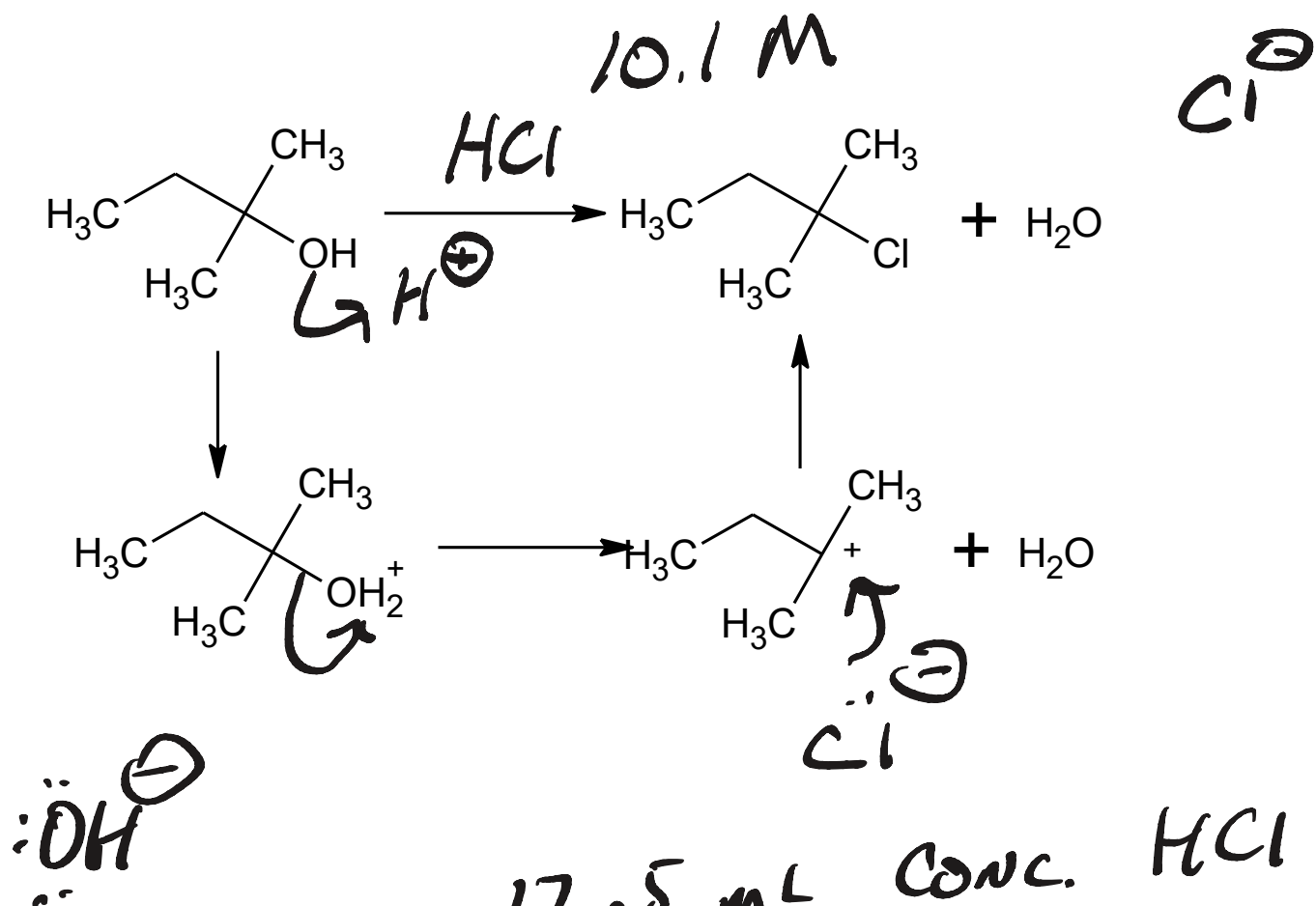


Nucleophilic Substitution

220C

10/12/26



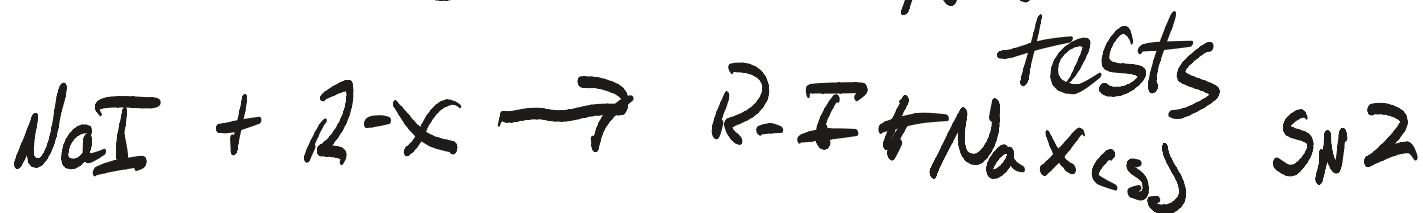
Wash
extraction

70% yield
65

30-50

IR

Halide



C-C

C-H

C=O



Functional group
Region

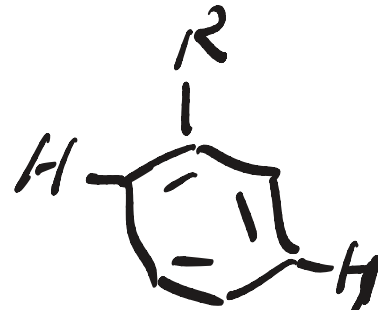
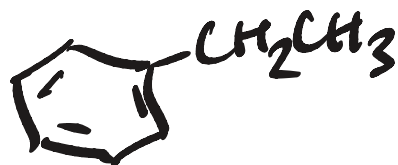
4000 cm^{-1} - 1250 cm^{-1}

TABLE IR.1 A Simplified Correlation Table

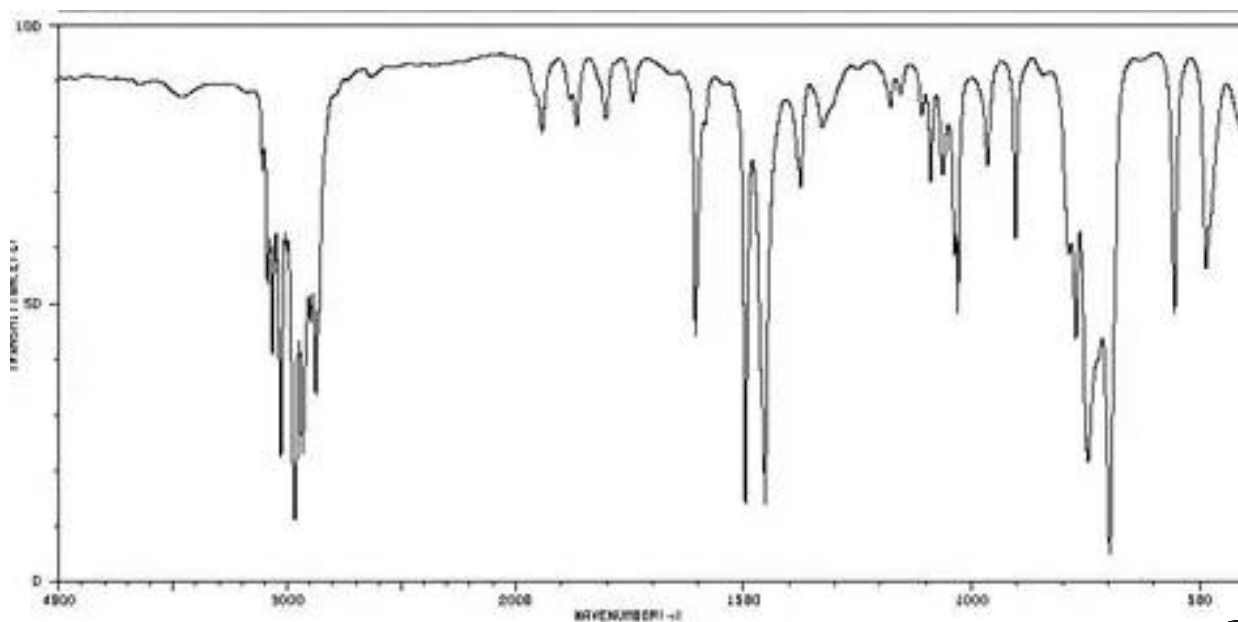
Type of Vibration			Frequency (cm^{-1})	Intensity
<u>C-H</u>	Alkanes	(stretch)	3000-2850	s
	-CH ₃	(bend)	1450 and 1375	m
	-CH ₂ -	(bend)	1465	m
	Alkenes	(stretch)	3100-3000	m
		(bend)	1700-1000	s
	Aromatics	(stretch)	3150-3050	s
		(out-of-plane bend)	1000-700	s
	Alkyne	(stretch)	ca. 3300	s
	Aldehyde		2900-2800	w
			2800-2700	w
C-C	Alkane	Not interpretatively useful		
C=C	Alkene		1680-1600	m-w
	Aromatic		1600-1400	m-w
C≡C	Alkyne		2250-2100	m-w
<u>C=O</u>	Aldehyde		1740-1720	s
	Ketone (acyclic)		1725-1705	s
	Carboxylic acid		1725-1700	s
	Ester		1750-1730	s
	Amide		1700-1640	s
	Anhydride		ca. 1810	s
			ca. 1760	s
C-O	Alcohols, ethers, esters, carboxylic acids		1300-1000	s
<u>O-H</u>	Alcohol, phenols			
	Free		3650-3600	m
	H-Bonded		3400-3200	m
	Carboxylic acids		3300-2500	m
N-H	Primary and secondary amines		ca. 3500	m
C≡N	Nitriles		2260-2240	m
N=O	Nitro (R-NO ₂)		1600-1500	s
			1400-1300	s
C-X	Fluoride		1400-1000	s
	Chloride		800-600	s
	Bromide, iodide		< 600	s

NOTE: s, strong; m, medium; w, weak.

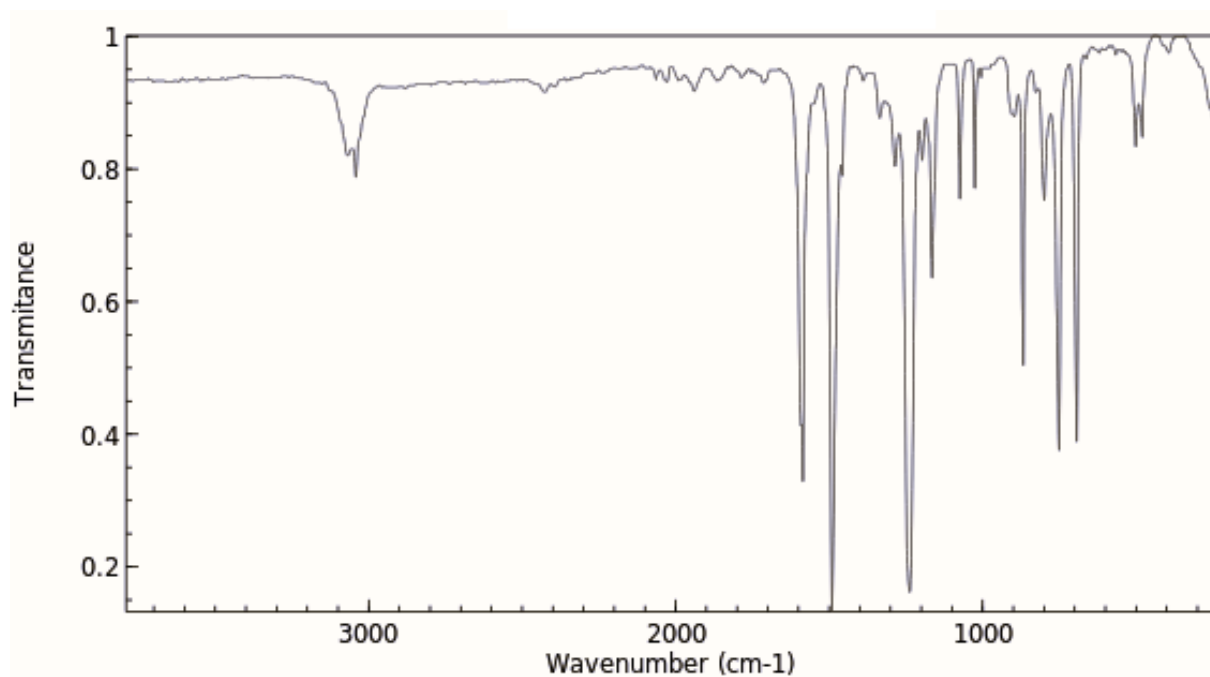
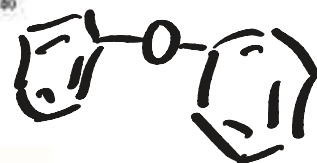
Peak Frequency vs Peak Intensity



Ethyl Benzene



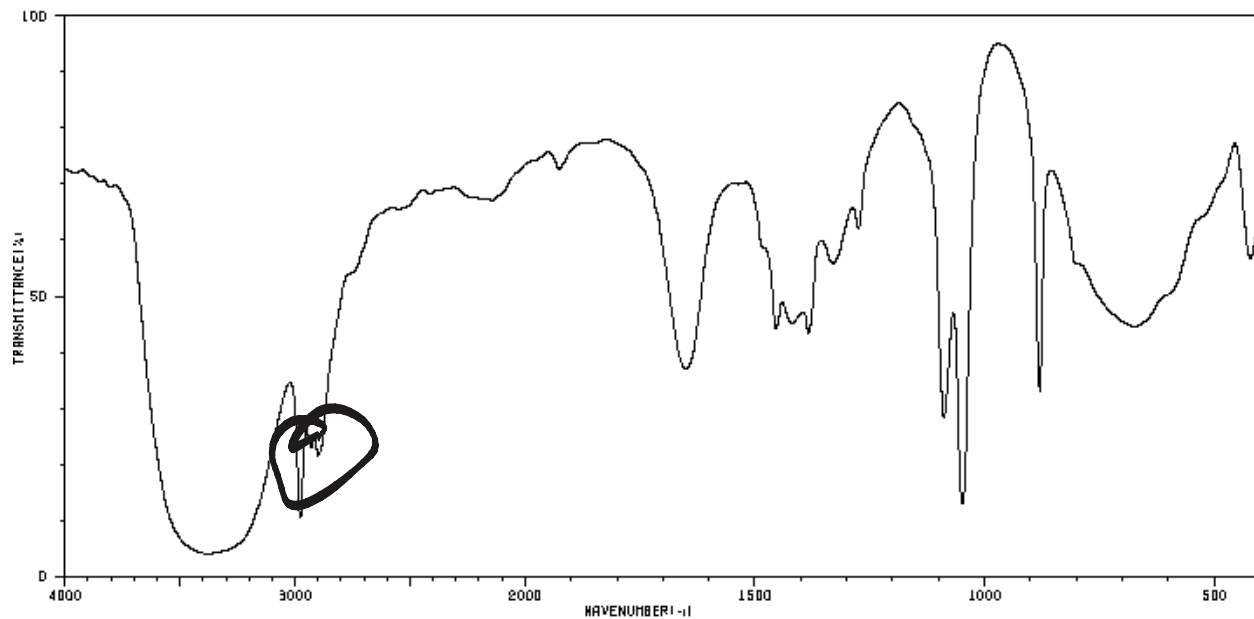
Diphenyl Ether



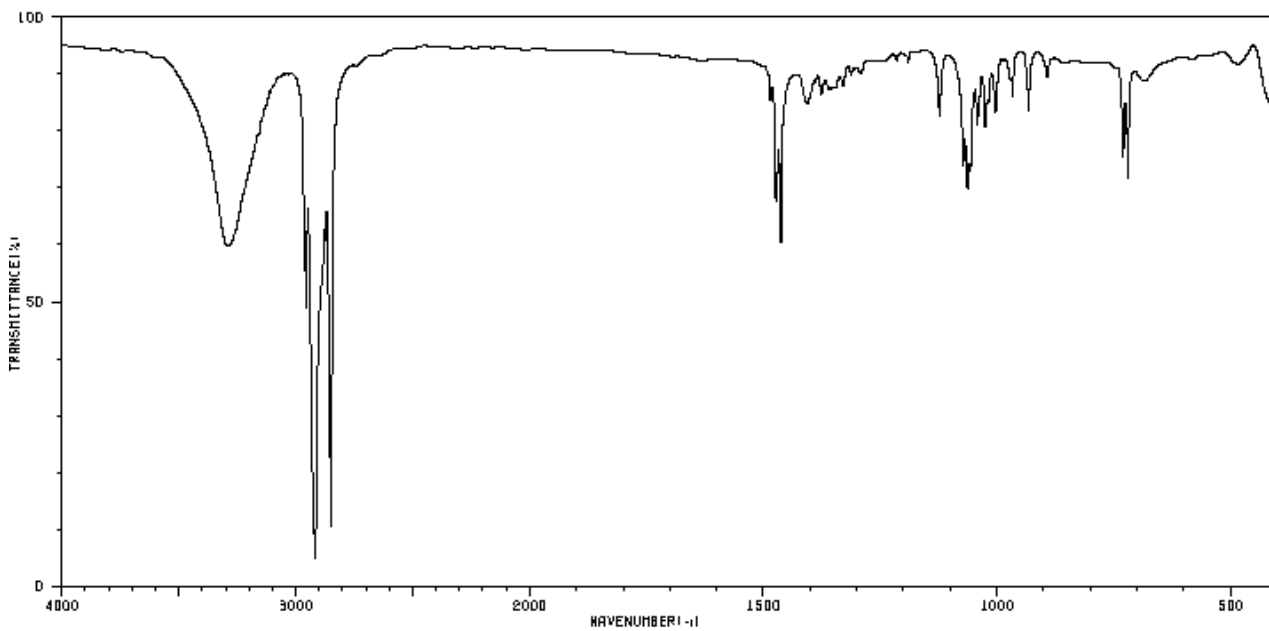
H-bonding



Ethanol

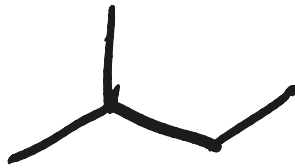


Tetradecanol

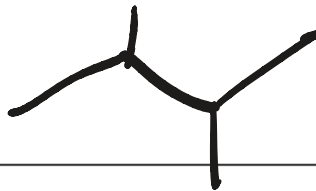
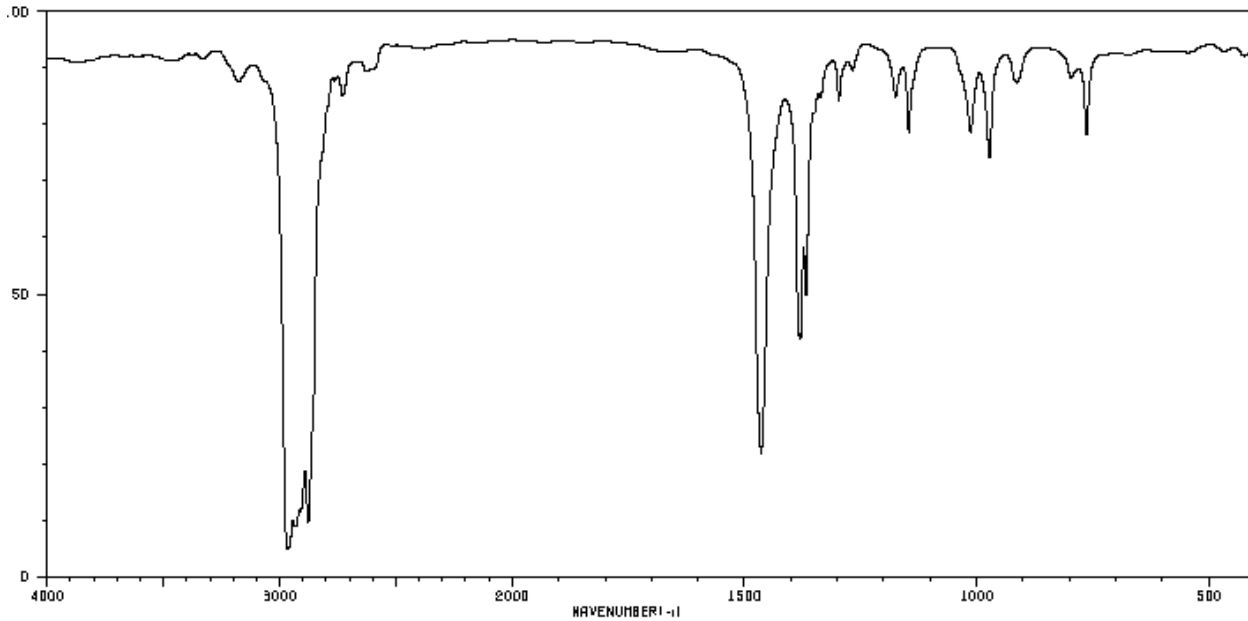


Fingerprint Region

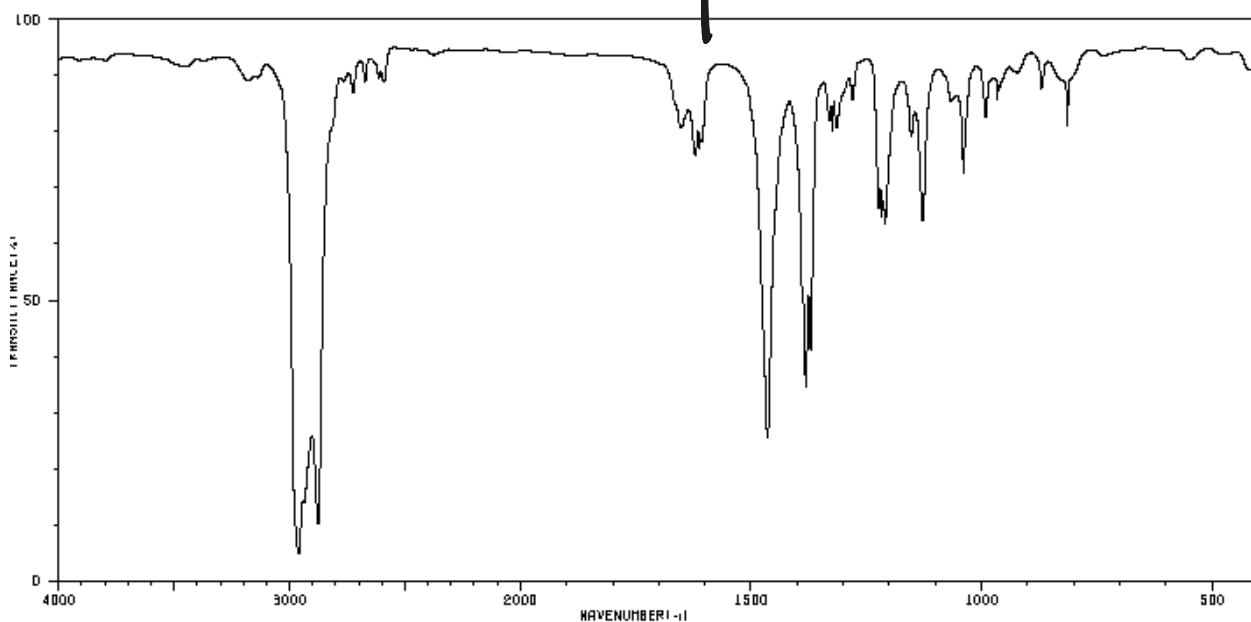
$1250\text{ cm}^{-1} \sim 400\text{ cm}^{-1}$



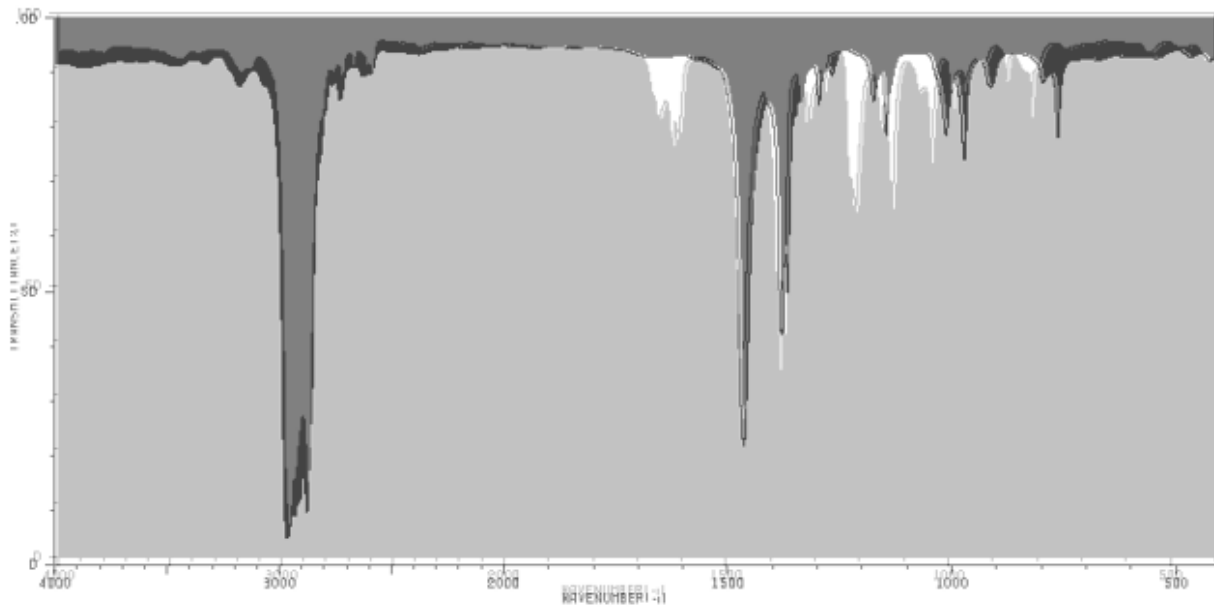
2-methylbutane



2,3-dimethylbutane



Overlay



1. clean area
2. clean instrument
3. Follow instructions
4. Look at IR

