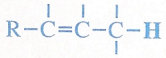
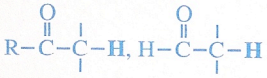
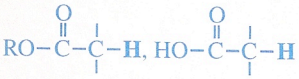
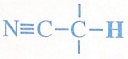
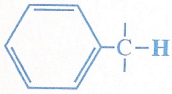
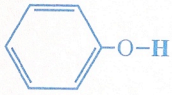
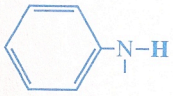
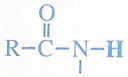
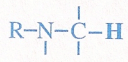
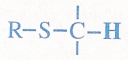
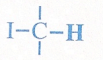
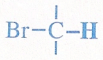
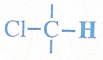
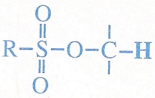
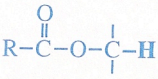
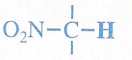
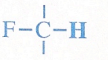
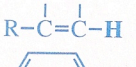
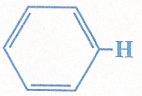
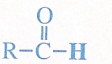
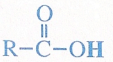
NMR Chemical Shift Ranges (ppm) for Selected Protons

$R-CH_3$		0.7–1.3
$R-CH_2-R$		1.2–1.4
R_3CH		1.4–1.7
		1.6–2.6
		2.1–2.4
		2.1–2.5
		2.1–3.0
		2.3–2.7
$R-C\equiv C-H$		1.7–2.7
$R-S-H$	var	1.0–4.0[a]
$R-N(-H)-$	var	0.5–4.0[a]
$R-O-H$	var	0.5–5.0[a]
	var	4.0–7.0[a]
	var	3.0–5.0[a]
	var	5.0–9.0[a]
		2.2–2.9
		2.0–3.0
		2.0–4.0
		2.7–4.1
		3.1–4.1
		ca. 3.0
		3.2–3.8
		3.5–4.8
		4.1–4.3
		4.2–4.8
		4.5–6.5
		6.5–8.0
		9.0–10.0
		11.0–12.0

Note: For those hydrogens shown as  , if that hydrogen is part of a methyl group (CH_3), the shift is generally at the low end of the range given; if the hydrogen is in a methylene group ($-CH_2-$), the shift is intermediate; and if the hydrogen is in a methine group (), the shift is typically at the high end of the range given.

[a]The chemical shift of these groups is variable, depending on the chemical environment in the molecule and on concentration, temperature, and solvent.

Infrared Absorption Bands

	Type of Vibration		Frequency (cm^{-1})	Intensity
C—H	Alkanes	(stretch)	3000–2850	s
	—CH_3	(bend)	1450 and 1375	m
	—CH_2—	(bend)	1465	m
	Alkenes	(stretch)	3100–3000	m
		(out-of-plane bend)	1000–650	s
	Aromatics	(stretch)	3150–3050	s
		(out-of-plane bend)	900–690	s
	Alkyne	(stretch)	ca. 3300	s
	Aldehyde		2900–2800	w
			2800–2700	w
O—H	Alcohol, phenols			
	Free		3650–3600	m
	H-bonded		3400–3200	m
	Carboxylic acids		3400–2400	m
N—H	Primary and secondary amines and amides			
	(stretch)		3500–3100	m
	(bend)		1640–1550	m–s
C≡C	Alkyne		2250–2100	m–w
C≡N	Nitriles		2260–2240	m
C=C	Alkene		1680–1600	m–w
	Aromatic		1600 and 1475	m–w
N=O	Nitro (R—NO_2)		1550 and 1350	s
C=O	Aldehyde		1740–1720	s
	Ketone		1725–1705	s
	Carboxylic acid		1725–1700	s
	Ester		1750–1730	s
	Amide		1680–1630	s
	Anhydride		1810 and 1760	s
	Acid chloride		1800	s
C—O	Alcohols, ethers, esters, carboxylic acids, anhydrides		1300–1000	s
C—N	Amines		1350–1000	m–s
C—X	Fluoride		1400–1000	s
	Chloride		785–540	s
	Bromide, iodide		< 667	s