Table of IR Absorptions

| *Functional Group* | *Characteristic Absorption(s)*(cm-1) | *Notes* |
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| Alkyl C-H Stretch | 2950 - 2850 (m or s) | Alkane C-H bonds are fairly ubiquitous and therefore usually less useful in determining structure. |
| Alkenyl C-H StretchAlkenyl C=C Stretch | 3100 - 3010 (m)1680 - 1620 (v) | Absorption peaks above 3000 cm-1 are frequently diagnostic of unsaturation |
| Alkynyl C-H StretchAlkynyl C=C Stretch | ~3300 (s)2260 - 2100 (v) |  |
| Aromatic C-H StretchAromatic C-H BendingAromatic C=C Bending | ~3030 (v)860 - 680 (s)1700 - 1500 (m, m) |  |
| Alcohol/Phenol O-H Stretch | 3550 - 3200 (broad, s) | See ["Free vs. Hyrdogen-Bonded Hydroxyl Groups"](http://www.chem.ucla.edu/~webspectra/irintro.html#hydroxyl) in the [Introduction to IR Spectra](http://www.chem.ucla.edu/~webspectra/irintro.html) for more information |
| Carboxylic Acid O-H Stretch | 3000 - 2500 (broad, v) |  |
| Amine N-H Stretch | 3500 - 3300 (m) | Primary amines produce two N-H stretch absorptions, secondary amides only one, and tertiary none. |
| Nitrile C=N Stretch | 2260 - 2220 (m) |  |
| Aldehyde C=O StretchKetone C=O StretchEster C=O StretchCarboxylic Acid C=O StretchAmide C=O Stretch | 1740 - 1690 (s)1750 - 1680 (s)1750 - 1735 (s)1780 - 1710 (s)1690 - 1630 (s) | The carbonyl stretching absorption is one of the strongest IR absorptions, and is very useful in structure determination as one can determine both the number of carbonyl groups (assuming peaks do not overlap) but also an estimation of which types. |
| Amide N-H Stretch | 3700 - 3500 (m) | As with amines, an amide produces zero to two N-H absorptions depending on its type. |

*All figures are for the typical case only -- signal positions and intensities may vary depending on the particular bond environment*

| **Typical Infrared Absorption Frequencies** |
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|  | **Stretching Vibrations** | **Bending Vibrations** |
| **Functional Class** | **Range (cm-1)** | **Intensity** | **Assignment** | **Range (cm-1)** | **Intensity** | **Assignment** |
| **Alkanes** | 2850-3000 | str | CH3, CH2 & CH2 or 3 bands | 1350-14701370-1390720-725 | medmedwk | CH2 & CH3 deformationCH3 deformationCH2 rocking |
| [**Alkenes**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir2) | 3020-31001630-16801900-2000 | medvarstr | =C-H & =CH2 (usually sharp) C=C (symmetry reduces intensity)C=C asymmetric stretch | 880-995780-850675-730 | strmedmed | =C-H & =CH2(out-of-plane bending)cis-RCH=CHR |
| **Alkynes** | 33002100-2250 | strvar | C-H (usually sharp)C≡C (symmetry reduces intensity) | 600-700 | str | C-H deformation |
| [**Arenes**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir3) | 30301600 & 1500 | varmed-wk | C-H (may be several bands)C=C (in ring) (2 bands)(3 if conjugated) | 690-900 | str-med | C-H bending &ring puckering |
| [**Alcohols & Phenols**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir4) | 3580-36503200-3550970-1250 | varstrstr | O-H (free), usually sharpO-H (H-bonded), usually broadC-O | 1330-1430650-770 | medvar-wk | O-H bending (in-plane)O-H bend (out-of-plane) |
| [**Amines**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir4c) | 3400-3500 (dil. soln.)3300-3400 (dil. soln.)1000-1250 | wkwkmed | N-H (1°-amines), 2 bandsN-H (2°-amines)C-N | 1550-1650660-900 | med-strvar | NH2 scissoring (1°-amines)NH2 & N-H wagging(shifts on H-bonding) |
| [**Aldehydes & Ketones**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir5) | 2690-2840(2 bands)1720-17401710-17201690167517451780 | medstrstrstrstrstrstr | C-H (aldehyde C-H)C=O (saturated aldehyde) C=O (saturated ketone)aryl ketoneα, β-unsaturationcyclopentanonecyclobutanone | 1350-13601400-1450 1100 | strstrmed | α-CH3 bendingα-CH2 bendingC-C-C bending |
| [**Carboxylic Acids**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir4b)**&**[**Derivatives**](http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/Spectrpy/InfraRed/irspec1.htm#ir5b) | 2500-3300 (acids) overlap C-H1705-1720 (acids)1210-1320 (acids)1785-1815 ( acyl halides)1750 & 1820 (anhydrides)    1040-11001735-1750 (esters)    1000-13001630-1695(amides) | strstrmed-strstrstrstrstrstrstr | O-H (very broad)C=O (H-bonded) O-C (sometimes 2-peaks)C=OC=O (2-bands)    O-CC=O    O-C (2-bands)C=O (amide I band) | 1395-14401590-1650 1500-1560 | medmedmed | C-O-H bendingN-H (1¡-amide) II bandN-H (2¡-amide) II band |
| **NitrilesIsocyanates,Isothiocyanates,Diimides, Azides & Ketenes** | 2240-22602100-2270 | medmed | C≡N (sharp)-N=C=O, -N=C=S-N=C=N-, -N3, C=C=O |   |