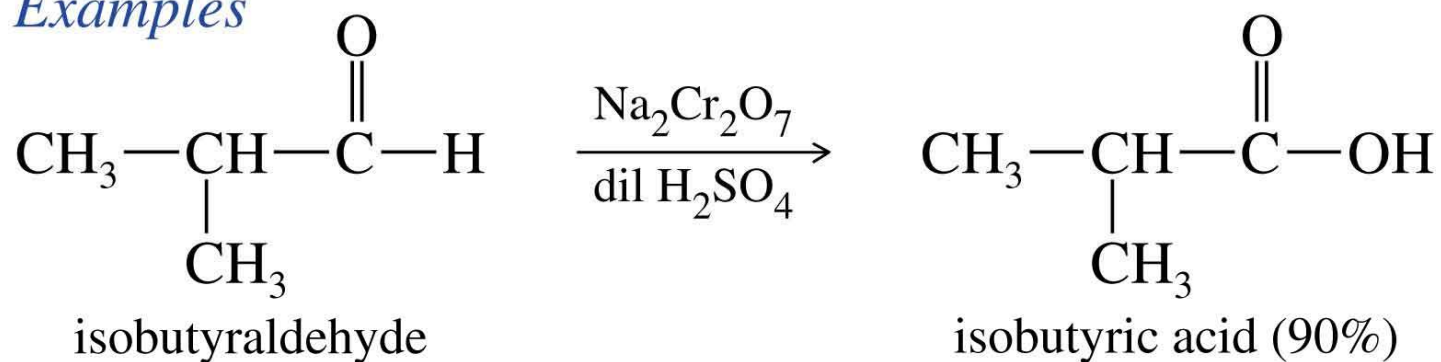
- aldehydes can be reduced to 1° alcohols
- ketones can be reduced to 2° alcohols
- the C=O group of an aldehyde or ketone can be reduced to a -CH₂- group

Aldehydes	Can Be Reduced to	Ketones	Can Be Reduced to
$\begin{array}{c} \text{O} \\ \parallel \\ \text{RCH} \end{array} \text{---} \begin{array}{c} \nearrow \\ \searrow \end{array}$	$\begin{array}{l} \text{RCH}_2\text{OH} \\ \text{RCH}_3 \end{array}$	$\begin{array}{c} \text{O} \\ \parallel \\ \text{RCR}' \end{array} \text{---} \begin{array}{c} \nearrow \\ \searrow \end{array}$	$\begin{array}{l} \text{RCHR}' \\ \text{RCH}_2\text{R}' \end{array}$

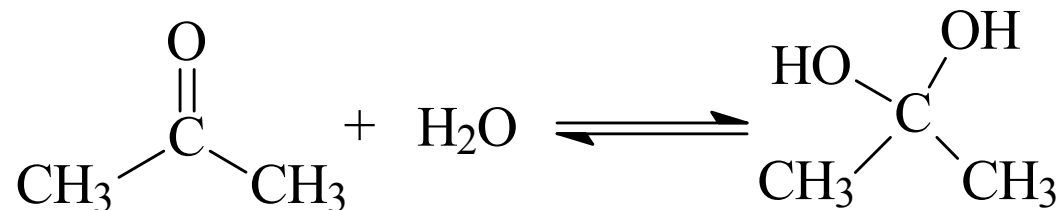
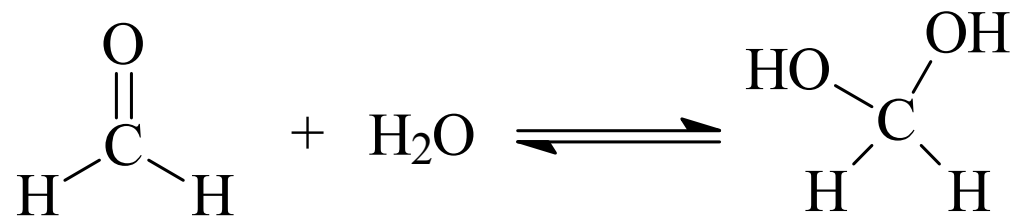
2-تفاعلات الأكسدة



Examples

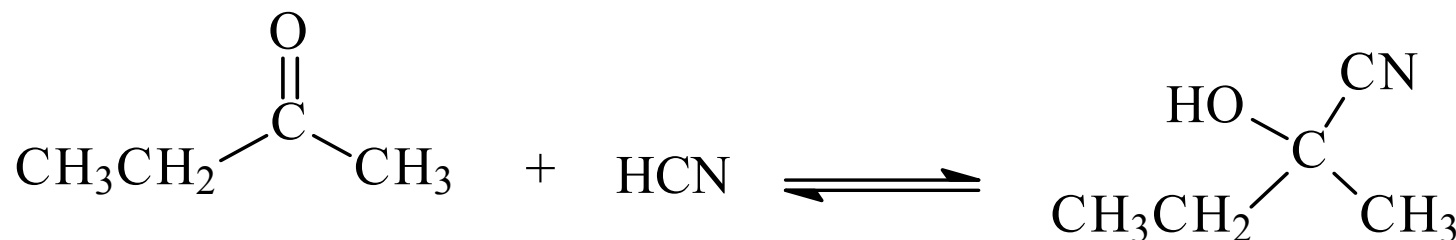


3- تفاعلات الأضافة أضافة الماء

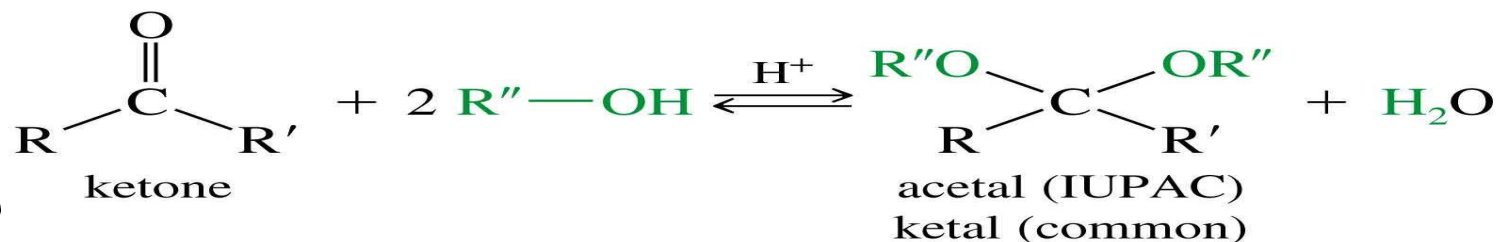
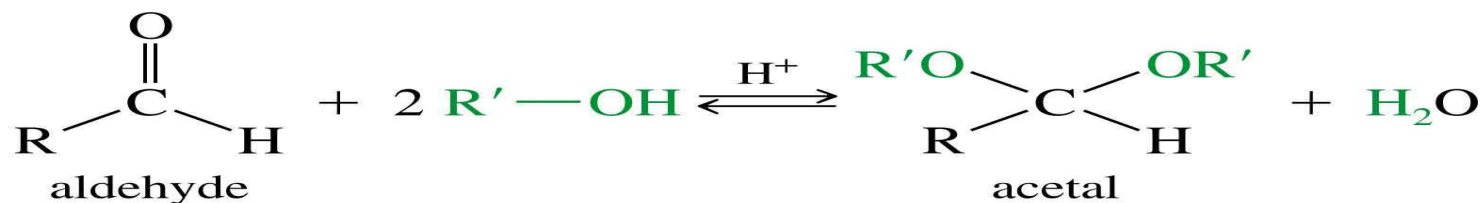


Hydrate

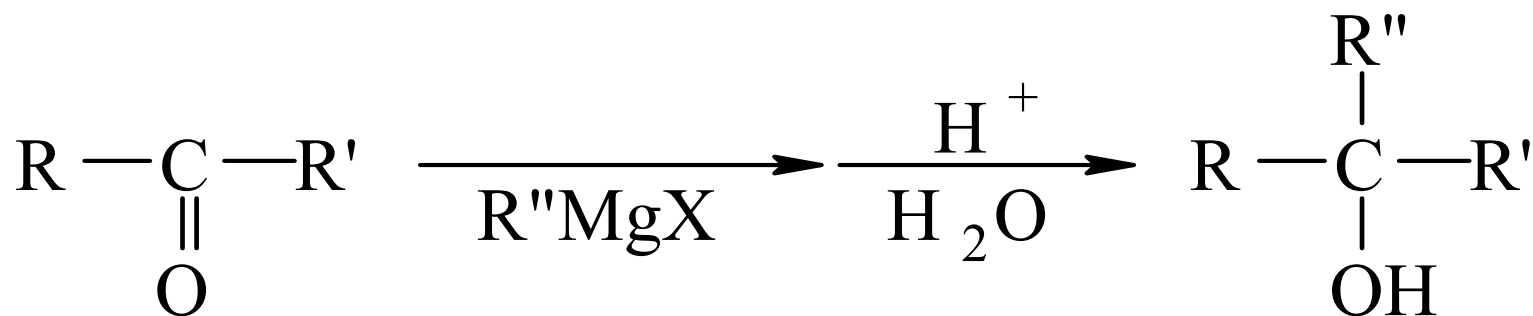
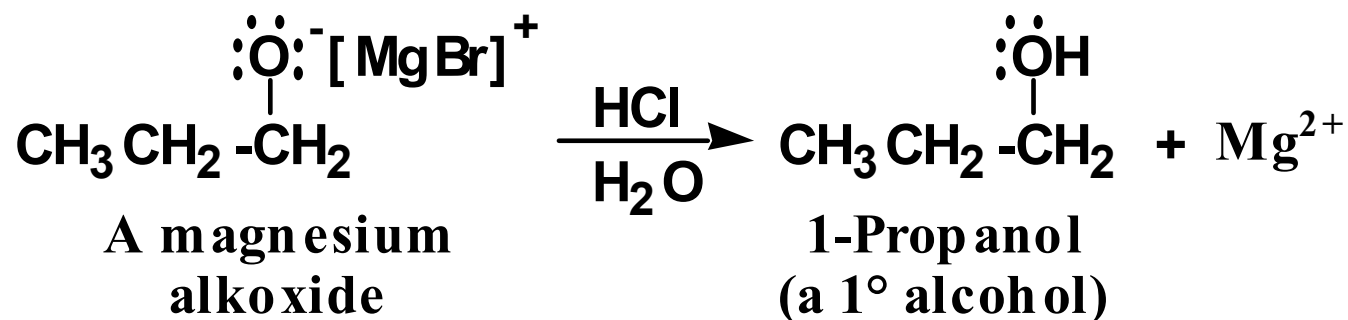
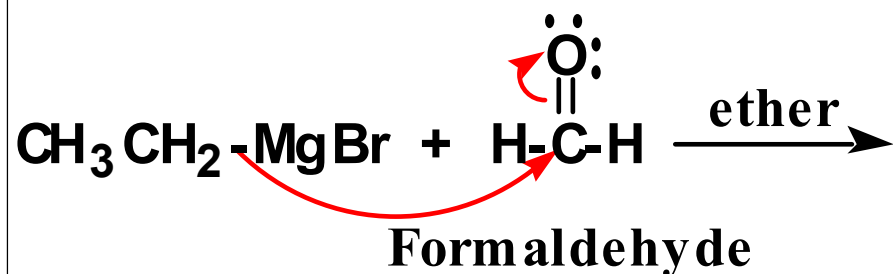
أضافة السيانيد



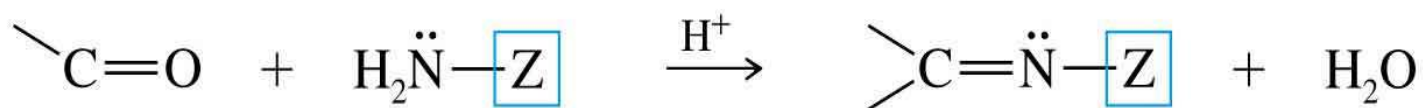
أضافة الكحول



التفاعل مع جوهري جرنيد



التفاعلات مع القواعد النتروجينية



<i>Z in Z—NH₂</i>	<i>Reagent</i>	<i>Product</i>
—H	$\text{H}_2\ddot{\text{N}}-\boxed{\text{H}}$ ammonia	$\text{>C=}\ddot{\text{N}}-\boxed{\text{H}}$ an imine
—R	$\text{H}_2\ddot{\text{N}}-\boxed{\text{R}}$ primary amine	$\text{>C=}\ddot{\text{N}}-\boxed{\text{R}}$ an imine (Schiff base)
—OH	$\text{H}_2\ddot{\text{N}}-\boxed{\text{OH}}$ hydroxylamine	$\text{>C=}\ddot{\text{N}}-\boxed{\text{OH}}$ an oxime
—NH ₂	$\text{H}_2\ddot{\text{N}}-\boxed{\text{NH}_2}$ hydrazine	$\text{>C=}\ddot{\text{N}}-\boxed{\text{NH}_2}$ a hydrazone
—NHPh	$\text{H}_2\ddot{\text{N}}-\boxed{\text{NHPh}}$ phenylhydrazine	$\text{>C=}\ddot{\text{N}}-\boxed{\text{NHPh}}$ a phenylhydrazone
—NHC(=O)NH_2	$\text{H}_2\ddot{\text{N}}-\boxed{\text{NH—C(=O)—NH}_2}$ semicarbazide	$\text{>C=}\ddot{\text{N}}-\boxed{\text{NH—C(=O)—NH}_2}$ a semicarbazone

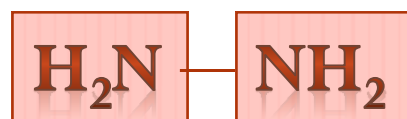
Reaction with Derivatives of Ammonia



HYDROXYLAMINE



OXIME

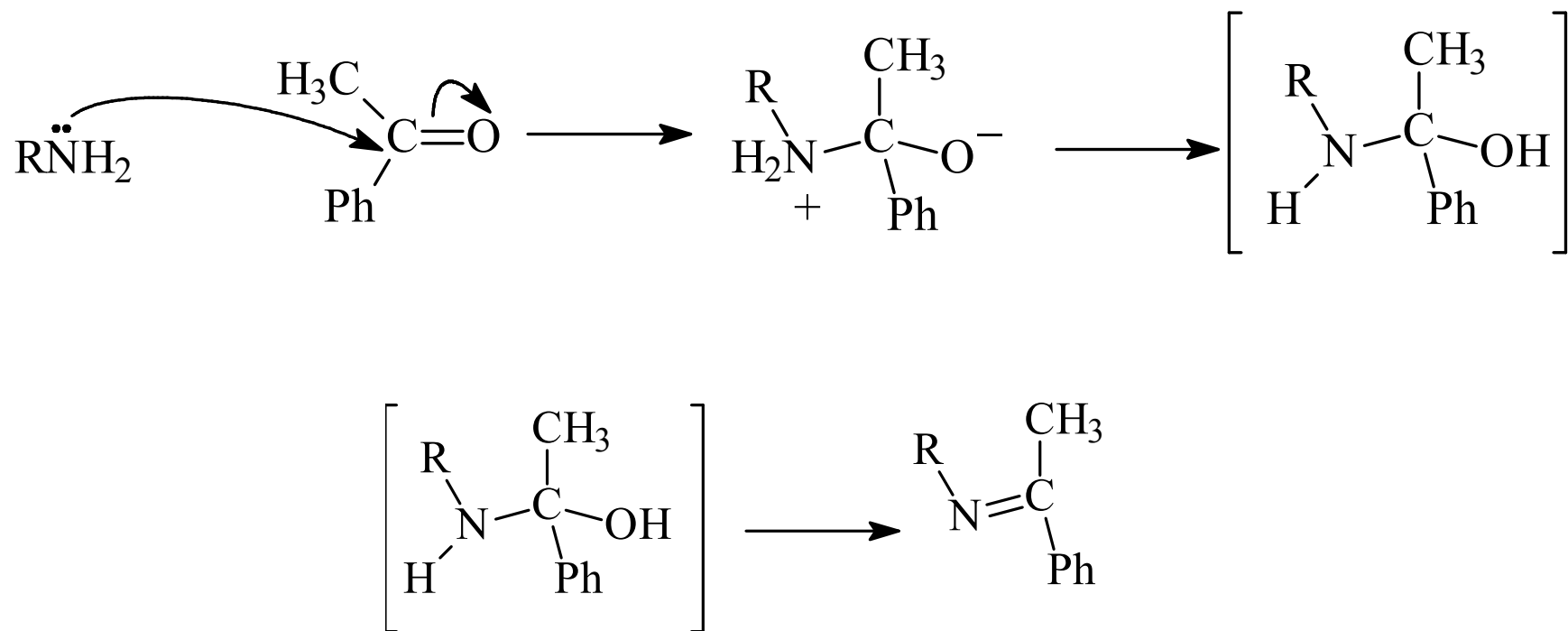


HYDRAZINE



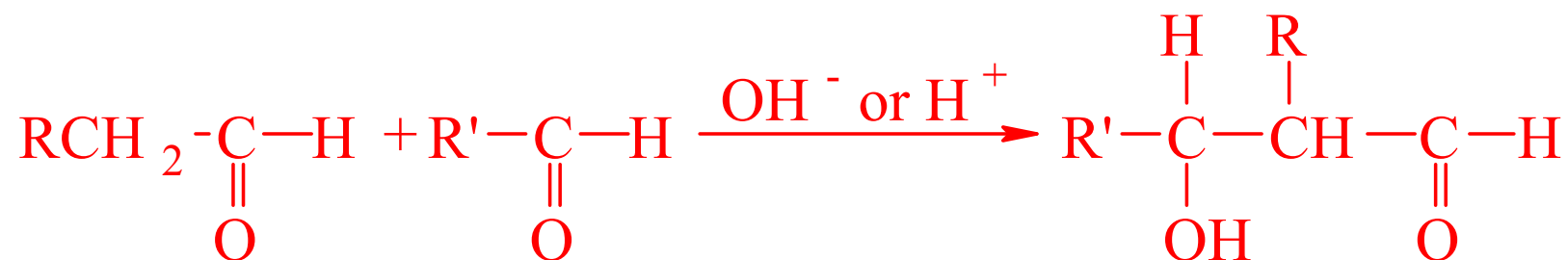
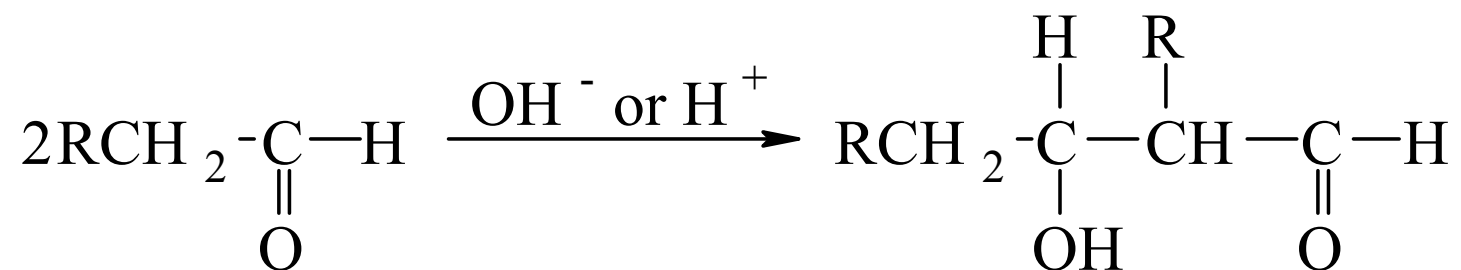
HYDRAZONE

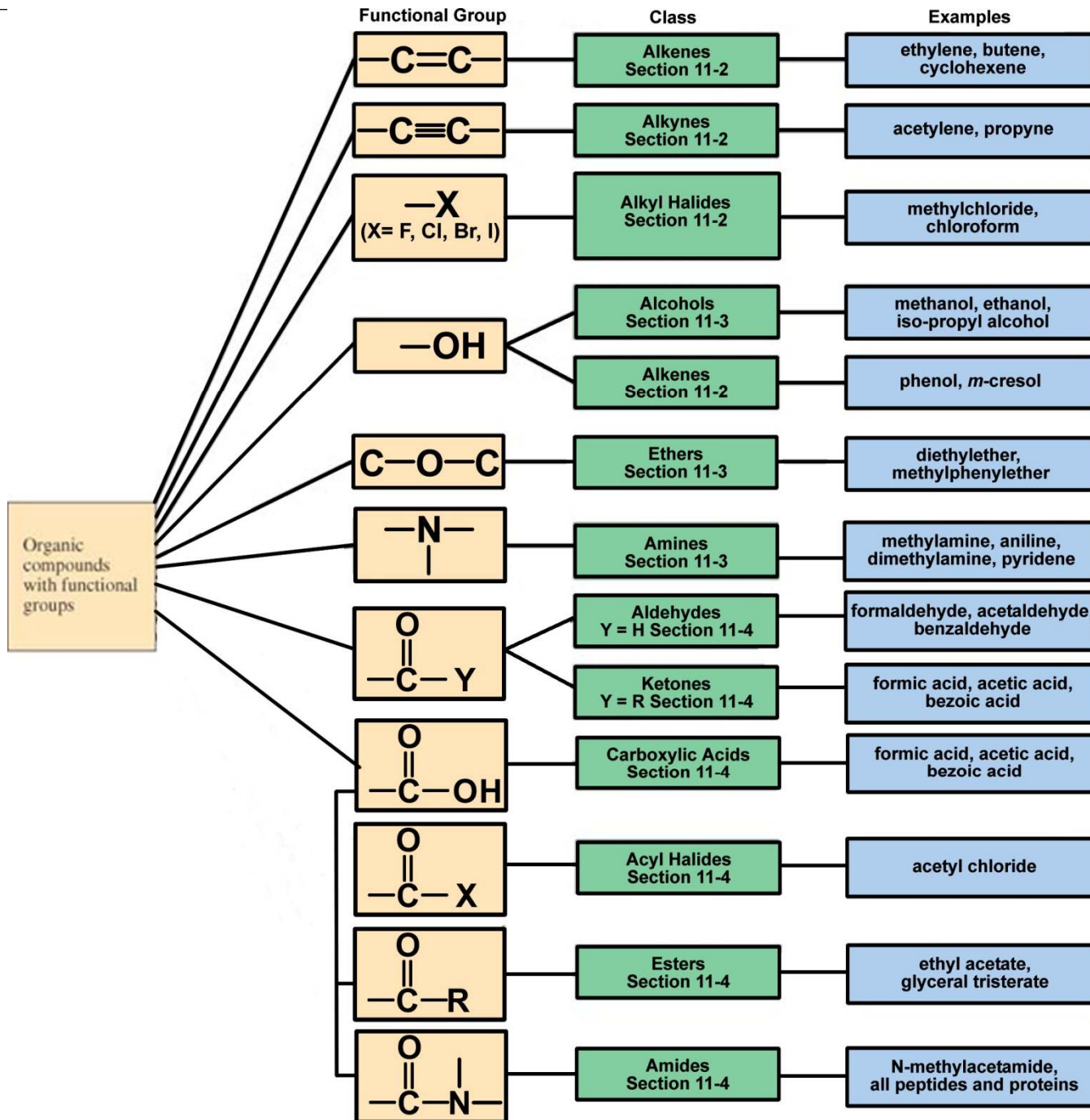
تكوين قاعدة شيف



4-التفاعلات التكثيف

Aldol Condensations





Important Terms

Typical Simple Ligands

Ion/Molecule	Name	Name as a Ligand
NH_3	ammonia	ammine
CO	carbon monoxide	carbonyl
Cl^-	chloride	Chloro
CN^-	cyanide	cyano
F^-	fluoride	fluoro
OH^-	hydroxide	hydroxo
NO	nitrogen monoxide	nitrosyl
NO_2^-	nitrite	nitro
PH_3	phosphine	phosphine

