

**CHARACTERISTIC INFRARED ABSORPTION BANDS OF FUNCTIONAL GROUPS**

Class of Compounds	Absorption, cm <sup>-1</sup>	Intensity	Assignment	Class of Compounds	Absorption, cm <sup>-1</sup>	Intensity	Assignment	
<b>Alkanes and Alkyls</b>	2850-3000	s	C-H stretch	<b>Carboxylic Acids</b>	2500-3500	s, broad	O-H stretch	
	1450-1470	s	C-H bend		R-C(O)-OH	1710-1715	s, broad	C=O stretch
	1370-1390	m	CH <sub>3</sub> C-H bend		C=C-C(O)-OH or	1680-1710	s	C=O stretch
	1365 + 1395 (two bands)	m	-CH(CH <sub>3</sub> ) <sub>2</sub> or -(CH <sub>3</sub> ) <sub>3</sub> bend		Ar-C(O)-OH			
	715-725	w	-(CH <sub>2</sub> ) <sub>n</sub> bend		<b>Esters</b>	aliphatic 1160-1210 acetates ~1240 aromatic 1250-1310	s-vs	O=C-O-C stretch
<b>Alkenes</b>	3020-3140	w-m	=C-H stretch	R-C(O)-O-R	1735-1750	s	C=O stretch	
	1640-1670	vw-m	C=C stretch	C=C-C(O)-O-R or	1715-1730	s	C=O stretch	
	RCH=CH <sub>2</sub>	m + s	=C-H bend	Ar-C(O)-O-R				
	(two bands)			R-C(O)-O-Ar	1760-1790	s	C=O stretch	
	RR'C=CH <sub>2</sub>	s	=C-H bend	<b>Acyl Chlorides</b>				
	<i>cis</i> -RCH=CHR'	665-730	m-s, broad	=C-H bend	R-C(O)-Cl	1785-1815	s	C=O stretch
	<i>trans</i> -RCH=CHR'	960-980	s	=C-H bend	Ar-C(O)-Cl	1770-1800	s	C=O stretch
RCH=CR'R''	790-840	s	=C-H bend	<b>Anhydrides</b>				
<b>Alkynes</b>	R-C≡C-H	3265-3335	s, sharp	R-C(O)-O-C(O)-R	~1750 + ~1815	s,s	C=O symmetric	
		2100-2140	m	Ar-C(O)-O-C(O)-Ar	~1720 + ~1775	s,s	& asym. stretch	
		610-700	s, broad	(both two bands)				
	R-C≡C-R'	2190-2260	vw-w	C≡C stretch	<b>Nitriles</b>			
<b>Alkyl halides</b>	R-F	1000-1350	vs	R-C≡N	2240-2260	m-s	C≡N stretch	
	R-Cl	750-850	s	C=C-C≡N or	2220-2240	s	C≡N stretch	
	R-Br	500-680	s	Ar-C≡N				
	R-I	200-500	s	<b>Amines</b>				
				R-NH <sub>2</sub>	~3400 + ~3500 (two bands)	w	N-H symmetric & asym. stretch	
<b>Alcohols</b>	C=C-CH <sub>2</sub> -OH	3300-3400	s, broad		1580-1650	w-m	N-H bend	
	R-CH <sub>2</sub> -OH (1°) or	1035-1050	m-s	RR'N-H	3310-33350	w	N-H stretch	
	C=C-CH(R)-OH	1050-1085	m-s	<b>Amides</b>				
	RR'CH-OH (2°) or	1085-1125	m-s	R-C(O)-NH <sub>2</sub>	3200-3400 and 3400-3500 (two bands)	w-m	N-H symmetric & asym. stretch	
	C=C-CRR'-OH				1650-1690	s, broad	C=O stretch	
	RR'R''C-OH (3°)	1125-1205	m-s		1590-1655	m-s	N-H bend	
	Ar-O-H	1180-1260	m-s	R-C(O)-NH-R	3400-3500	w-m	N-H stretch	
<b>Ethers</b>	R-O-R'	1085-1150	s		1640-1690	s, broad	C=O stretch	
	Ar-O-R	1020-1075 and 1200-1275 (two band)	m-s	R-C(O)-NR'R''	1510-1560	m-s	N-H bend	
					1630-1680	m-s	C=O stretch	
<b>Aldehydes</b>	R-CH=O	2700-2725	m	<b>Nitro Compounds</b>				
	C=C-CH=O or	1720-1740	s	R-NO <sub>2</sub>	~1550 and ~1370	s	N-O symmetric & asym. stretch	
	Ar-CH=O	1685-1710	s	C=C-NO <sub>2</sub> or	~1525 and ~1335	s	N-O symmetric & asym. stretch	
				Ar-NO <sub>2</sub>	(both two bands)			
<b>Ketones</b>	RR'C=O	1710-1720	s	<b>Aromatic Compounds</b>	3010-3100	m	Ar C-H stretch	
	C=C-C(O)-R	1665-1685	s		1450-1600	m-s	ring C=C stretch	
	Ar-C(O)-R	1675-1695	s		(two to four bands)	sharp		
	four member cyclic	1770-1780	s	monosubstituted	730-770 and 690-710 (two bands)	s	C-H bend	
	five member cyclic	1740-1755	s					
	six member cyclic	1710-1720	s	<i>o</i> -disubstituted	735-770	s	C-H bend	
				<i>m</i> -disubstituted	750-810 and 690-710	s	C-H bend	
				<i>p</i> -disubstituted	810-840	s	C-H bend	

**Intensity abbreviations:** vw = very weak, w = weak, m = medium, s = strong, vs = very strong