California State Polytechnic University, Pomona

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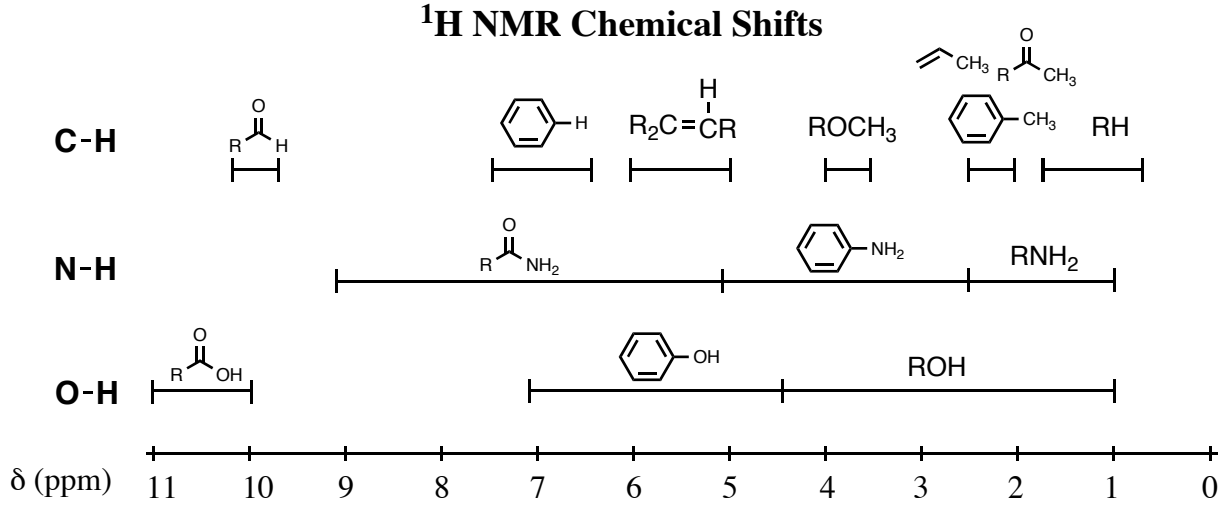
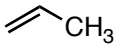
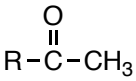
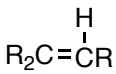
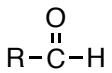
^{1}H NMR Chemical Shifts

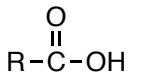
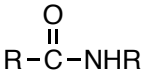


Protons on Carbon

Type of C-H	δ (ppm)	Description of Proton
$R-CH_3$	0.9	alkyl (methyl)
$R-CH_2-R$	1.3	alkyl (methylene)
R_3C-H	1.5-2	alkyl (methine)
	1.8	allylic (C is next to a pi bond)
	2-2.3	α to carbonyl (C is next to C=O)
$Ar-CH_3$	2.3	benzylic (C is next to Ph)
$RC\equiv C-H$	2.5	alkynyl
R_2N-CH_3	2-3	α to nitrogen (C is attached to N)
$R-CH_2-X$	2-4	α to halogen (C is attached to Cl, Br, I)
$RO-CH_3$	3.8	α to oxygen (C is attached to O)
$R-CH_2-F$	4.5	α to fluorine (C is attached to F)
	5-5.3	vinylic (H is attached to alkene C)
$Ar-H$	7.3	aromatic (H is on phenyl ring)
	9.7	aldehyde (H is on C=O)

Note: aldehyde (-CHO) proton usually does not couple with neighboring H's so appears as a singlet

Protons on Oxygen/Nitrogen*

Type of H	δ (ppm)	Description
ROH	0.5-5	alcohol
ArOH	4-7	phenol
	10-13	carb. acid
RNH_2	0.5-5	amine
$ArNH_2$	3-5	aniline
	5-9	amide

**Protons on N or O typically have wide ranges of expected chemical shifts; the actual δ value depends on the solvent used, the concentration, temperature, etc. Because these protons are acidic and, therefore, exchangeable, they may be broad peaks and usually do not couple with neighboring protons (typically they are broad singlets). If a protic deuterated solvent is used (e.g., D_2O or CD_3OD), then the NH and OH protons will exchange with the deuterium and the peaks will shrink or disappear entirely, since D (^{2}H) does not show up in the ^{1}H NMR spectrum.*

R = alkyl group
Ar = aromatic ring, such as phenyl (Ph)