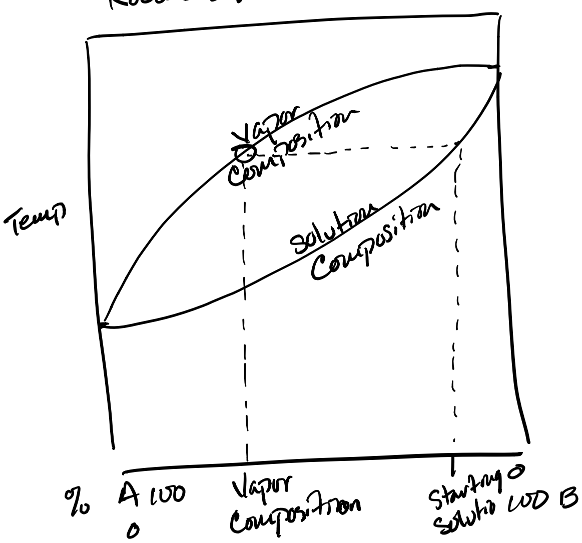
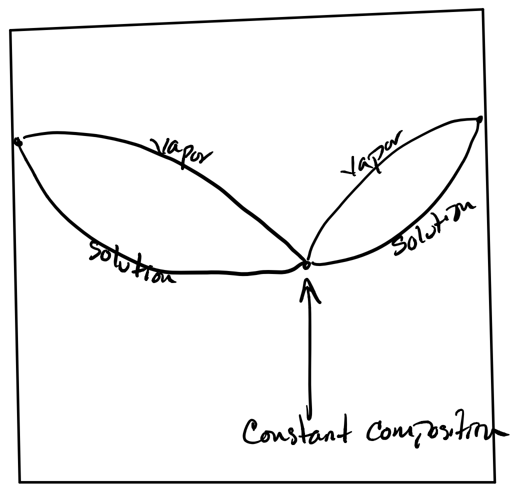
# Azeotropes - (Non-ideal Solutions)

Ideal Solution
Roualts Law



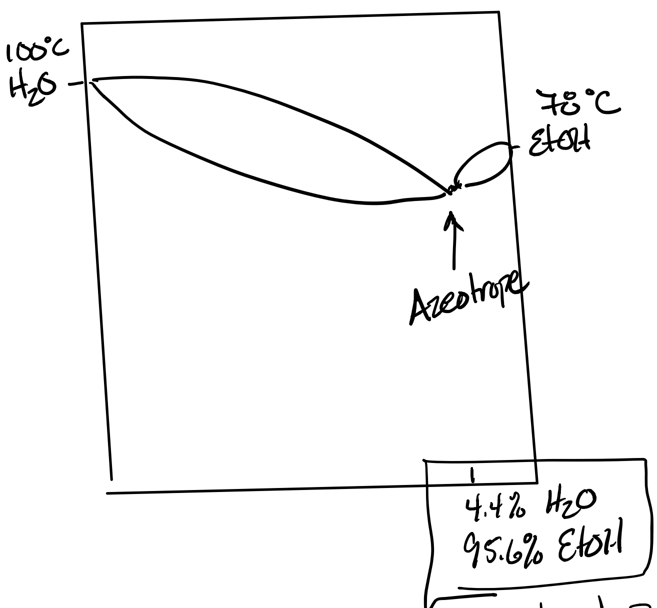

Azeotrope Non-Ideal



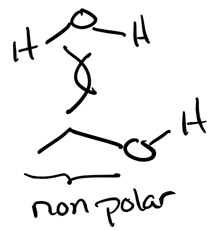

IMF forces ⇒ Slight repulsive forces that cause an increase in vapor pressure

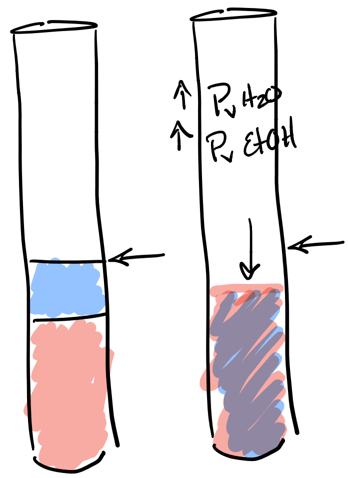
# Azeotrope w/ Low boiling point

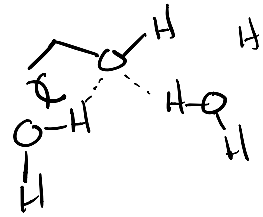
Two materials can have repulsive forces leading to high vapor pressure




Constant Boiling fraction

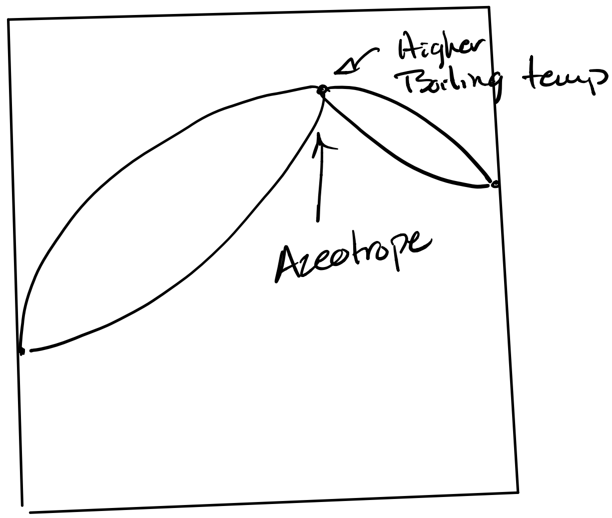



H-bonding

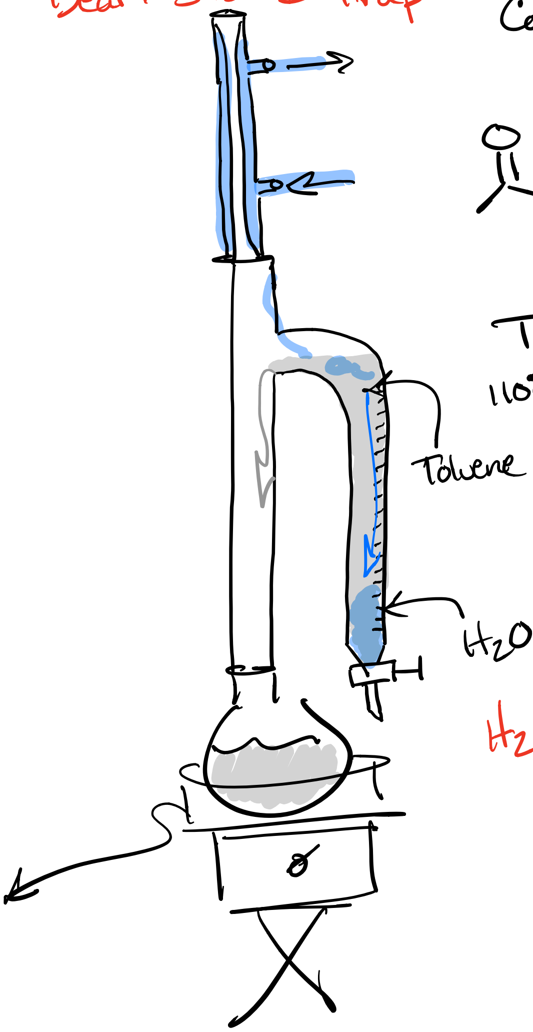
Attractive Force Azeotrope



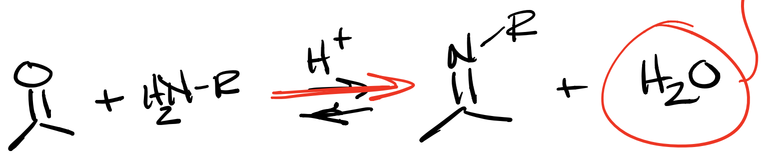

Acetone 20%    $CHCl_3$ 80%    64.7°C Azetrope

How Azeotropes can be used - Drying by distillation

# Dean-Stark Trap

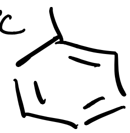



Condensation Rxn → produce $H_2O$




Toluene & $H_2O$ 100°C

110°C



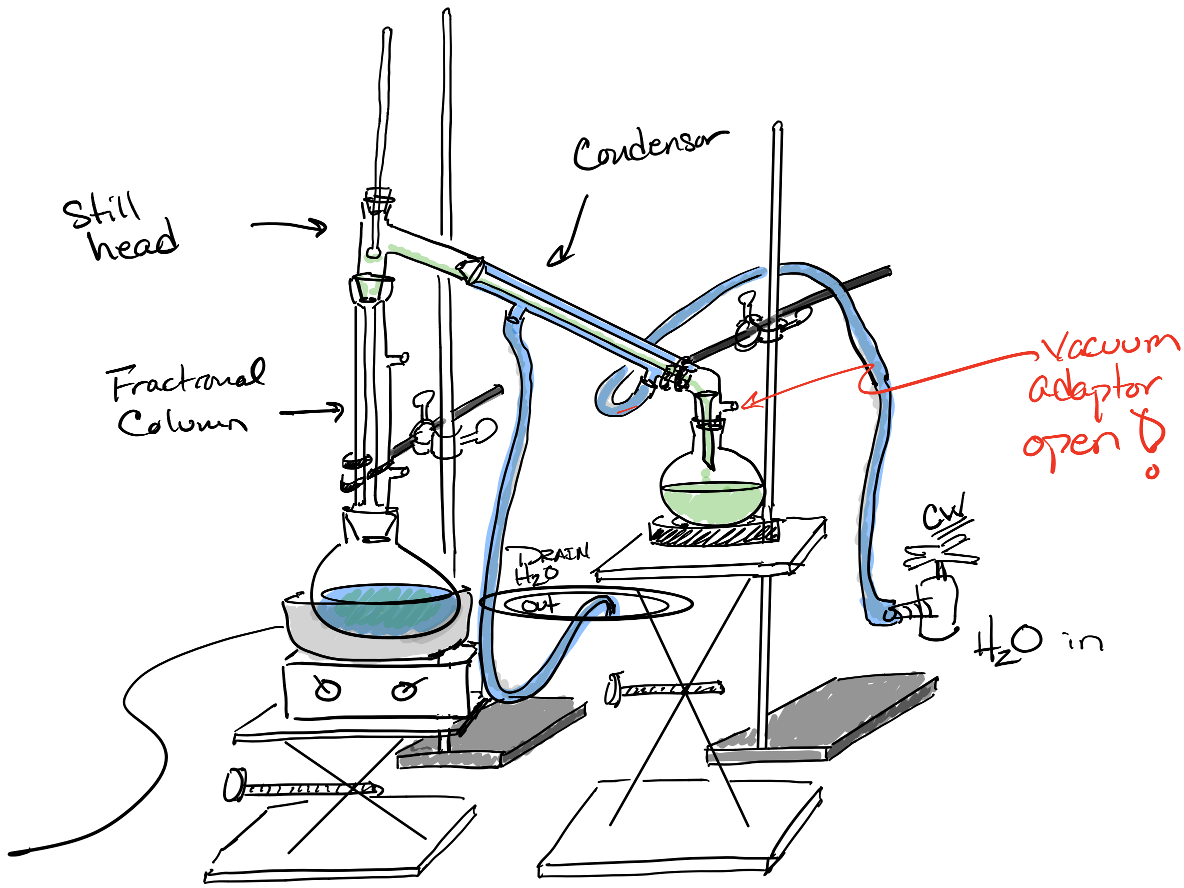
2%

98%

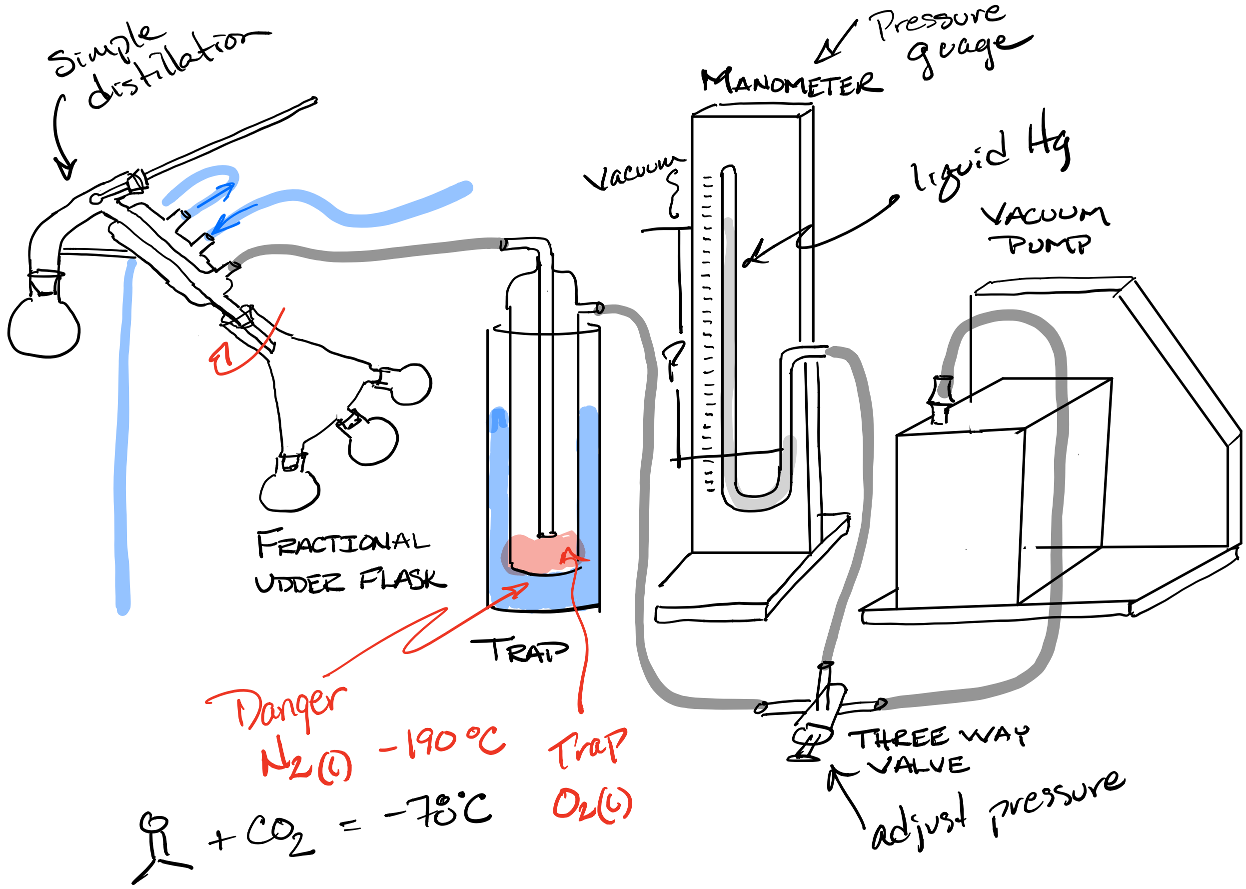
Azeotrope 98°C

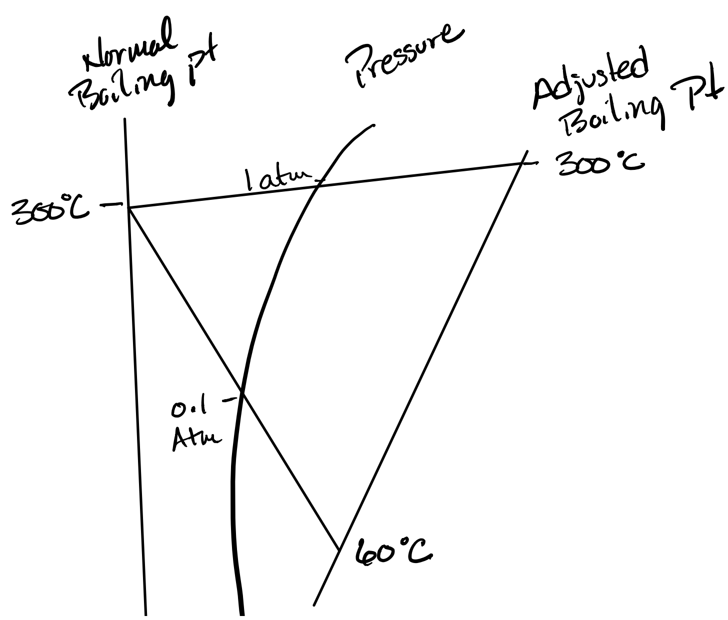
$H_2O$ removed from chemical Rxn

# Fractional Distillation

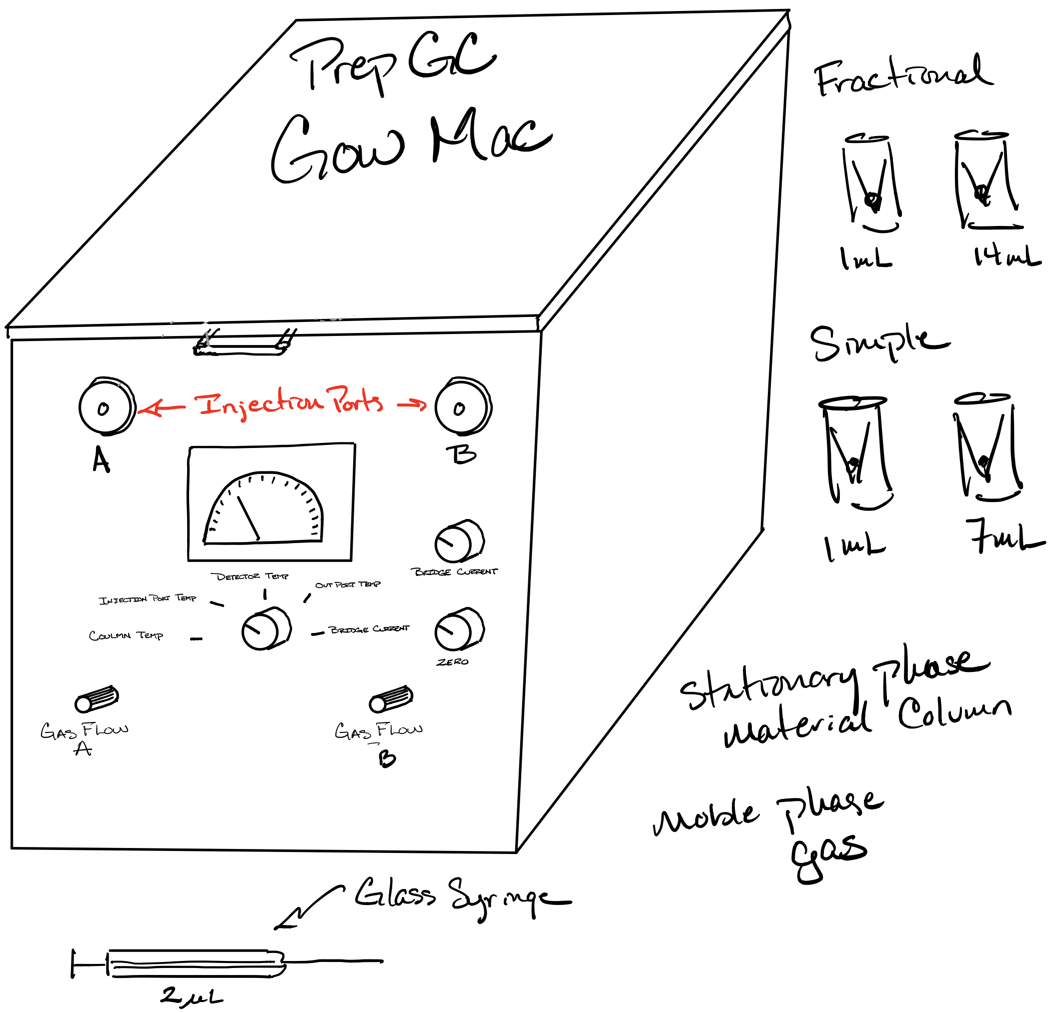


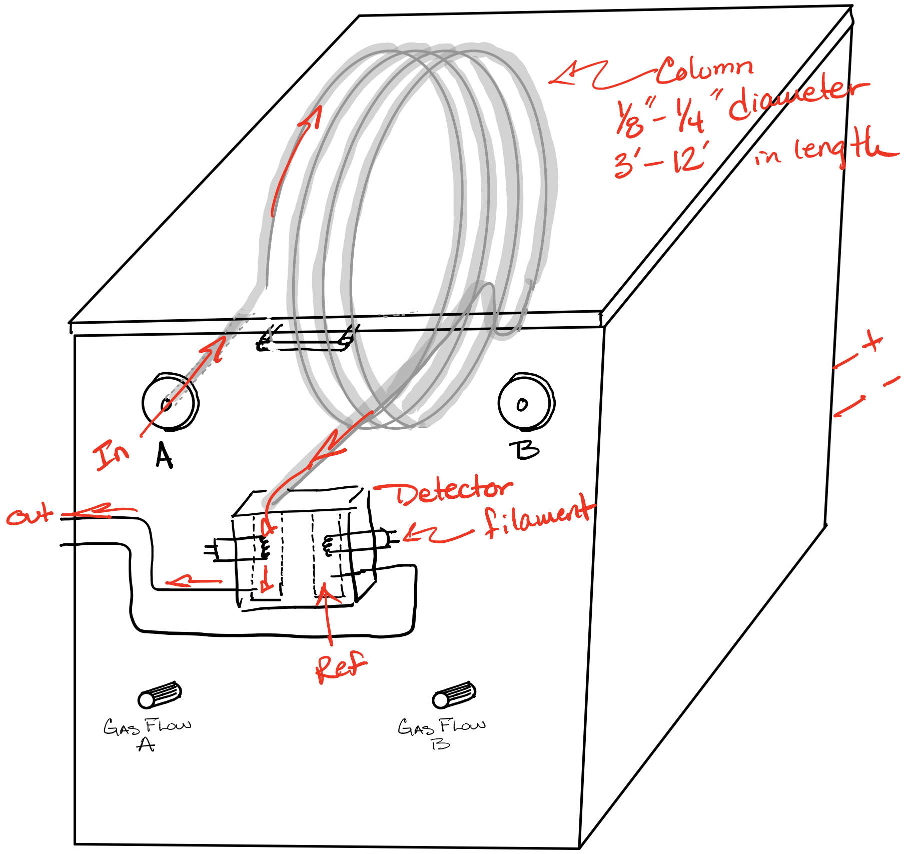
# Vacuum Distillation



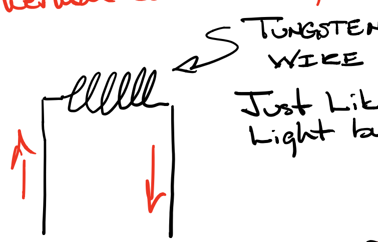



# Gas Chromatography (GC)

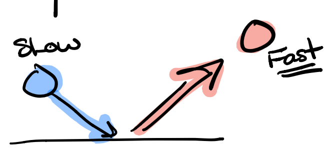





**Thermal Conductivity Meter**




Just Like A Light bulb



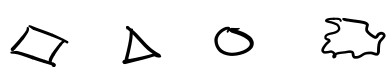

Molecule Steals Heat from wire

Wire cools down

Conductance $\propto$ Temperature

$\Delta$Temperature = $\Delta$mV Signal

Problem



Different molecular shapes steal different amounts of energy

Conc $\propto$ $\Delta$mV but not equal to $\Delta$mV

# Responce Factors

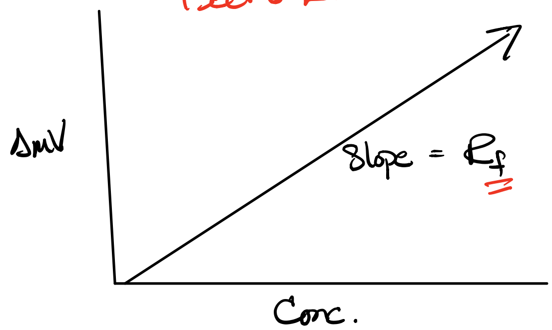
$\Rightarrow$ $Conc. \times R_f = \Delta mV$

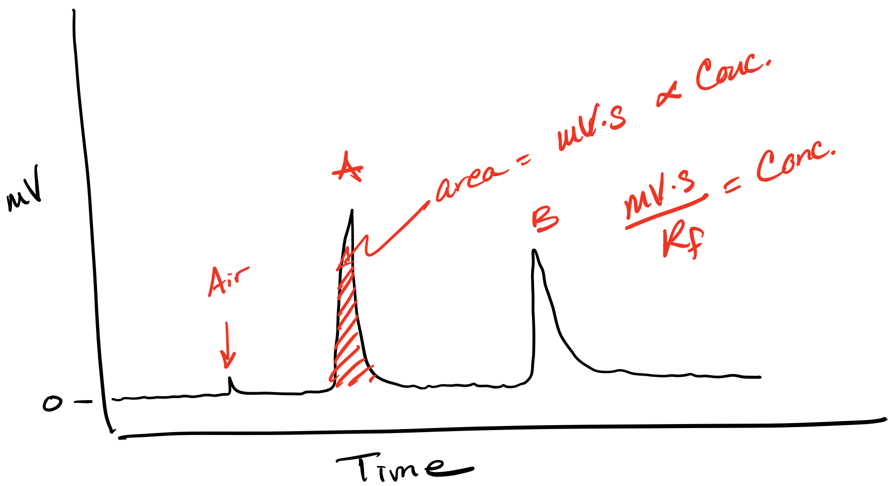
$Conc = \dfrac{\Delta mV}{R_f}$

$y = mx + b$

$\Delta mV = R_f \, Conc + 0$

Beers Law Plot




$$\%A = \frac{\text{Area A}}{\text{Area A} + \text{Area B}} \times 100$$

$$\%A_{corr} = \frac{\frac{\text{Area A}}{R_{fA}}}{\frac{\text{Area A}}{R_f} + \frac{\text{Area B}}{R_f}} \times 100$$