

# Recrystallization

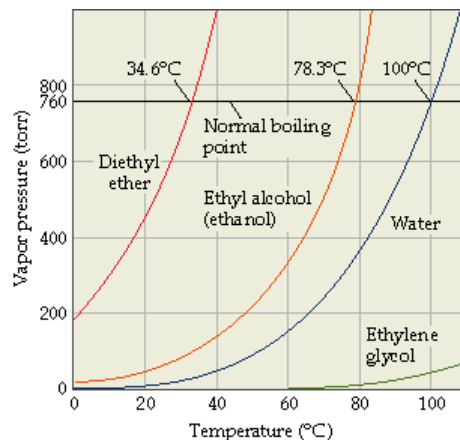
- Common technique for the purification of solids
- Principle: Solid and solid impurities can be separated from each other by selective dissolution
  - Dissolve solid in a liquid (solvent) so that it is insoluble at low temperature but soluble at high temperature
  - The impurities will remain undissolved, and so can be filtered off
  - Upon cooling, recrystallization will occur
  - May be an iterative process

# Distillation

- Separation of liquids based on boiling points
- Vapor pressure – pressure that a gas exerts on a liquid at equilibrium
- Boiling occurs when the atmospheric (outer) pressure is equal to the vapor pressure (VP)

# Dependence of Vapor Pressure on Temperature and External Pressure

- Normal bp = T at which equilibrium is reached when the external pressure is 1 atm
- At a reduced pressure (vacuum), the temperature required for boiling is lower



# Simple Distillation

- “Quick and dirty”
- Useful if the boiling points of the liquids in the mixture differ greatly ( $> 40^{\circ}\text{C}$ )
- The more volatile component will be eluted, the less volatile will remain in the flask (pot)

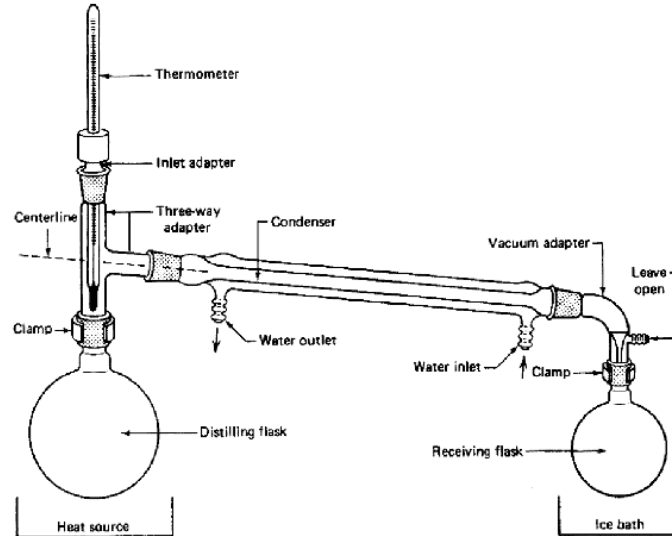


Fig. 98 A complete, entire simple distillation setup.

# Fractional Distillation

- Used when the mixtures contains liquids that are closer together in bp ( $> 10^{\circ}\text{C}$ )
- Typically fractions are collected which contain (hopefully) pure compounds
- A greater separation is achieved by a better distillation column
  - Greater surface area

# Extraction

- Technique used to purify liquid-liquid or liquid-solid systems
- Primarily based on intermolecular forces and polarity
- Used extensively in “work-up” of organic reactions
- Can be used iteratively
  - Same conditions – increase recovery
  - Different conditions – extract different compounds from complex mixtures (ex. natural product isolation)

# Chromatography

- Separation of compounds based on polarity
- More effective than extraction in terms of identifying the *number* of components in a mixture
- Can also be used to separate compounds that are very similar in nature (though it becomes more difficult the more similar they are)