Infrared Functional Groups

Group	Vibration	Type	Range	Comments
CH_3	Stretch	Antisymmetric	2962± 10	
		Symmetric	2872± 10	
	Bend	Antisymmetric	1460± 10	
		Symmetric	1375± 10	Umbrella
CH_2	Stretch	Antisymmetric	2926± 10	
		Symmetric	2853± 10	
	Bend	Scissors	1455± 10	
	Rocking	Concerted	720± 10	Four or more
$=CH_2$	Stretch	Antisymmetric	3080	
		Symmetric	2997	
	Twist	Out-of-plane	993	Mono or Trans only
	Bend	Out-of-Plane	909	Terminal alkene
			1821	Overtone frequency
C=C	Stretch	Cis and Vinyl	1640+ 20	
		Trans, tri and tetra	1670+ 10	
≅CH	Stretch	Normal	3300± 20	Always very sharp
	Bend	Normal	630	
			1238	Overtone frequency
C≅C	Stretch	Normal	2220± 10	Terminal alkynes
			2225± 10	Internal alkynes
C≅N	Stretch	Normal	2250± 10	10 to 20 lower when conjugated
CH_2	Bend	Scissoring	1426	Shifted with ≅
$C(sp^2)$-H (aromatic)	Stretch	Aromatic or unsaturated	3050± 50	Not assigned to specific vibrational modes
Aromatic Ring	Ring Stretch	Symmetric	1590± 10	Non-symmetrical substitution
			1500± 10	Variable intensity
		Sideways	1450± 10	CH_3 bend overlap
	Bend	Hydrogen	730± 20	Out of Plane
		Out of Plane Ring	690± 20	Mono, meta or 1,3,5 substitution
OH	Stretch	OH stretch	3350± 150	Broad
	Bend	Broad	1400± 100	
	Wag	Band	660	Not a good frequency
C-O to C-C	Stretch	Antisymmetrically coupled	1°: 1050± 25 2°: 1125± 25 3°: 1150± 50	
NH_2	Stretch	Antisymmetric	3300± 100	
		Symmetrical	3290	
	Bend	Scissoring	1615±15	1° only
	Wag	Band	797	1° and 2° only
CH=O	Stretch/bend	C-H	2820	Hidden under CH stretches
			2735± 15	Not hidden
	Bend	C-H	1395± 10	
C=O	Stretch	C=O	3420	1727 Overtone Frequency
		C=O	1727	Aldehyde
	Stretch	Conjugated	3400	1715 Overtone Frequency
		Conjugated	1715	Ketone
CH_2	Bend	Scissoring	1407	Shifted with carbonyl
COOH	Wag	Out-of-plane OH	935± 15	Acid Dimer
	Stretch	Antisymmetric	3000± 500	Acid Dimer
	Overtone	Bands	2500± 300	Acid group
	Bend/stretch	Combination	1425± 25	Acid group
	Stretch/bend	Combination	1250± 50	Acid group
O-C(O)-C	Stretch	O-C-C	1245± 15	
			1190±30	Higher esters
		C=O	3484	Overtone ester
			1742	ester
O=C-O-C=O	Stretch	Symmetrically	1830± 10	Anhydride
		Antisymmetric	1755± 15	Anhydride