

### Basic Spectroscopy Data

IR Stretch	IR Frequency (cm <sup>-1</sup> )		Proton NMR	Chemical Shift (ppm)
COO—H	3500-2500		(sp <sup>3</sup> ) C—H	0.5-1.5
O—H, N—H	3300		O=C-C—H	2-2.5
(sp <sup>2</sup> ) C—H	Above 3000		Ph-C—H	2-3
(sp <sup>3</sup> ) C—H	Below 3000		C≡C—H	2.5-3.0
O=C—H	2800, 2700		O—C—H	3.5-4.0
C≡N	Above 2200		X—C—H	3.5-4.0
C≡C	Below 2200		(sp <sup>2</sup> ) C—H	5-6
C=O (ester)	1745		Ph—H	7-8
C=O	1715		O=C—H	9-10
C=O (amide)	1650		O=C—O—H	11
C=O (conjugated)	1685			
C=C	1650			
C=C aromatic	1600			

Carbon NMR	Chemical Shift (ppm)
Alkane C	0-50
C-X	40-60
C-O	50-70
C≡C	80-100
sp <sup>2</sup> , aromatic C	100-150
C=O	160-220