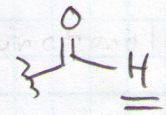
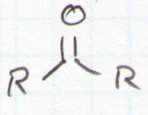
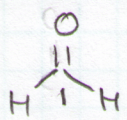
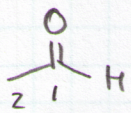
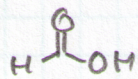
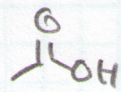
# aldeHydes and Ketones ("Key"-tones)

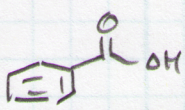
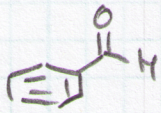


1 and 2 carbon aldehydes retain common names

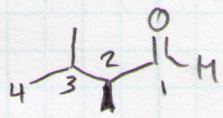
derived from  

| | | | | |
|---|---|---|---|---|
| Common: | formaldehyde | acetaldehyde | formic acid | acetic acid |
| IUPAC: | methanal | ethanal | methanoic acid | ethanoic acid |
| | (methane - e) + al | | | |

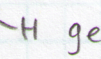



benzoic acid ⟶ benzaldehyde

IUPAC names of aldehydes



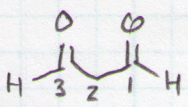
① 4 Cs in longest chain including 
∴ of butane family → butanal

②  gets # 1 since its terminal

③ Name and # substituents
2,3- dimethyl

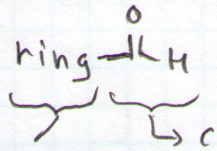
④ Label stereoisomerism

(2S)- 2,3-dimethylbutanal

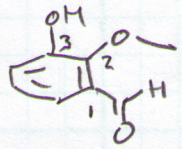

'dial'

retain this vowel to separate 'n' and 'd'

propanedial




full name → carbaldehyde gets lowest #




① Ring = benzene

② carbaldehyde is # 1 substituent

③ (single bond) oxygen substituents get 'oxy' suffix

HO → Hydroxy

–O → methoxy

3-hydroxy-2-methoxybenzenecarbaldehyde

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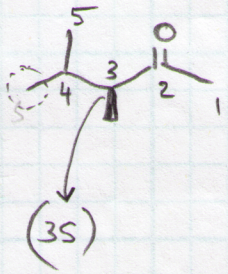
Ketones IUPAC




① of the pentane family ↓ pentanone

② 3,4-dimethyl

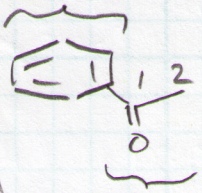
③ (3S)-

(3S)-3,4-dimethyl-2-pentanone


IUPAC = acetone over 2-propanone

Ketones are named as 'ALKAN'ones suggesting the following IUPAC name for acetophenone (common)

substituent attached to alkanone : phenyl



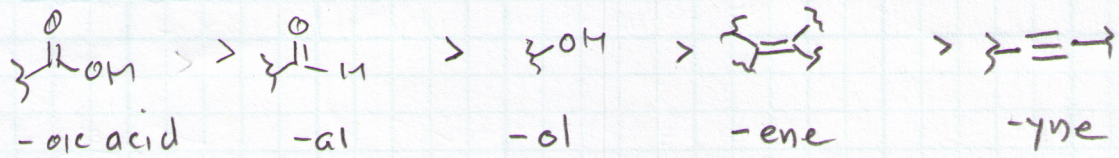

1-phenylethanone

"acetoyl" + "phenyl" Ketone

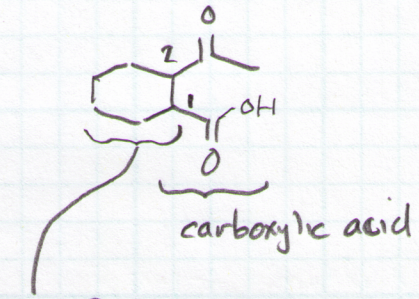
-yl suffixes

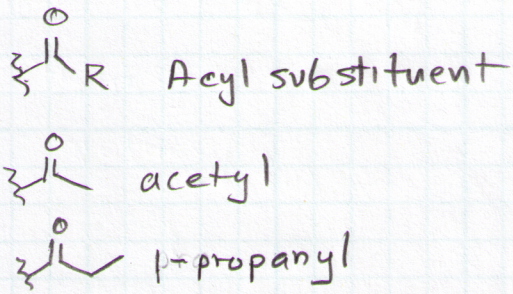
alkyl portion: ethanone

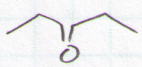
Functional group priority in naming alkyl chain

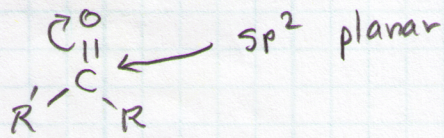


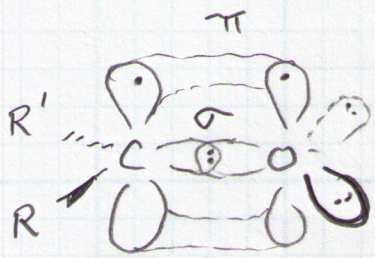

How is this named?

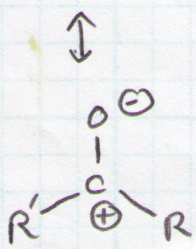


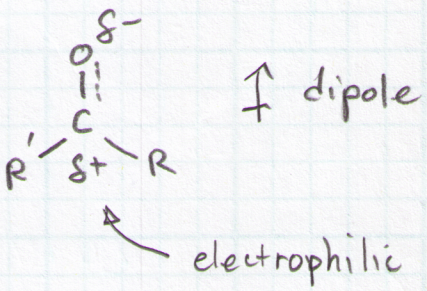

convert $CH_3CH_2CO CH_2CH_3$ to line bond 



Hybrid




electron withdrawing effect created by polarity of carbonyl group of ketones and aldehydes

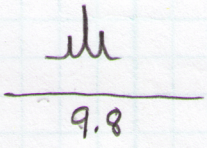
# NMR Properties of Aldehydes and ketones

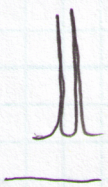
→ doublet (N = 1)

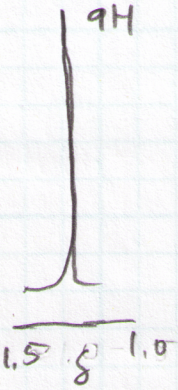
→ multiplicity : triplet (N+1)
↳ 2H on adjacent C

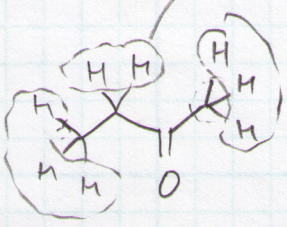
↓ singlet (N = 0)

1H diagnostic of Aldehyde



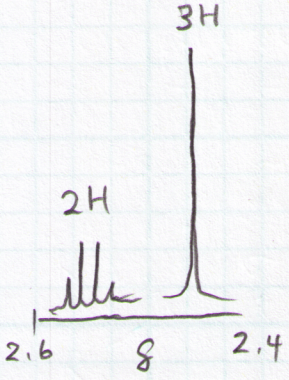



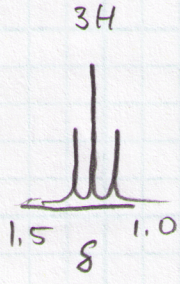



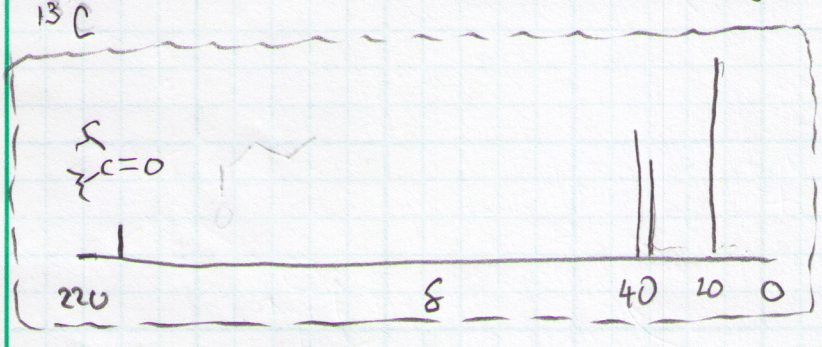
quartet, 2H

— singlet, 3H

↳ triplet, 3H

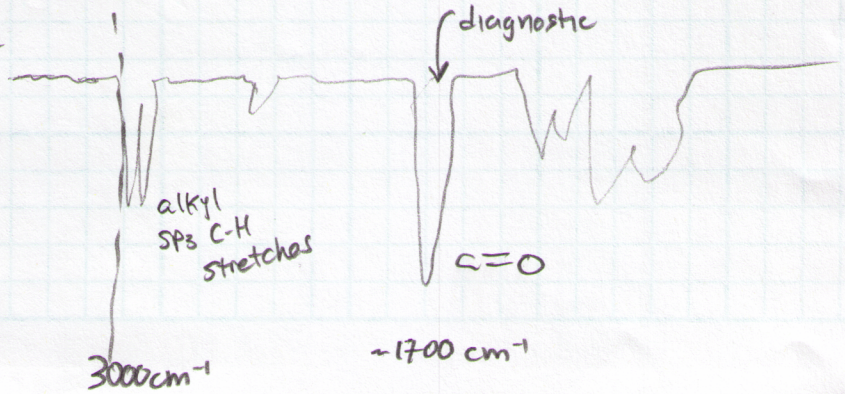



'3 Dees'
Deshielded
Larger Delta (δ)
more Downfield

IR Spectra

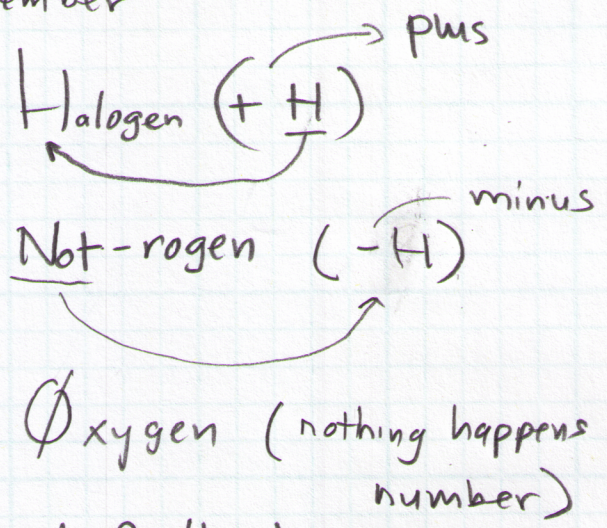


# Degrees of Un Saturation (DOUS)

$C_8H_{10}N_2O$

① saturated C/H compound w $C_8$ is $\boxed{C_8H_{18}}$

② Remember




③ Convert $C_8H_{10}N_2O$ to C/H equivalent

$C_8H_{10}N_2O$

→ $C_8H_{10}N_2$ remove oxygen, keep H # the same

→ $C_8H_8$ remove $N_2$ remove 2H

$C_8H_{18}$

$-\ C_8H_8$ } Subtract new formula from saturated formula to determine hydrogen deficiency.

$H_{10}$

NOTE: there is 1 DOUS per $H_2$ lost

or $\frac{1\ DOUS}{H_2}$

$H_{10} \times \frac{1\ DOUS}{H_2} = \underline{5\ DOUS}$

DOUS cont'd

$C_7H_4OBrCl$ → $C_7H_4BrCl$ Oxygen does nothing → $C_7H_6$ Halogens add 1H when removed

saturated $C_6$ → $C_nH_{2n+2}$ → $C_7H_{16}$ use later

$$\begin{array}{r} C_7H_{16} \\ -C_7H_6 \\ \hline H_{10} \end{array} \times \frac{1\ \text{DOUS}}{H_2} = 5\ \text{DOUS}$$

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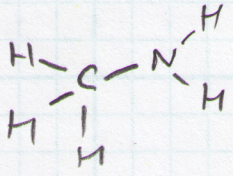
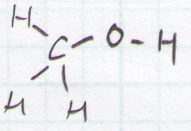
why does this work



This compound is saturated
∴ it is equivalent to → $CH_4$ (saturated $C_1$)

$CH_5N$ → $CH_4$ (H is lost when N is removed)

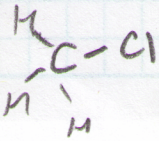
$$\begin{array}{r} CH_4 \\ -CH_4 \\ \hline H_0 \end{array} \times \frac{1\ \text{DOUS}}{H_2} = 0\ \text{DOUS}$$



saturated
NO RINGS or π bonds → $CH_4$

$CH_4O$ → $CH_4$ equal

NOTE Oxygen does nothing to H#



$CH_3Cl$ → $CH_4$

NOTE when Cl is removed an H must be added