IR Analysis

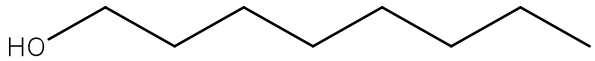
The interpretation of infrared spectra involves the correlation of absorption bands in the spectrum of an unknown compound with the known absorption frequencies for types of bonds. This table will help users become more familiar with the process. Significant for the identification of the source of an absorption band are **intensity** (weak, medium or strong), **shape** (broad or sharp), and **position** (cm^{-1}) in the spectrum. Characteristic examples are provided in the table below to assist the user in becoming familiar with the intensity and shape absorption bands for representative absorptions.

You can make use of this Table by doing the set of practice problems given at the end of this page.

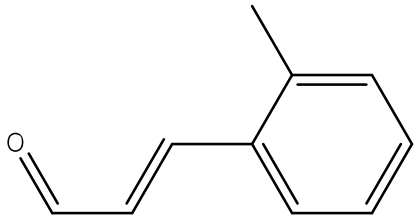
CHARACTERISTIC INFRARED ABSORPTION FREQUENCIES

Bond	Compound Type	Frequency range, cm^{-1}
C-H	Alkanes	2960-2850(s) stretch
		1470-1350(v) scissoring and bending
	CH_3 Umbrella Deformation	1380(m-w) - Doublet - isopropyl, *t*-butyl
C-H	Alkenes	3080-3020(m) stretch
		1000-675(s) bend
C-H	Aromatic Rings	3100-3000(m) stretch
	Phenyl Ring Substitution Bands	870-675(s) bend
	Phenyl Ring Substitution Overtones	2000-1600(w) - fingerprint region
C-H	Alkynes	3333-3267(s) stretch
		700-610(b) bend
C=C	Alkenes	1680-1640(m,w)) stretch
C≡C	Alkynes	2260-2100(w,sh) stretch
C=C	Aromatic Rings	1600, 1500(w) stretch
C-O	Alcohols, Ethers, Carboxylic acids, Esters	1260-1000(s) stretch
C=O	Aldehydes, Ketones, Carboxylic acids, Esters	1760-1670(s) stretch
O-H	Monomeric -- Alcohols, Phenols	3640-3160(s,br) stretch
	Hydrogen-bonded -- Alcohols, Phenols	3600-3200(b) stretch
	Carboxylic acids	3000-2500(b) stretch
N-H	Amines	3500-3300(m) stretch
		1650-1580 (m) bend
C-N	Amines	1340-1020(m) stretch
C≡N	Nitriles	2260-2220(v) stretch
NO_2	Nitro Compounds	1660-1500(s) asymmetrical stretch
		1390-1260(s) symmetrical stretch

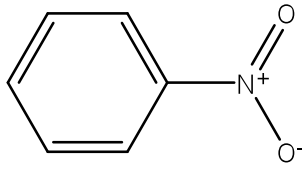
v - variable, m - medium, s - strong, br - broad, w – weak



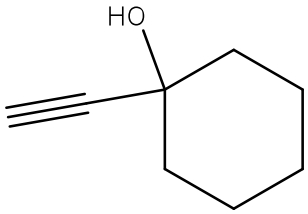
1-octanol



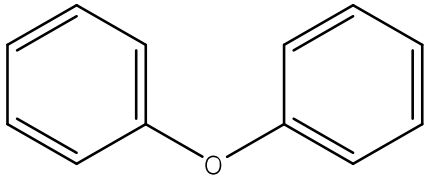
2-methylcinnamaldehyde



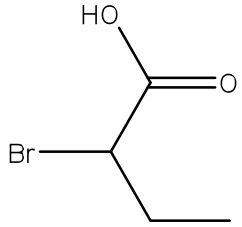
nitrobenzene



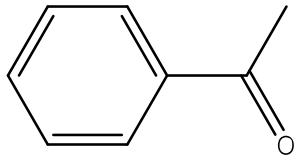
1-ethynylcyclohexanol



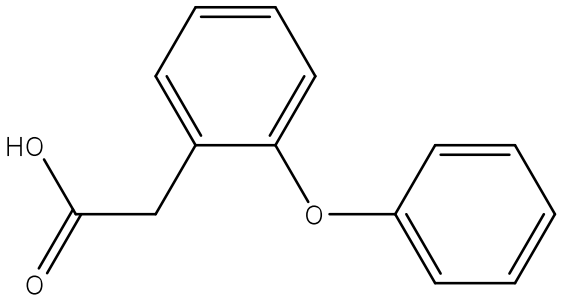
diphenyl ether



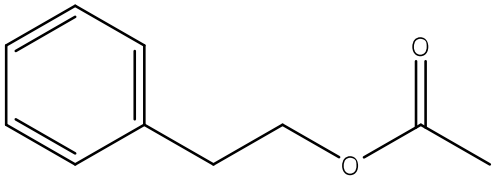
2-bromobutanoic acid



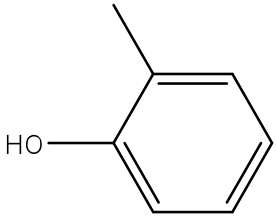
acetophenone



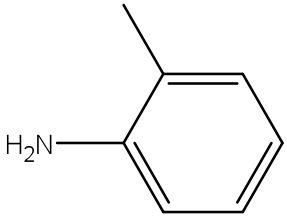
2-phenylether ethanoate



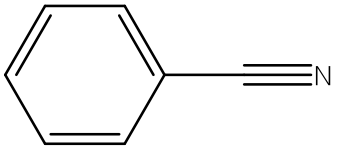
2-phenylethyl ethanoate



2-methylphenol



2-methylaniline



benzonitrile