Infrared spectroscopy absorption table

From OChemOnline

The following table lists **infrared spectroscopy absorptions** by frequency regions.

4000-3000 cm^{-1}						
3700-3584	medium	sharp	O-H	stretching	alcohol	free
3550-3200	strong	broad	O-H	stretching	alcohol	intermolecular bonded
3500 3400	medium		N-H	stretching	primary amine	
3400-3300 3330-3250	medium		N-H	stretching	aliphatic primary amine	
3350-3310	medium		N-H	stretching	secondary amine	
3300-2500	strong	broad	O-H	stretching	carboxylic acid	usually centered on 3000 cm^{-1}
3200-2700	weak	broad	O-H	stretching	alcohol	intramolecular bonded
3000-2800	strong	broad	N-H	stretching	amine salt	

3000-2500 cm^{-1}						
3333-3267	strong	sharp	C-H	stretching	alkyne	
3100-3000	medium		C-H	stretching	alkene	
3000-2840	medium		C-H	stretching	alkane	
2830-2695	medium		C-H	stretching	aldehyde	doublet
2600-2550	weak		S-H	stretching	thiol	

2400-2000 cm^{-1}						
2349	strong		O=C=O	stretching	carbon dioxide	
2275-2250	strong	broad	N=C=O	stretching	isocyanate	
2260-	weak		C≡N	stretching	nitrile	

2222					
2260-2190	weak	C≡C	stretching	alkyne	disubstituted
2175-2140	strong	S-C≡N	stretching	thiocyanate	
2160-2120	strong	N=N=N	stretching	azide	
2150		C=C=O	stretching	ketene	
2145-2120	strong	N=C=N	stretching	carbodiimide	
2140-2100	weak	C≡C	stretching	alkyne	monosubstituted
2140-1990	strong	N=C=S	stretching	isothiocyanate	
2000-1900	medium	C=C=C	stretching	allene	
2000		C=C=N	stretching	ketenimine	

2000-1650 cm^{-1}

2000-1650	weak	C-H	bending	aromatic compound	overtone

1870-1540 cm^{-1}

1818 1750	strong	C=O	stretching	anhydride	
1815-1785	strong	C=O	stretching	acid halide	
1800-1770	strong	C=O	stretching	conjugated acid halide	
1775 1720	strong	C=O	stretching	conjugated anhydride	
1770-1780	strong	C=O	stretching	vinyl / phenyl ester	
1760	strong	C=O	stretching	carboxylic acid	monomer
1750-1735	strong	C=O	stretching	esters	6-membered lactone
1750-1735	strong	C=O	stretching	δ-lactone	γ: 1770
1745	strong	C=O	stretching	cyclopentanone	
1740-1720	strong	C=O	stretching	aldehyde	
1730-1715	strong	C=O	stretching	α,β-unsaturated ester	or formates
1725-	strong	C=O	stretching	aliphatic ketone	or cyclohexanone

1705					or cyclopentenone
1720-1706	strong	C=O	stretching	carboxylic acid	dimer
1710-1680	strong	C=O	stretching	conjugated acid	dimer
1710-1685	strong	C=O	stretching	conjugated aldehyde	
1690	strong	C=O	stretching	primary amide	free (associated: 1650)
1690-1640	medium	C=N	stretching	imine / oxime	
1685-1666	strong	C=O	stretching	conjugated ketone	
1680	strong	C=O	stretching	secondary amide	free (associated: 1640)
1680	strong	C=O	stretching	tertiary amide	free (associated: 1630)
1650	strong	C=O	stretching	δ-lactam	γ: 1750-1700 β: 1760-1730

1670-1600 cm^{-1}

1678-1668	weak	C=C	stretching	alkene	disubstituted (trans)
1675-1665	weak	C=C	stretching	alkene	trisubstituted
1675-1665	weak	C=C	stretching	alkene	tetrasubstituted
1662-1626	medium	C=C	stretching	alkene	disubstituted (cis)
1658-1648	medium	C=C	stretching	alkene	vinylidene
1650-1600	medium	C=C	stretching	conjugated alkene	
1650-1580	medium	N-H	bending	amine	
1650-1566	medium	C=C	stretching	cyclic alkene	
1648-1638	strong	C=C	stretching	alkene	monosubstituted
1620-1610	strong	C=C	stretching	α,β-unsaturated ketone	

1600-1300 cm^{-1}

1550-1500	strong	N-O	stretching	nitro compound	

1372-1290					
1465	medium	C-H	bending	alkane	methylene group
1450 1375	medium	C-H	bending	alkane	methyl group
1390-1380	medium	C-H	bending	aldehyde	
1385-1380 1370-1365	medium	C-H	bending	alkane	gem dimethyl

1400-1000 cm^{-1}					
1440-1395	medium	O-H	bending	carboxylic acid	
1420-1330	medium	O-H	bending	alcohol	
1415-1380 1200-1185	strong	S=O	stretching	sulfate	
1410-1380 1204-1177	strong	S=O	stretching	sulfonyl chloride	
1400-1000	strong	C-F	stretching	fluoro compound	
1390-1310	medium	O-H	bending	phenol	
1372-1335 1195-1168	strong	S=O	stretching	sulfonate	
1370-1335 1170-1155	strong	S=O	stretching	sulfonamide	
1350-1342 1165-1150	strong	S=O	stretching	sulfonic acid	anhydrous hydrate: 1230-1120
1350-1300 1160-1120	strong	S=O	stretching	sulfone	
1342-1266	strong	C-N	stretching	aromatic amine	
1310-	strong	C-O	stretching	aromatic ester	

1250						
1275-1200 1075-1020	strong		C-O	stretching	alkyl aryl ether	
1250-1020	medium		C-N	stretching	amine	
1225-1200 1075-1020	strong		C-O	stretching	vinyl ether	
1210-1163	strong		C-O	stretching	ester	
1205-1124	strong		C-O	stretching	tertiary alcohol	
1150-1085	strong		C-O	stretching	aliphatic ether	
1124-1087	strong		C-O	stretching	secondary alcohol	
1085-1050	strong		C-O	stretching	primary alcohol	
1070-1030	strong		S=O	stretching	sulfoxide	
1050-1040	strong	broad	CO-O-CO	stretching	anhydride	

1000-650 cm^{-1}

995-985 915-905	strong		C=C	bending	alkene	monosubstituted
980-960	strong		C=C	bending	alkene	disubstituted (trans)
895-885	strong		C=C	bending	alkene	vinylidene
850-550	strong		C-Cl	stretching	halo compound	
840-790	medium		C=C	bending	alkene	trisubstituted
730-665	strong		C=C	bending	alkene	disubstituted (cis)
690-515	strong		C-Br	stretching	halo compound	
600-500	strong		C-I	stretching	halo compound	

900-700 cm^{-1}

880 ± 20 810 ± 20	strong	C-H	bending	1,2,4-trisubstituted
880 ± 20 780 ± 20 (700 ± 20)	strong	C-H	bending	1,3-disubstituted
810 ± 20	strong	C-H	bending	1,4-disubstituted or 1,2,3,4-tetrasubstituted
780 ± 20 (700 ± 20)	strong	C-H	bending	1,2,3-trisubstituted
755 ± 20	strong	C-H	bending	1,2-disubstituted
750 ± 20 700 ± 20	strong	C-H	bending	monosubstituted benzene derivative