| 3600 | 3400 | | 3200 | | 3000 | | 2 | 2800 | | 2600 | 2400 cm ⁻¹ | |
|---------|-------|----------|--------|----|------|-------|----------------|------|----------|------|-----------------------|--|
| | | | | | | 1 | 5 | | <u></u> | | | -CH ₃ >CH ₂ |
| | | | | | | 8 | w | | | | | }с—н |
| | | | | | | w | | | | | | $0 \rightarrow H \rightarrow H - CH_2 X$ |
| | | | Ĩ | | | | | | w | | | —сно |
| 77 | | | 8 | | | 27 | | m | a. | | | -OCH ₃ |
| | | | | | | 0 | | m | 0 | | | -0-CH2-0- |
| | | | | | | | | m | | | | N-CH3 |
| | | | S | | | 0 | | | 19 17 | | | —с≡с—н |
| s | | 0 | | 20 | m | | | | - | | 10 | $>c=c<_{H}^{H}$ |
| | | | | | | m | | | | | |)c=c< ^H |
| | | | 8 | | | w | | | 1 | | | aryl—H |
| Free OH | H-bri | dged oli | gomers | | li | ntram | olecular H-bri | dges | v | | | —0-н |
| | | | m | | | | | | | | | -NH ₂ =NH |
| | m | m | | | V | / | | | i ci | | | -CONH ₂ in solution |
| | | | | | n | n | | | 53 | | | -CONH ₂ soild state |
| | | m | | | | | | | | | | -CONH- in solution |
| | | | | | F | n | | | | | | -CONH- solid state |
| | | | | | | m | | | а | | | NH3* |
| | | | | | | | | m | | | | >NH2 ⁺ ->NH ⁺ =NH ⁺ - |
| | | | Î | | | | | | | w | | S-н |
| | | | | | | 0 | | | | | m | P-H |
| | | | | | | | | | | m | | P <o−h< td=""></o−h<> |

Valence vibrations of hydrogen, v(H-Y); intensity: s, strong; m, medium; w, weak; and v, variable.

| 2400 2300 | 2200 | 2100 | 2000 | 1900 cm ⁻¹ |
|-----------|------|------|------|-----------------------|
| | | W | | -C≡CH |
| | | V | | -C≡C |
| | V | i i | | —C≡N |
| | s | | | —N⁺≡N |
| | | S | | _S_C≡N |
| s | | | | 0=C=0 |
| | S | | | -N=C=0 |
| | | s | | -N=N=N |
| | | s | | -N=C=N- |
| | | s | |)c=c=0 |
| | | | S | -N=C=S |
| | Ű | 1 | 5 | $\sum = N = N$ |
| | | | 1 |)C=C=N- |
| | | Ê | | m >c=c=c< |

Valence vibrations of triple bonds and cumulated double bonds; intensity: s, strong; m, medium; w, weak; and v, variable.

| 800 1700 1 | 600 1 | 500 14 | 400 cm ⁻¹ |
|-------------------|------------|--------|--|
| | m | | NH ₂ (amide: s) |
| | | w | >NH (amide: s) |
| | 5 | s | NH3+ |
| п | I-W | |)c=c< |
| | m | 0 / | C=C (conj. to aryl) |
| 1 s | 2 s | | diene (1), triene (2) |
| +1870 cf. Fig. 2. | 13 1500- | s |)c=0 |
| | 5 | | c=c ^{_C=0} |
| v | | 6 |)c=n_ |
| v | | | C=N C=C ^{C=N} |
| | | v | C = N - (conj. cyclic) |
| | v | | _N=N_ |
| | v | | 0_N*=N_ |
| | | s | -HN_N*=N |
| s | | | $\frac{-HN}{C=C} \times \frac{N^{+}=N^{-}}{C=C} \times \frac{N^{+}=N^{-}}{C=C} \times \frac{N^{+}}{C=C} \times \frac{N^{+}}{C} \times \frac{N^{+}}{C$ |
| One or two bands | , m | m | arenes, pyridines |
| | | s | C-NO2 |
| | s | | 0-NO2 |
| | S | | N-NO2 |
| | | 5 | C-N=O |
| Two bands | s | | 0-N=0 |
| | 6 | 5 | N-N=0 |

| 900 | 1800 | D | 170 | 0 | 10 | 500 | | 1500 cm ⁻¹ |
|-----|----------|-----------|-----------|-------|----------|-----|---------------------------------------|--|
| | | | | | | | | aldehyde (saturated) |
| | | | | | | | | aldehyde (α,β-unsaturated; aryl-) |
| | | | | | | | | ketone (saturated, open chain) |
| | 4-membe | ered | 5-membe | ered | | | | ketone (cyclic; 4- and 5-membered ring |
| | | | | | | | | ketone (α,β-unsaturated; aryl-) |
| | | | | | | | | ketone (α- and α,α'-halogenated) |
| | | | | 1 | | | | ketone (α,β-,α',β'-unsaturated; quinone |
| | | | | | | | | ketone, aldehyde or ester with H-bridge |
| | | | | | | | | 1,2-diketone |
| | | | | | | | | ester (saturated, open chain) |
| 4-n | nembered | 5 | -membered | | | | | ester (4- and 5-membered lactone) |
| | | | | | | | | ester (α,β-unsaturated; aryl-) |
| | | | | | | | | ester (α,β-unsaturated five-ring lactone |
| | | | | | | | | ester (β,γ-unsaturated five-ring lactone |
| | | | | | | | | ester (vinylester -CO-O-C=C) |
| | | | | | | | | ester (α -halogen- and α -keto-ester) |
| | | | | | | | | thioester R-CO-S-R |
| | | | | | | | | carboxylic acid (saturated) |
| - | | | | | | | | carboxylic acid (α,β-unsaturated; aryl-) |
| | | | | | | - | | carboxylic acid chloride |
| | | | | | | | | carboxylic acid anhydride |
| | | | | | | | | carboxylic acid (α-halogenated) |
| | | | | | | | | carboxylate ion |
| | | | | | | | | peroxo carboxylic acid (R-CO-OO-H) |
| | | | | | | | | amide (primary, in solution) |
| | | | | | two band | s | | amide (primary, solid state) |
| | | | | | | | | amide (N-monosubstituted, in solution) |
| | | | | | | - | only open chaine | d amide (N-monosubstituted, solid state) |
| | | | | | | | | amide (N,N-disubstituted) |
| | | 4-membere | d | 5-mem | ibered | | · · · · · · · · · · · · · · · · · · · | amide (4- and 5-membered lactam) |
| 2 | | t | wo bands | | | | | imide |
| | | | | | | | | urethane |

Carbonyl valence vibrations v(C=O); all bands are strong

| 500 | 1400 | 1300 | 1200 | 1100 | 1000 | 900 | 800 | 700 cm ⁻¹ |
|-----|------|------|------|------|----------|----------|-----|---|
| m | m | | | | | | w | alkane |
| | s | | | | | 14 | | carboxylate —C ≤ 0 |
| | m s | | | | | | | C(CH ₃) ₃ |
| | s | | | | | 5 | | >C(CH ₃) ₂ (double band) |
| | | | | | s | | | (E)—CH==CH |
| | | | | S | -m | | | C=C-H alkene |
| | s | | | | | | | —0—Н |
| | | s | | | | 5 | | C—0 |
| | | | | | | | 5 | aromatic C-H: 5 neighboring H |
| | | 22 | | | | 27 2. | S | aromatic C-H: 4 neighboring H |
| | | | | | | | s | aromatic C-H: 3 neighboring H |
| | | | | | | s | | aromatic C-H: 2 neighboring H |
| | | | | | | w | | aromatic C-H: 1 isolated H |
| | s | | | | | | | C-NO ₂ |
| | | s | | | | | | O-NO2 |
| | | s | | | <i>.</i> | 3) | | N-NO ₂ |
| | s | | | | | | | N-N=0 |
| | | s | | | s | | | }N⁺—O⁻ |
| | | 2 | s | | 1. | 0 | | >c=s |
| s | | | | | | 40 44 | | -HN >C=S |
| | | S | | | | | | >s=0 |
| | | | | s | | | | >so ₂ |
| | S | | S | | | 0 | | -so ₂ -n< |
| | s | | 1.1 | | | | | -so ₂ -0- |
| | s | 0 | S | | 10 | 57 | | P—O—alkyl |
| | | | | S | | | | P—O — aryl |
| | | S | | _ | 6 | | |)∋P=0 |
| | | S | | | | -) | | >P≷OH |
| | 5 | | | | | | | C—F |
| | | 0 | | s | 8 | 9 | \$ | c—a |

Characteristic absorptions in the fingerprint range; intensity: s, strong; m, medium; and w, weak.