Aldehydes/Ketones I

General

Naming

Prep.

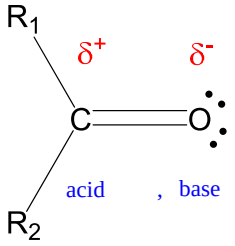
Ref 16: 1 - 5

Prob 16: 1; in-class HMWK

Adv Rdg 16: 6

General

(R_1 and/or R_2 = H: aldehyde; else ketone)



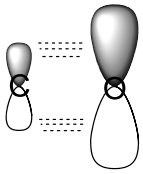
acid , base site

reacts w/ nucleophiles , electrophiles

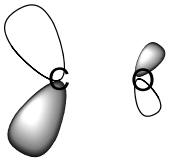
e.g. OH^- , "H^+"

- C and (O) sp^2 hybridized
- R_1, R2, C, O all in same plane
- ~ 120° bonding angle
- strongly **polar** bond present

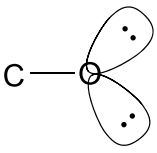
MO Description



π orbital;
larger on O; polarized MO
bonding, same phase overlap
contains 2 e-'s



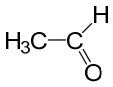
π* orbital (antibonding);
larger on C; polarized MO
empty in ground state
"LUMO"
nucleophiles attack here



"sp^2"orbitals on O,
contain non-bonding e-'s,
attract electrophiles

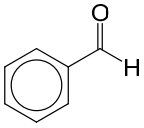
Common Names/ Occurrence

formaldehyde
aqu. soln = formalin

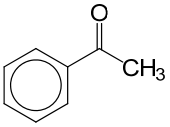


acetaldehyde

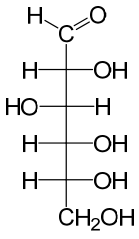
acetone



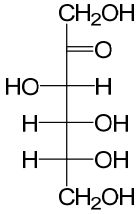
benzaldehyde



acetophenone



glucose



fructose

open structures

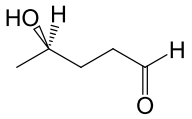
table sugar = dimer of glucose and fructose

Systematic Naming

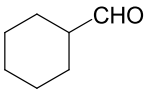
1.) Aldehydes

- ending: ...al
- highest priority (so far)
- always terminal; therefore C1
- carbaldehyde (carboxaldehyde) if attached to ring

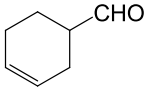
Practice



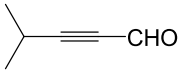
(4R)-4-hydroxypentanal



cyclohexanecarbaldehyde



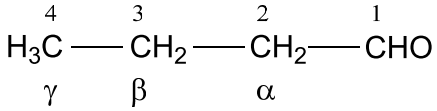
3-cyclohexenecarbaldehyde



4 -methyl-3-pentynal

Use of Greek letters in carbony cmpds

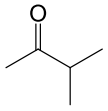
Ex.



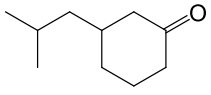
2.) Ketones

- ending: ...one
- "highest priority" , higher than –OH, = , otherwise similar to alcohols

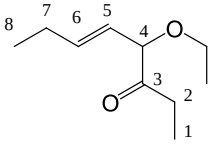
Practice



3 - methylbutanone

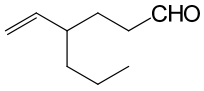


3 - isobutylcyclohexanone

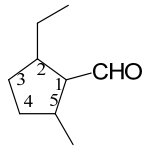


4 - ethoxy-5-octen-3-one

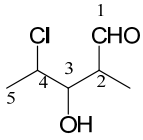
HMWK: Naming of Aldehydes & Ketones



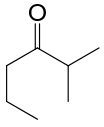
4-propyl-5-hexenal



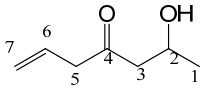
2-ethyl-5-methylcyclpentanecarbaldehyde



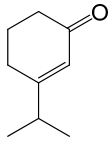
4-chloro-3-hydroxy-2-methylpentanal



2 - methyl - 3 - hexanone



2 - hydroxy - 6 - hepten - 4 - one

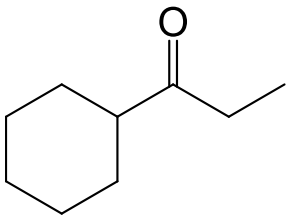


3 - isopropyl - 2 - cyclohexenone

Semi-systematic Naming

"alkyl alkyl ketone" method

e.g.,



cyclohexyl ethyl ketone

Preparation

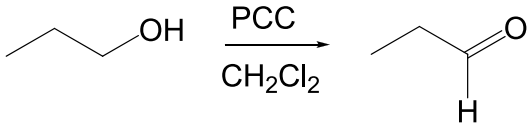
A.) Aldehydes

1.) Oxidation of 1° alcohols

in non-aqueous media

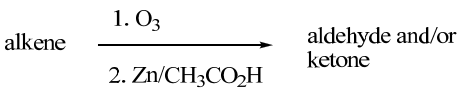
esp. w/ PCC in CH_2Cl_2
"pyridinium chlorochromate"

Ex.

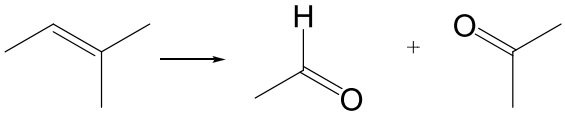


(mech. later)

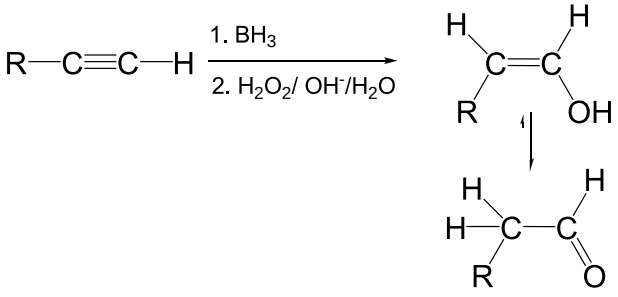
2.) **Ozonolysis** (see CHEM261)



Ex.



3.) **Hydroboration of terminal alkynes**



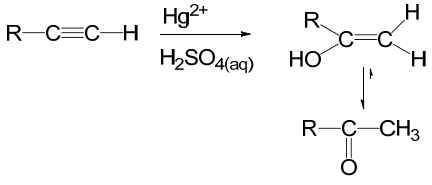
4.) **Reduction of acid derivatives**
(later)

B.) Ketones

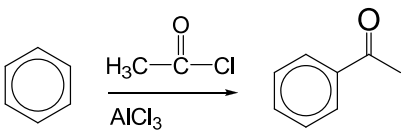
1.) 2^o ROH → Ketone
PCC, CH_2Cl_2
or
CrO_3, $H_2SO_{4(aq)}$

2.) Ozonolysis (seen before)

3.) Oxymercuration of alkynes (terminal or internal);
seen before; e.g.



4.) Friedel - Crafts Acylation; seen before; e.g.



Mech. of PCC Oxidation