## Beloit College

## Infrared Spectroscopy Peaks

## *Weaker springs have slower vibrations*.

## *Larger masses have slower vibrations*.

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| Springs | Observed stretching frequencies, cm-1 |
| single bond: | C-H, O-H, N-H 2700-3800  C-C, C-O, C-N 800-1300 |
| double bond: | CC, CO, CN 1500-1900 |
| triple bond: | C≡C, C≡N, C≡O 2000-2300 |

Force constants for bending are about 1/10 that for stretching.



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| C-H Functional Group | Frequency, cm-1 | Remarks |
| Unsaturated CH | **>3000**  2000-1650(w)  900-600(s) | C-H stretching.  Aromatic overtone bands.  Out-of-plane C-H bending. |
| -CH3 | 2962±10(s), as  2872±10(s), s | Asymmetric C-H stretching.  Symmetric C-H stretching. |
|  | **1450**±20(m), as  **1375**± 5(s), s | Asymmetric C-H bend.  Symmetric C-H bend. |
| -CH2- | 2926± 5(s), as  2853± 5(s), s | Asymmetric C-H stretching.  Symmetric C-H stretching. |
|  | **1465**±15(m), s | C-H bend, sharp. |
|  | 1350-1150,  | C-H wag and twist. |
|  | 1100-700,  | C-H rock, intense. |
|  | **725(m)** | -(CH2)*n*-, *n* ≥ 4 |
| -CH- | 2890±10(w),  | C-H stretch, usually very weak. |
| -C(CH3)3  *t*-butyl | **1390(m)**  **1370(s)** | C-H geminal dimethyl doublet,  *unequal* intensity. |
|  | 1250  1208±6 | C-C skeletal vibrations. |
| -CH(CH3)2  *i*-propyl | **1385(s)**  **1370(s)** | C-H geminal dimethyl doublet,  *equal* intensity. |
|  | 1170  1145 | Skeletal vibrations;  C-C stretch and C-C-H bend. |