CHARACTERISTIC INFRARED ABSORPTION BANDS

General Trend in Bond Stretching Absorption Frequencies (in wavenumbers = cm^{-1})

single bonds to hydrogen:	C−H	N−H	O−H	2850−3650 cm^{-1}
triple bonds:	C≡C	C≡N	C≡O	2000−2300 cm^{-1}
double bonds:	C=C	C=N	C=O	1500−1900 cm^{-1}
single bonds:	C−C	C−N	C−O	800−1300 cm^{-1}

Characteristic Absorption Bands for Common Functional Groups

Functional Group	Fragment	Mode of Vibration	Range (cm^{-1}) (most useful)	Strength (s,m,w,v)	Comments (typical values)
Hydrocarbons:					
Alkanes	C−H	stretch	**2850−2960**	m−s	nonspecific band
Alkenes	C=C	stretch	1640−1480	v	(1660), substitution weakens −20 to 30 cm^{-1} & stronger if conjugated
	C−H	stretch	**3010−3100**	m	sharp, above 3000 cm^{-1}
Alkynes	C≡C	stretch	2100−2260	v	sharp, weak or gone if internal
	C−H	stretch	**3270−3320**	s	sharp, stands alone
Aromatics	ring C−C	overtones	1667−2000	v	indicates substitution pattern
	C−H	stretch	**3030**	v	above 3000 cm^{-1} characteristic bands for -OH & NH
Oxygen & Nitrogen:					
Alcohols	O−H	stretch	**3200−3550**	br,s	H-bonding in conc. Solutions
	C−O	stretch	1050−1200	s	strong but not always easy to ID
Ethers	C−O	stretch	1050−1150	s	strong but not always easy to ID
Amines	N−H	stretch	**3300−3500**	m	
	1°	stretch	3400, 3500	m	two peaks
	2°	stretch	3300−3350	m	one peak
Carbonyls:	C=O	stretch	**1630−1780**	s	often the strongest absorption lowered by conjugation 20−30 cm^{-1}
Aldehydes	C=O	stretch	1680−1750	s	sharp (nominally 1730)
	(CO)−H	stretch	**2720**	w	often characteristic
Ketones	C=O	stretch	1680−1750	s	(nominally 1715)
Carbox. Acid	O−H	stretch	2500−3200	s	H-bonding, double bump, broad
	C=O	stretch	1700−1720	s	broad range (1700)
Esters	C=O	stretch	1735−1750	s	
	C−O	stretch	1050−1300	s	broad, (1150−1225 if saturated)
Amide	N−H	stretch	3400−3500	s	two bands for 2°, one band for 1°
	C=O	stretch	1630−1690	s	broad
Nitriles (CN)	C≡N	stretch	**2220−2260**	m	

s = strong, m = medium, w = weak, v = variable

values in red are a good starting point