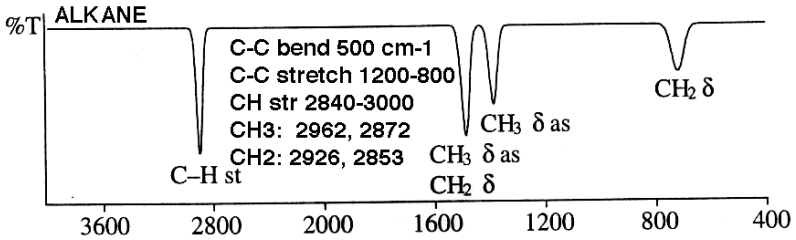

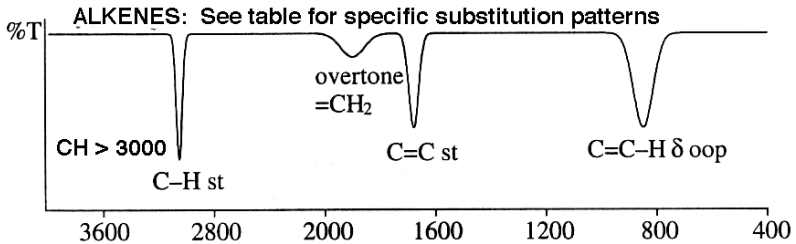

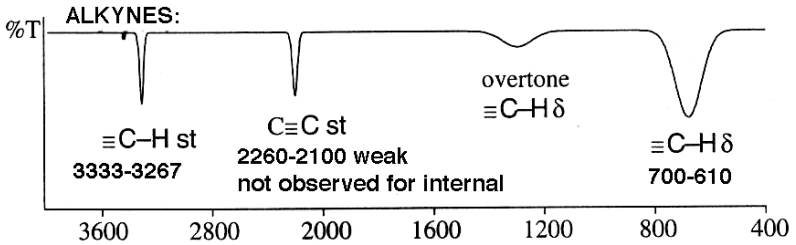

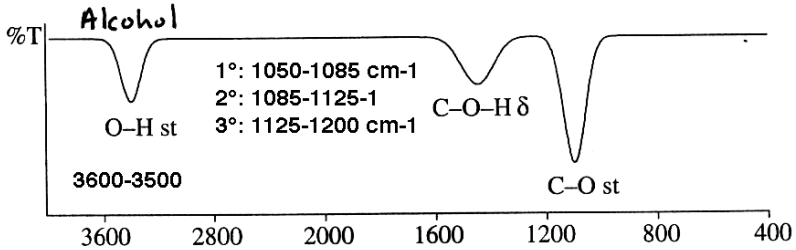

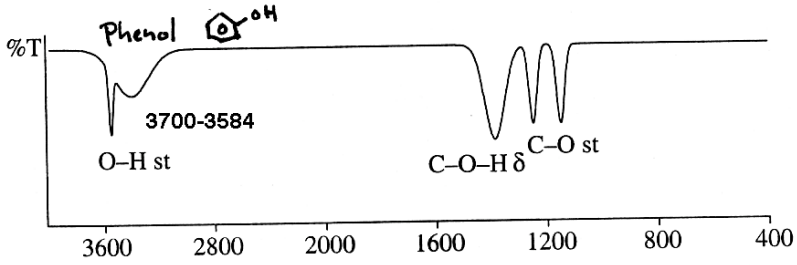

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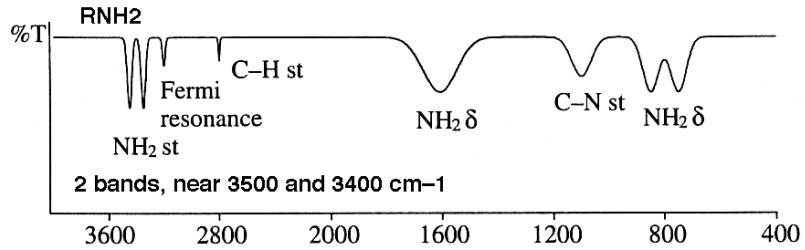
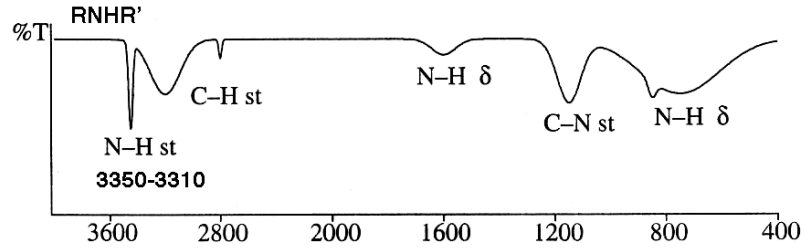


Secondary Amines



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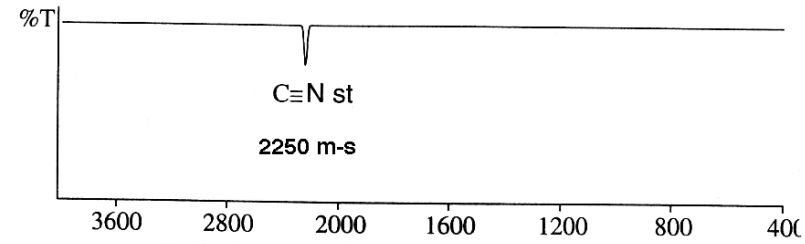
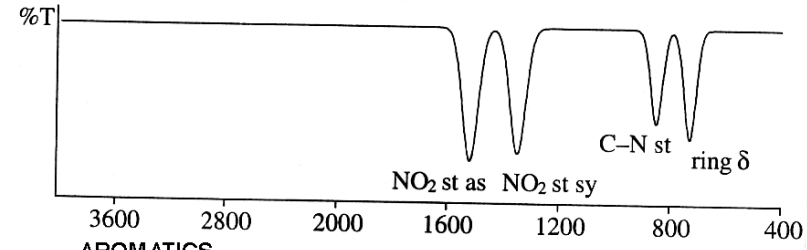
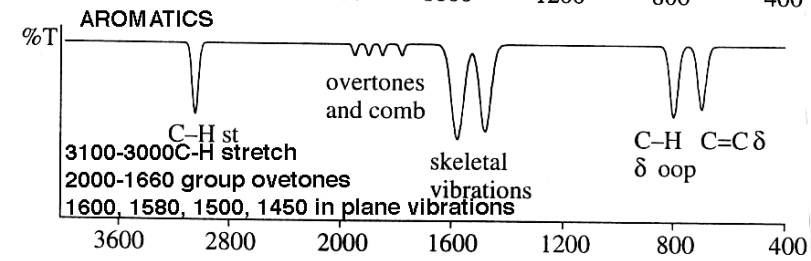
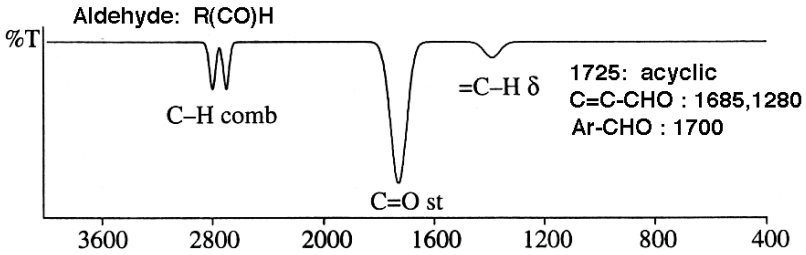
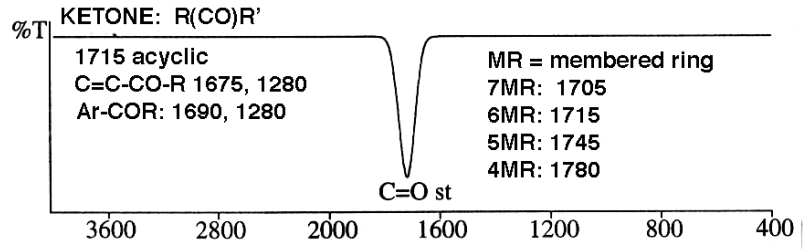


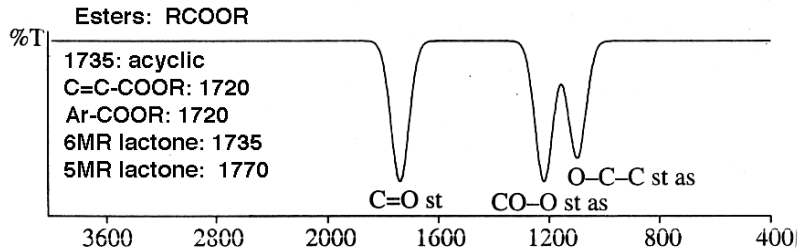
Nitro Compounds



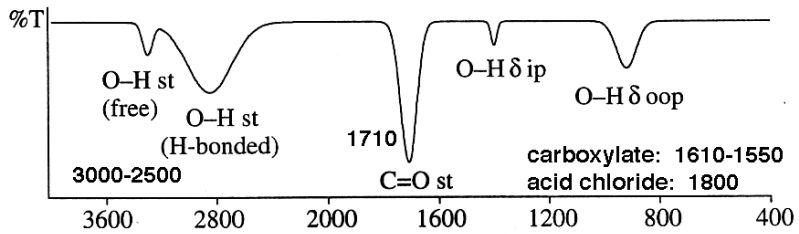


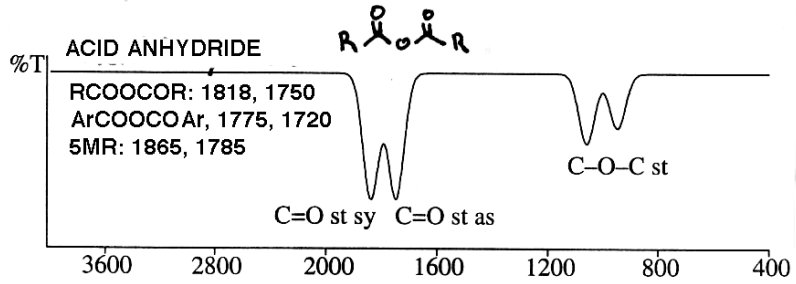




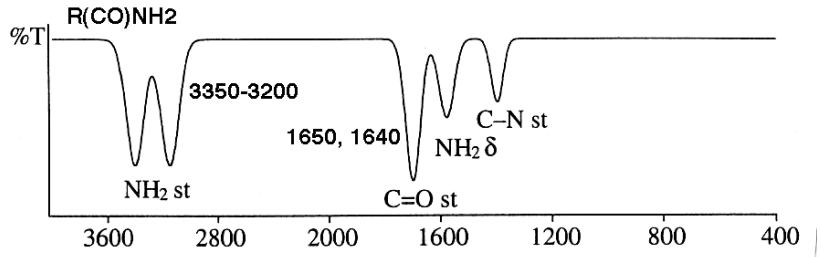


Carboxylic Acids





Primary Amides



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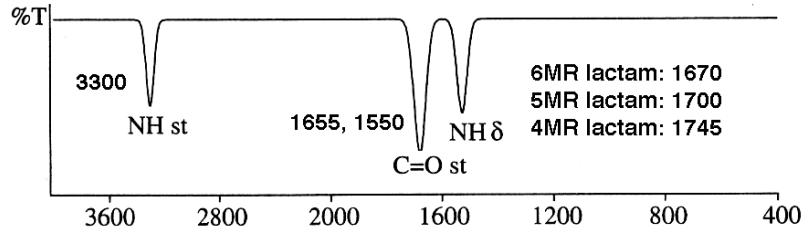
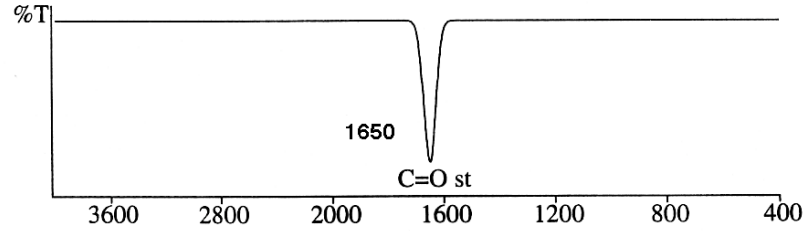
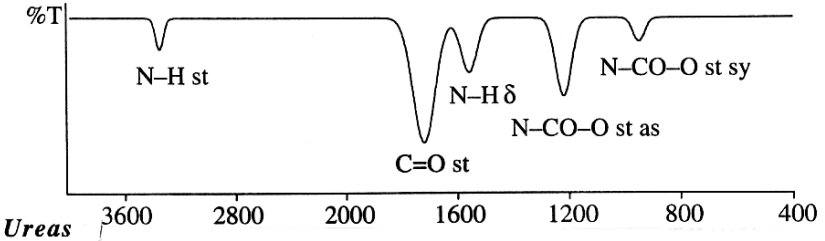


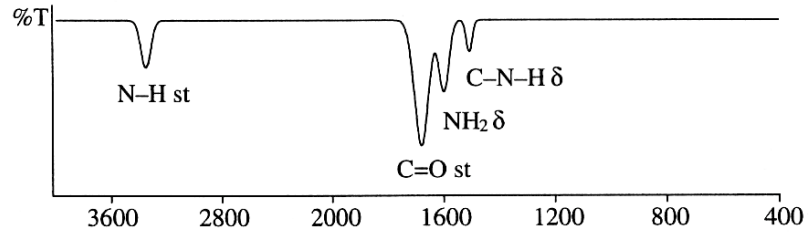
Tertiary Amides

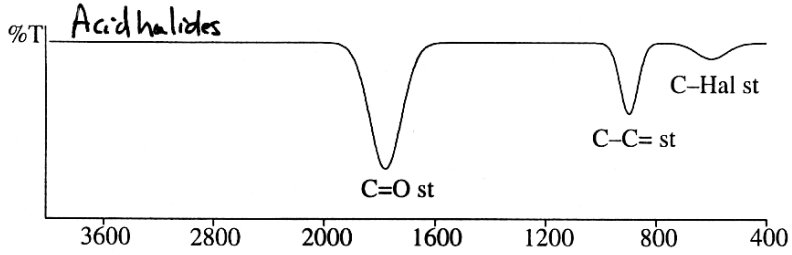


Carbamates

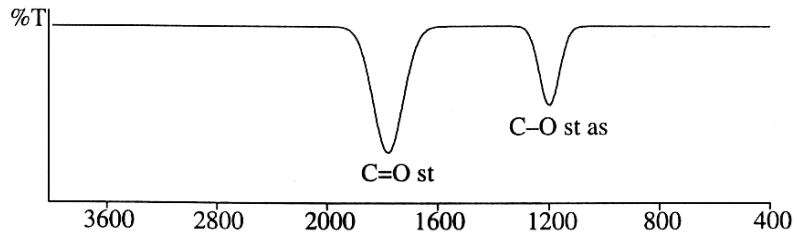


Ureas

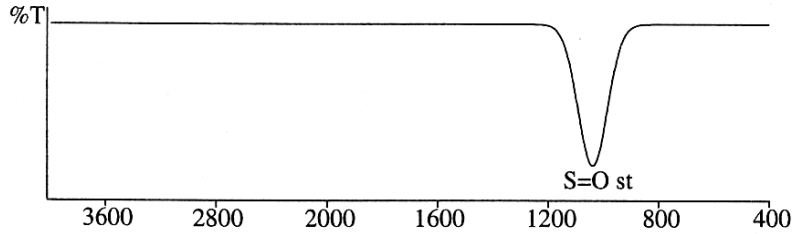




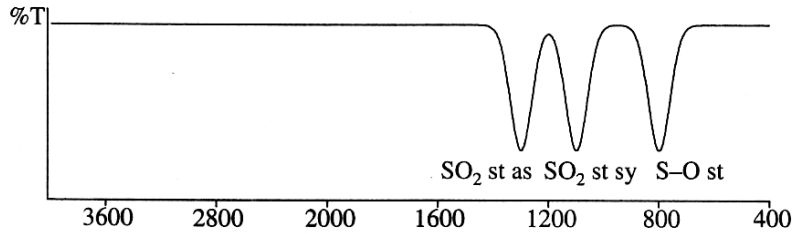
Carbonic Acid Derivatives



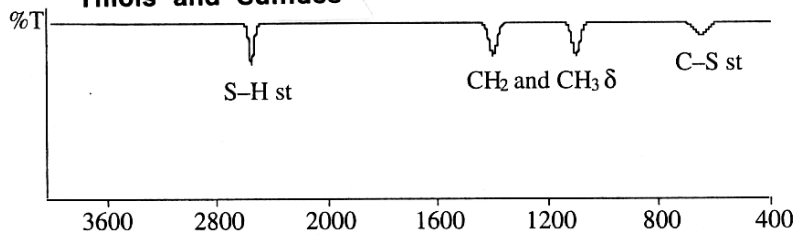
Sulfoxides



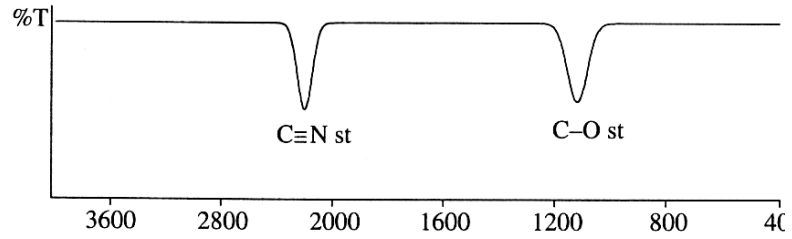
Sulfones



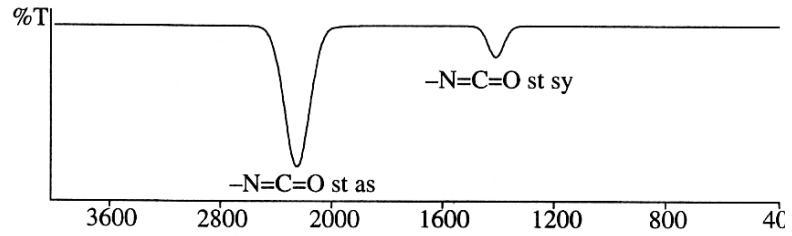
Thiols and Sulfides



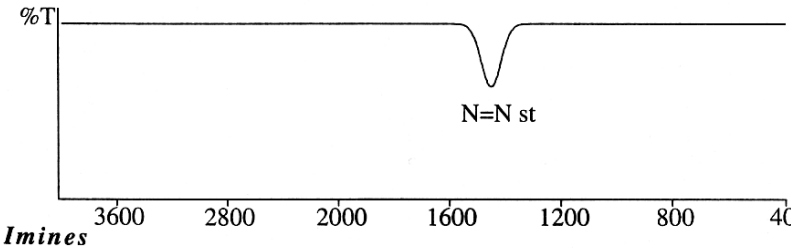
Cyanates



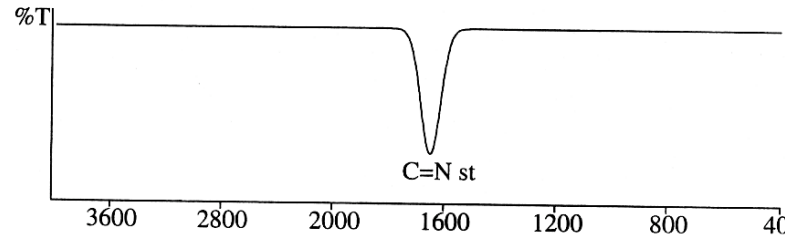
Isocyanates



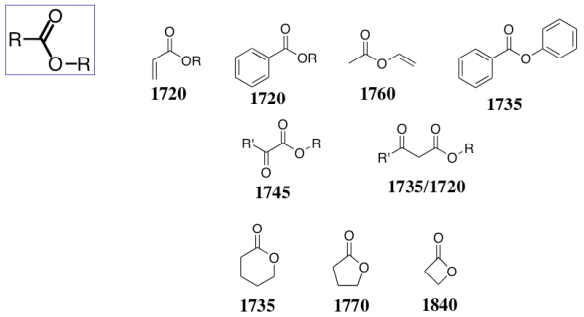
Azo Compounds



Imines



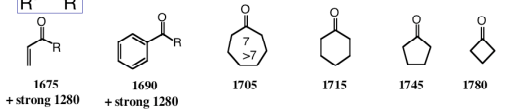
Ester: 1735 + two at 1300-1050



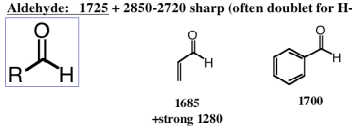
Carbonyl Compounds: 1870-1600 cm^{-1} (strong absorbance)

Ketone: 1715

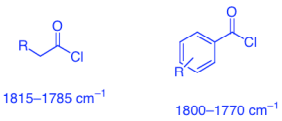
1240-1100: strong in aliphatic ketones
1280: strong in aromatic or α, β unsaturated ketones



Aldehyde: 1725 + 2850-2720 sharp (often doublet for H-CO)

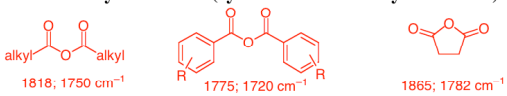


Acid Halides



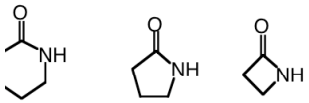
Anhydrides

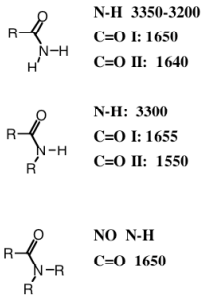
- **Two carbonyl stretches (symmetrical and asymmetrical)**

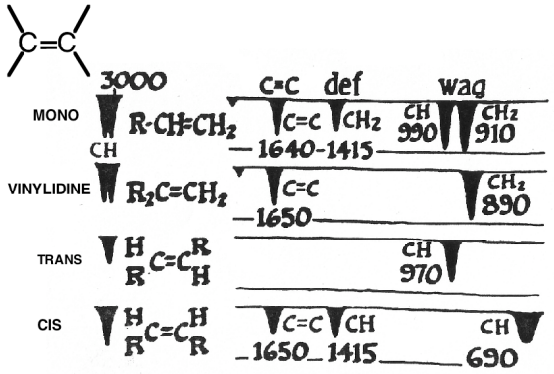


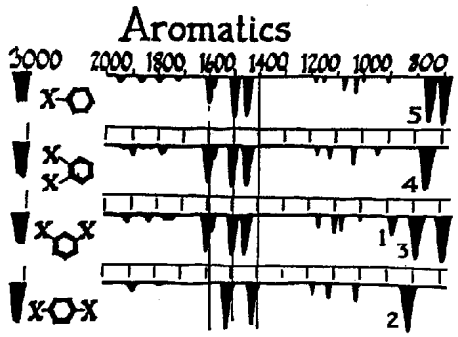
Amide: 1735 + two at 1300-1050

Coupling between C=O stretch and N-H gives double peak









3100-3000C-H stretch and overtones
2000-1660 group ow week ovetones
1600, 1580, 1500, 1450 in plane vibrations (not seen with all substitutions)

Alcohols:

R–O–H RO-H 3640-3600 sharp if not hydrogen bonded/solvated
3600-3500 m hydrogen bonded or solvated
C-OH 1° = 1050, 2° = 1100, 3° = 1150

—C≡N (nitrile) 2250 m-s

—C≡C–H Alkyne C≡C-H 3300 strong and sharp
—C≡C–R - C≡C- 2260-2190 very weak or absent

R–O–R Ethers C-O-C 1150-1070 s

Nitro: 1660-1500(s) asymmetrical stretch
390-1260(s) symmetrical stretch

Amines

- NH stretching
  - in dilute solution, primary amines (RNH_2) display 2 bands, near 3500 and 3400 cm^{-1}. These represent 'free' asymmetrical and symmetrical stretches.
  - in dilute soln, secondary amines (R_2NH) display one band near 3350-3310 cm^{-1}.
  - weaker and sharper than OH

  - neat primary aliphatic amines ($alkylNH_2$) absorb at 3400-3300 and 3330-3250 cm^{-1}. $ArylNH_2$ absorb at slightly higher frequencies.

Alkynes

- —C≡C— stretch: weak absorption at 2260-2100 cm^{-1}
  - not observed for symmetrical alkynes (v. weak for 'pseudo' symmetric alkynes
  - terminal alkynes (R-C≡C-H) absorptions are stronger than internal (R-C≡ C-R) absorptions

- C≡C–H stretch:
  - 3333–3267 cm^{-1}
  - strong, narrow (as compared to OH or NH)

- C≡C–H bend:
  - 700-610 cm^{-1}: broad, strong absorption
  - 1400-1220 cm^{-1}, overtone of above