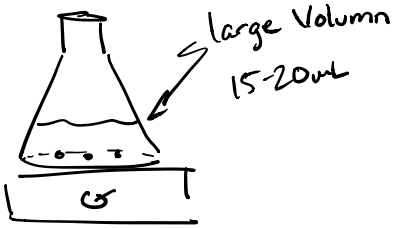
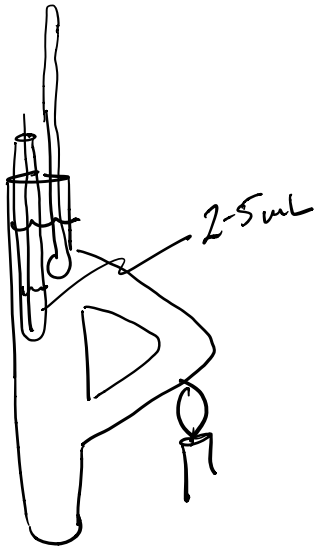
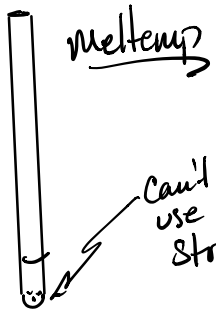
Experiment 8 Boiling Point & Infrared Spectroscopy

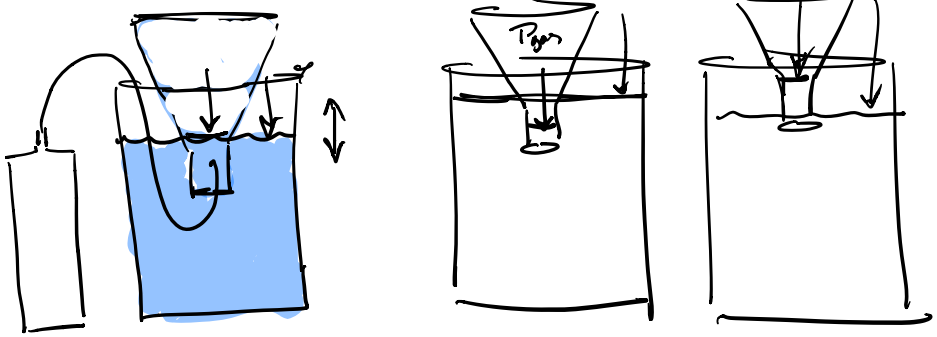
Boiling Points

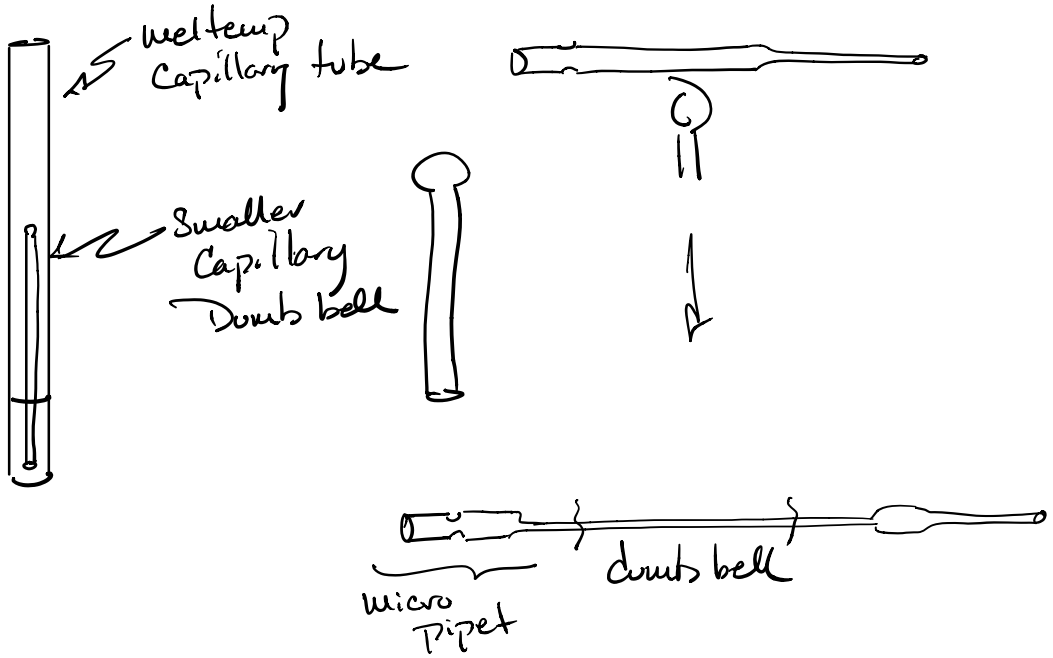




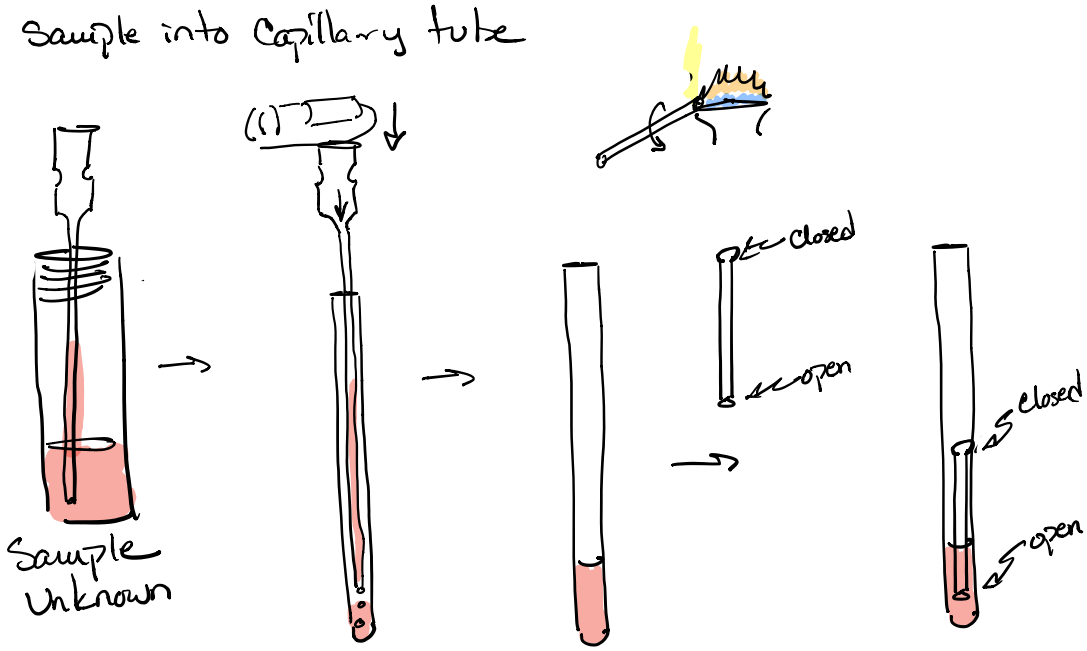


Boiling Point = $P_{vap} = P_{atm}$





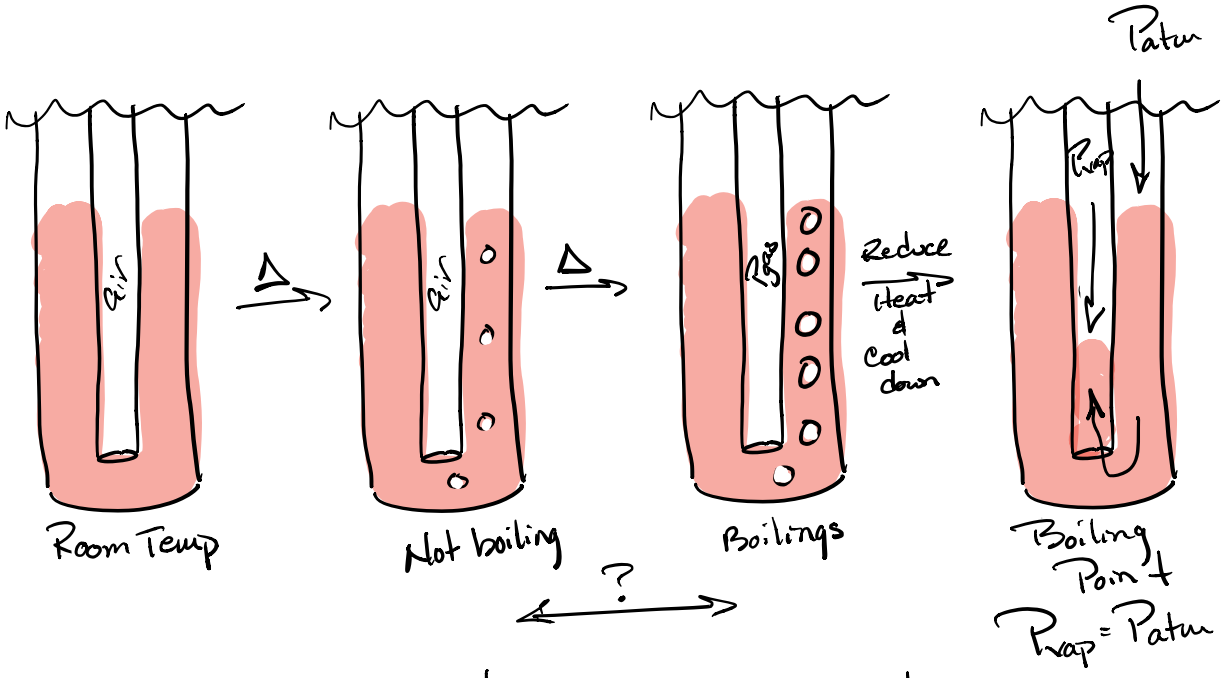
① Add sample into Capillary tube



② make dumb bell

③ Add dumb bell to capillary

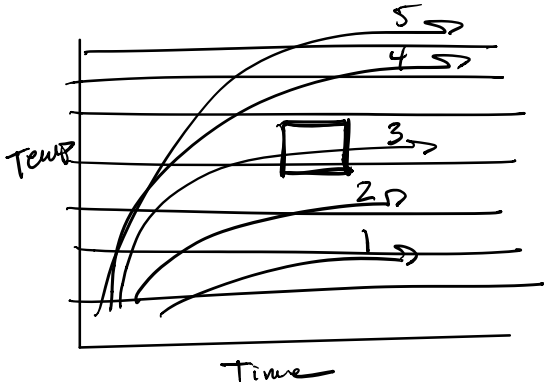
Taking the boiling Point



Melttemp
Set 7 or 8

Rough

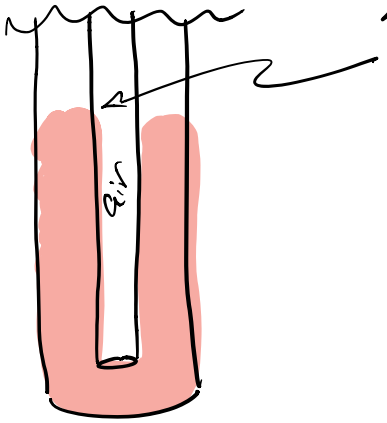
Melttemp
turn down
to 3 or 4



Set at 3 down to 2
fine

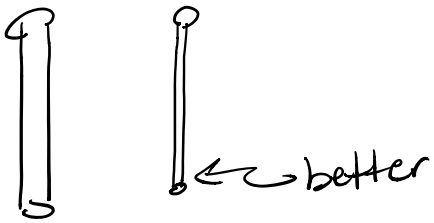
unknowns 220°C – 40°C

Goal Boiling Pt within ± 5°C of actual

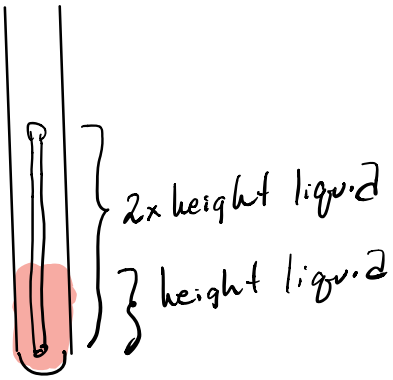


2 keys to Sucess

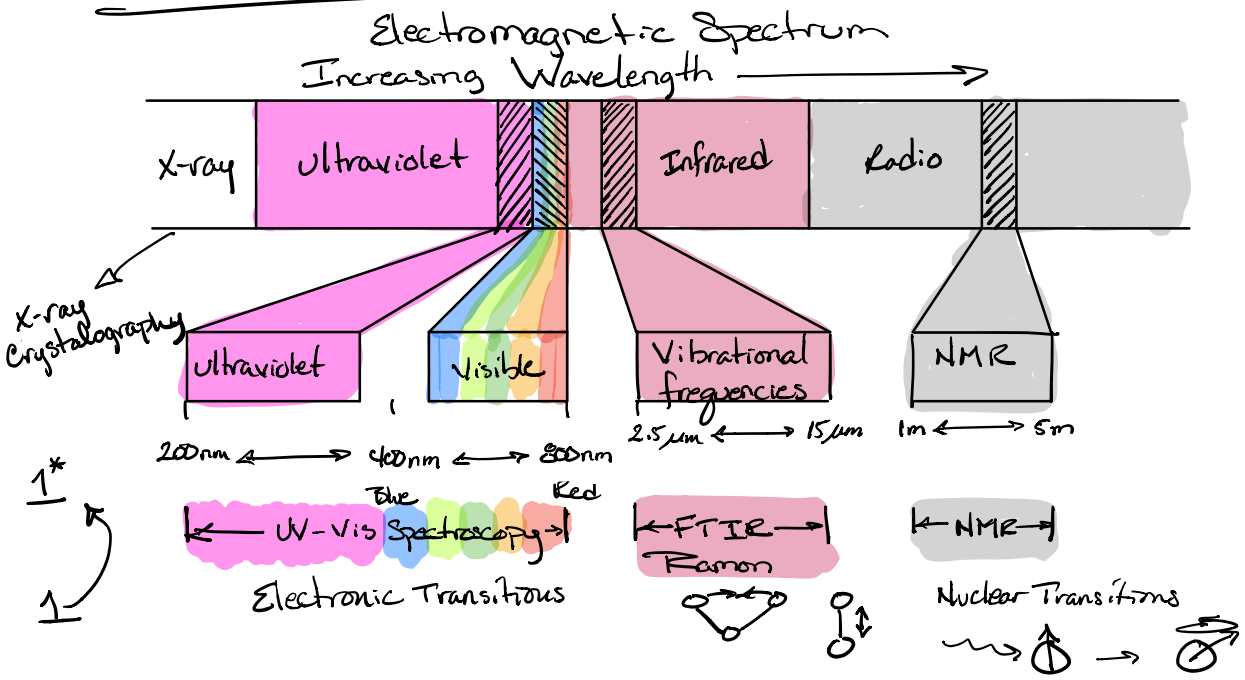
① Make Capillary as thin as possible while still being a tube



② Height of Capillary 2x height of liquid

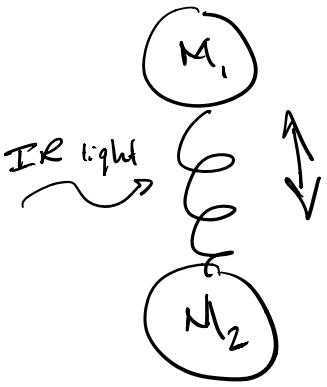


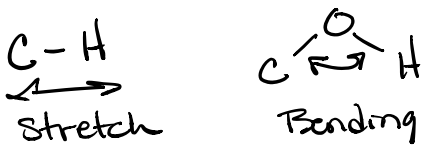
Infrared Spectroscopy

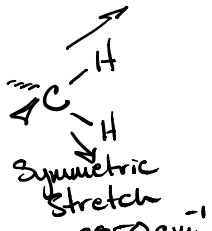


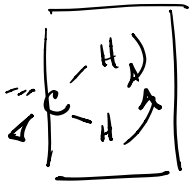
Wavelength = $\mu m = 1 \times 10^{-6}\ m = 1 \times 10^{-5}\ cm$

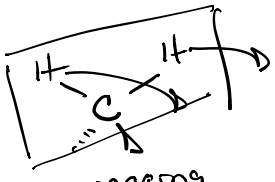
Wavenumber = $cm^{-1} = \frac{1}{\mu m} \times \frac{10{,}000\ \mu m}{1\ cm} = \frac{1}{\mu m} \times 10{,}000$

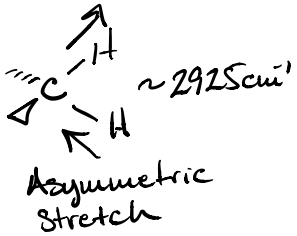


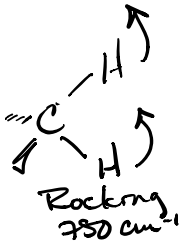


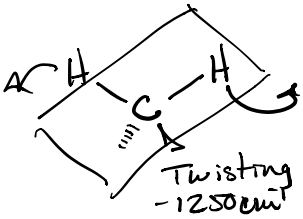


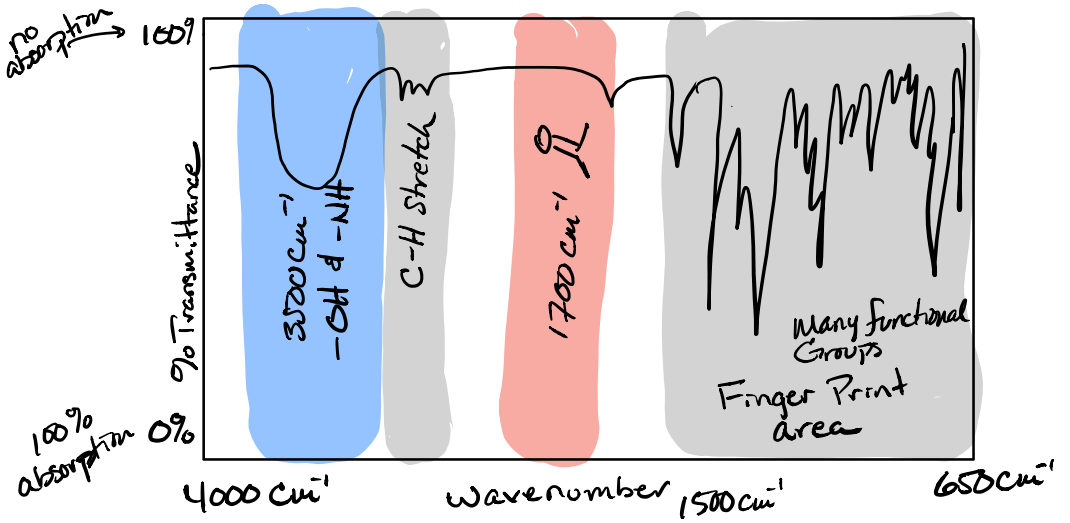


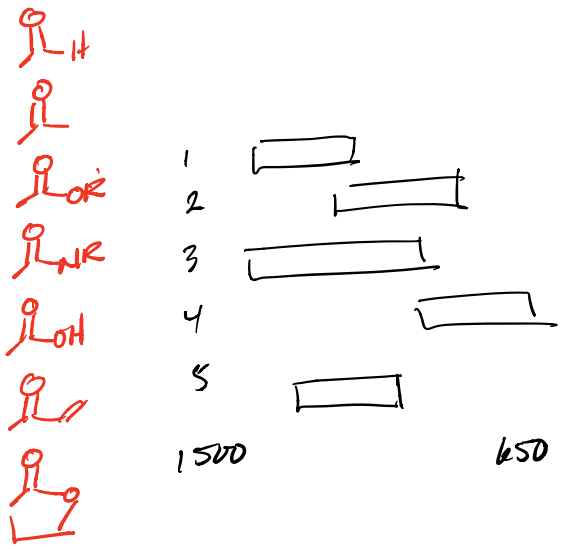


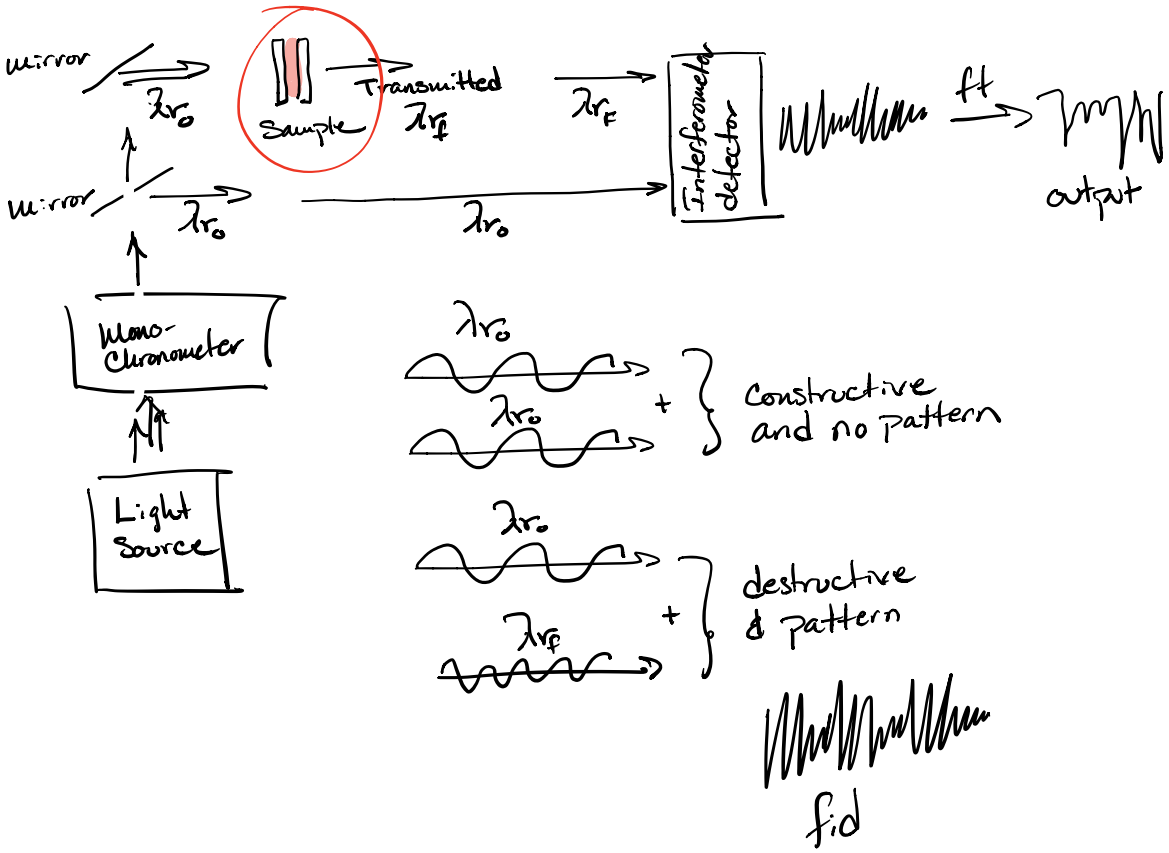




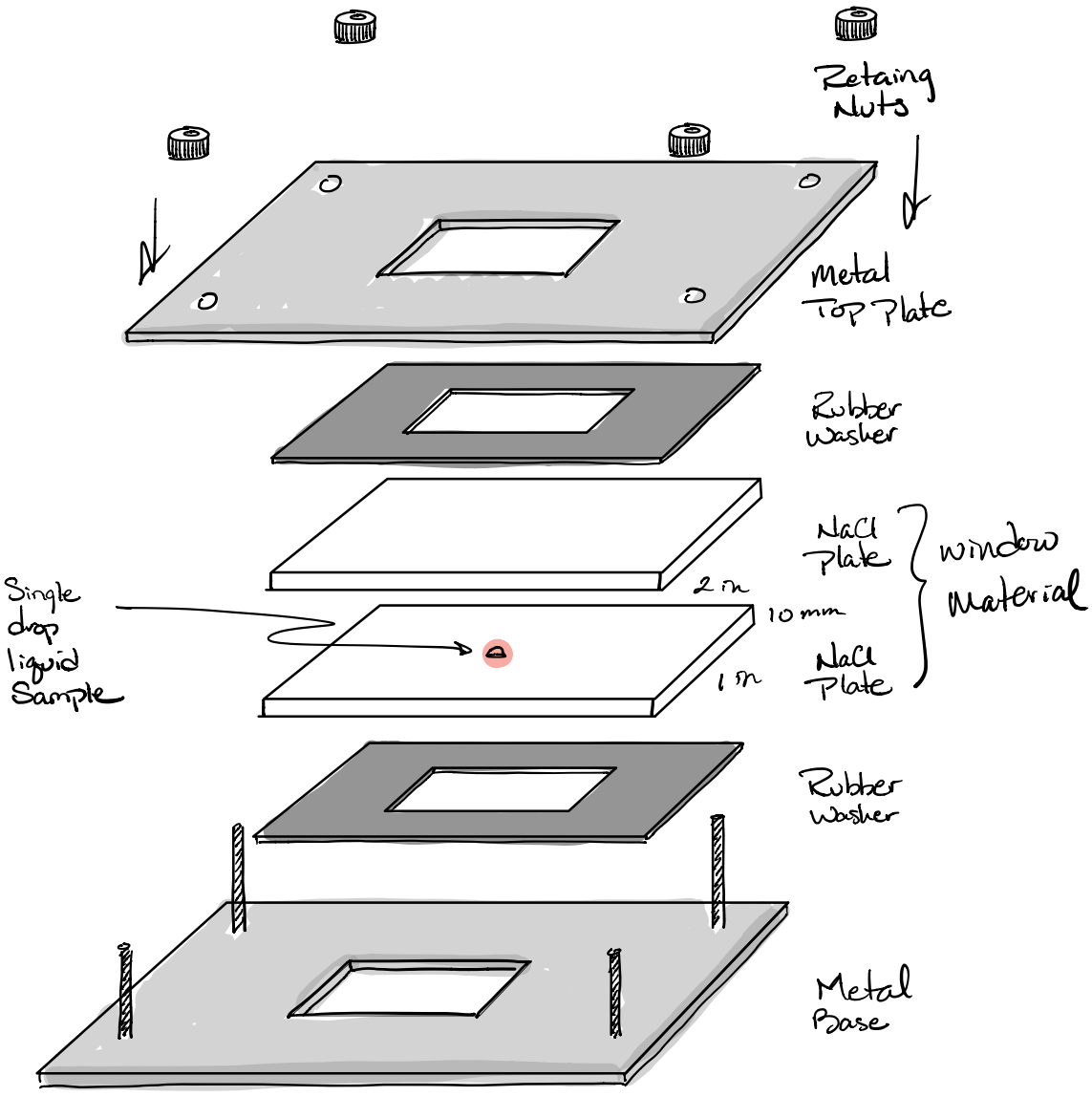


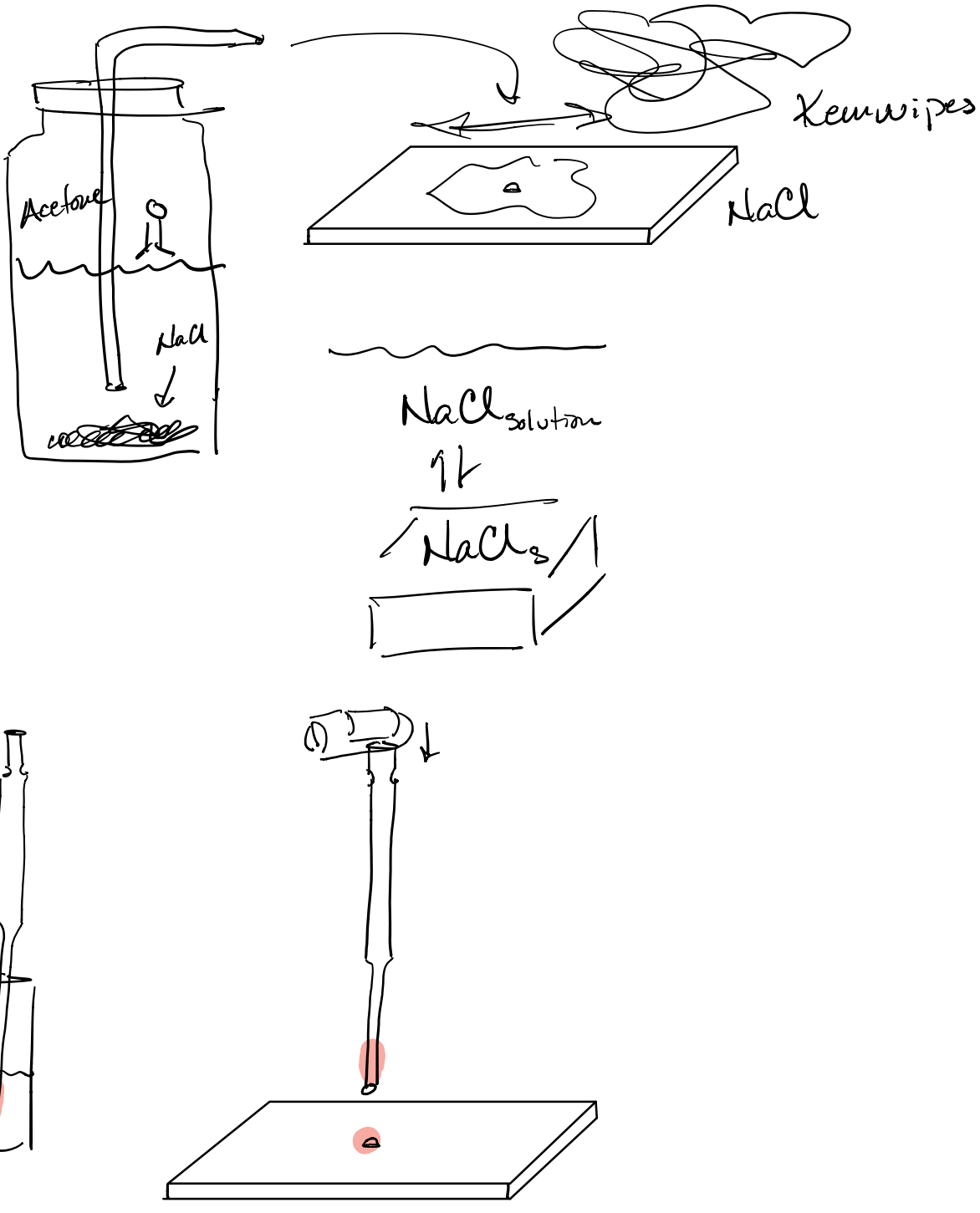

no absorption
100%
% Transmittance
100% absorption
0%
3300 cm⁻¹
-OH & -NH
C-H stretch
1700 cm⁻¹
Many functional Groups
Finger Print area
4000 cm⁻¹
Wavenumber
1500 cm⁻¹
650 cm⁻¹

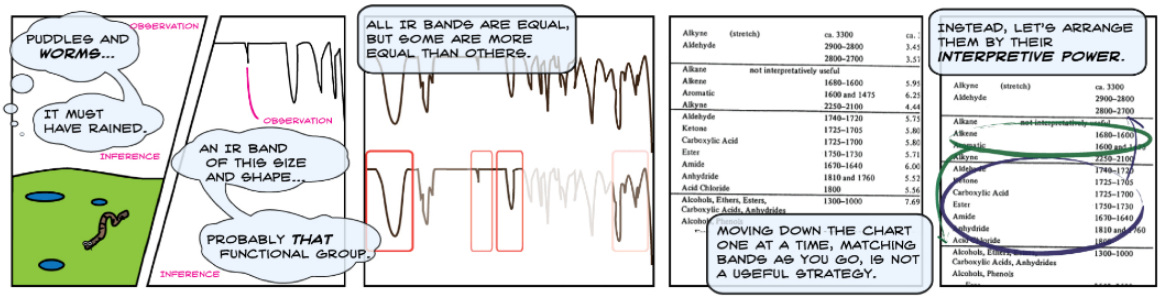

1
2
3
4
5
1500
650


mirror
λr_0
Sample
Transmitted
λr_f
λr_F
Interferometer detector
ft
output
mirror
λr_0
λr_0
Mono-Chronometer
Light Source
λr_0
λr_0
+
Constructive and no pattern
λr_0
λr_f
+
destructive & pattern
fid

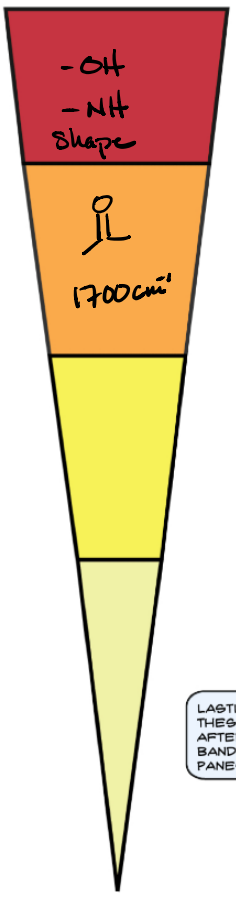
Sample Holder

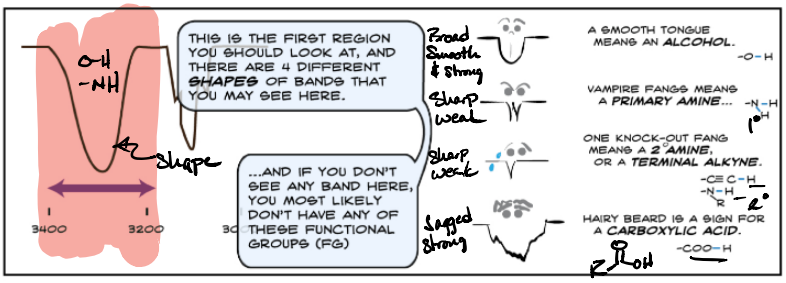


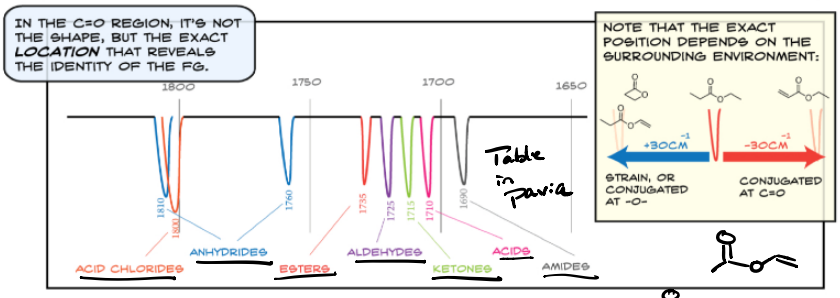

Acetone
NaCl
Kemwipes
NaCl
$NaCl_{solution}$
$NaCl_s$

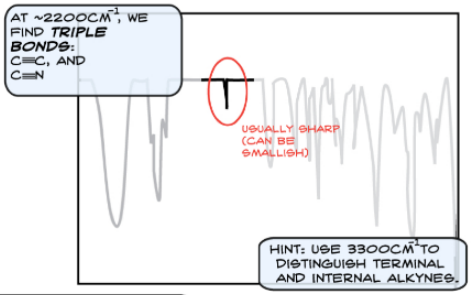


GREAT INTERPRETIVE POWER









Interpreting IR spectra

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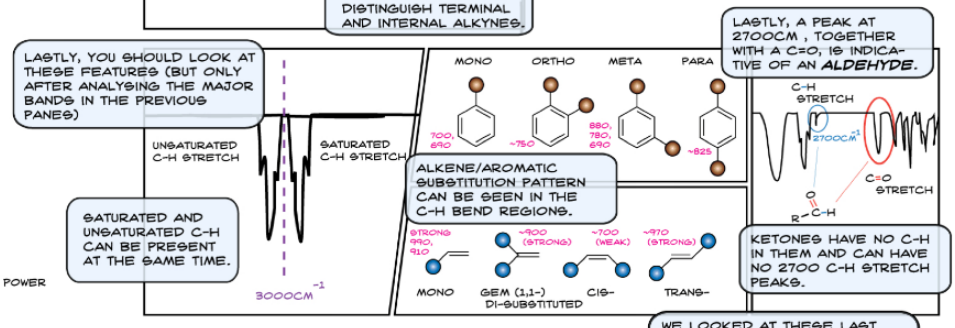


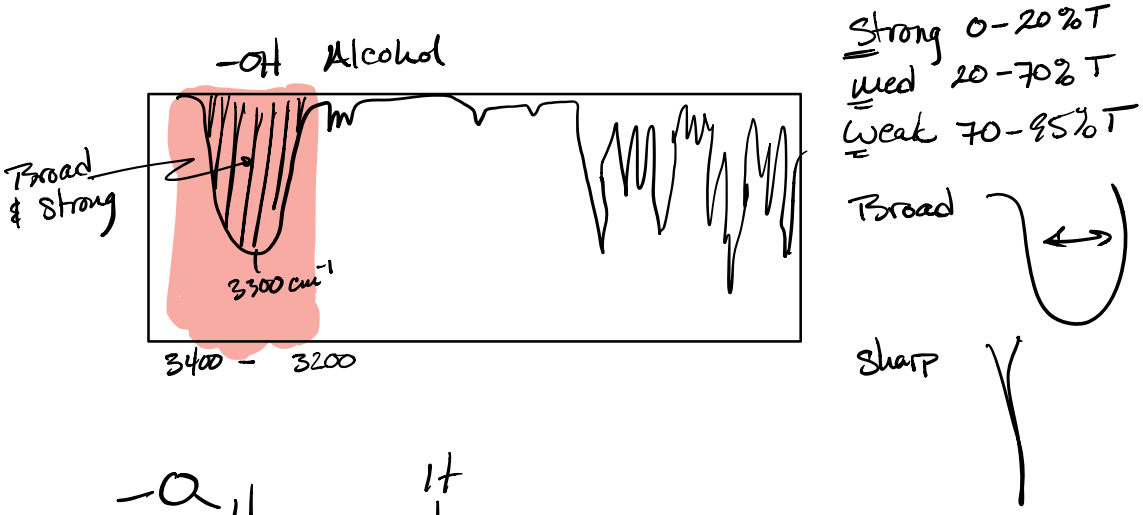
WE LOOKED AT THESE LAST BECAUSE THEY CAN BE AMBIGUOUS TO INTERPRET, OR THEY HAVE ONLY A NARROW NICHE OF USEFULNESS.

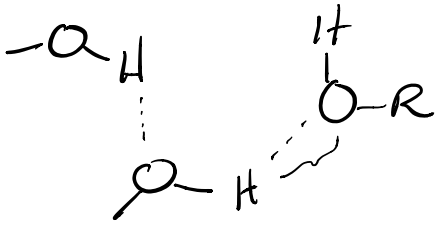
NOTES

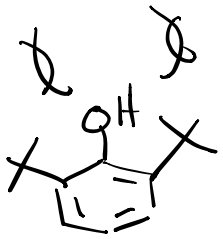
** IF YOU'RE NOT SURE WHAT THE DIFFERENCE BETWEEN AN ACID AND AN ALCOHOL IS, DO THE QUICK "FUNCTIONAL GROUP IDENTIFICATION" EXERCISE.

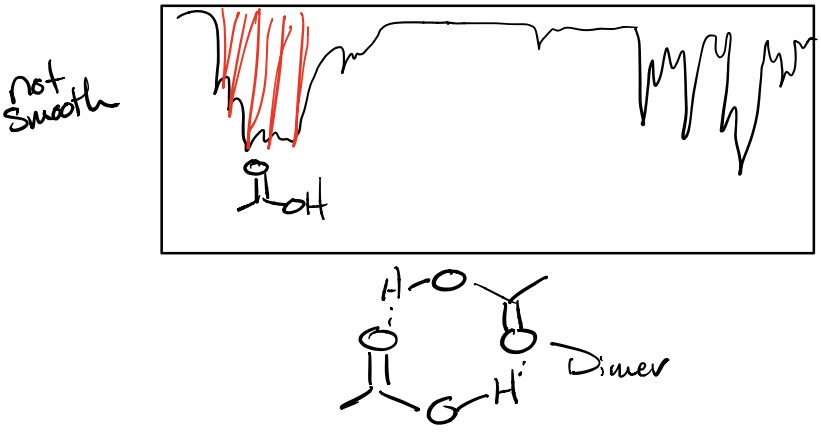
** ...IF YOU HAVE ONE FG. TWO 2° AMINE WOULD LOOK LIKE A 1 AMINE.

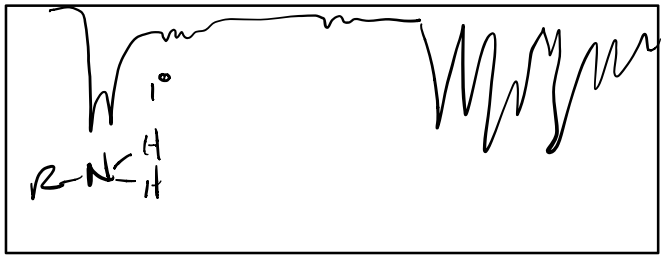
3400 cm^{-1} → 3200 cm^{-1} OH & NH



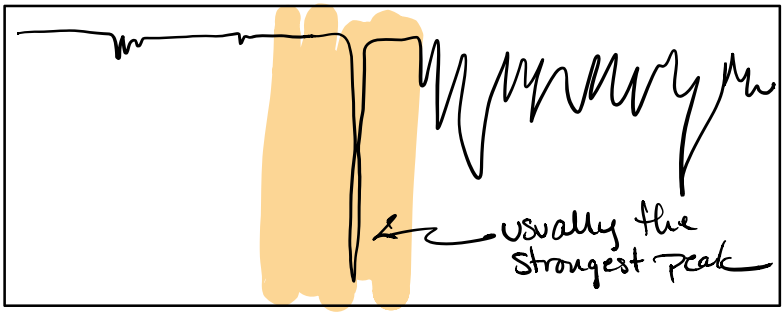








Carbonyl



1730 – 1700 cm – 1630