Organic Chemistry Lab Techniques

Summary of Purification Methods

Method	Use
Extraction	Separates dissolved subs. Based on differential solubility in aqueous vs. organic solvents
Filtration	separates solids from liquids
Recrystallization	Separates solids based on diff. solubilities; temperature is important
Sublimation	Separates solids based on their ability to sublime
Centrifugation	Separates large things (ex. Cells, organelles, macromolecules) based on mass and density
Distillation	Separates liquids based on boiling point (depends on intermolecular forces)
Chromatography	Uses stationary and mobile phases to separate compounds based on how tightly they adhere (generally due to polarity, but sometimes size as well)
Electrophoresis	Used to separate biological macromolecules (such as proteins or nucleic acids) based on size and sometimes charge

Extraction

- Water = *aqueous* layer; ether = *organic* layer
- Like dissolves like
- 3 IMF that affects solubility
    - *hydrogen bonding* – ex. Alcohols & acids will move into aq. layer
    - *dipole-dipole interactions* – less likely to move in aq. layer
    - *van der Waals (London dispersion)* = nonpolar molecules (does not go into aq. layer)
- when ACID dissociates, resulting anion formed is more soluble
- ***ADDing a BASE helps EXTRACT ACID into the aq. layer

Simple Distillation

- separate liquids that boil BELOW 150^{O}C (at least 25C apart)

Vacuum Distillation

- separates liquids that boil ABOVE 150C
- reduced P, lowering the BP of liquids (preventing their decomposition typical at high T)

Fractional Distillation

- separates liquids that boil LESS than 25C apart
- near the top of the column, vapor is composed solely of 1 component, which will condense and collect in the receiving flask
- can be thought of as repeated distillation of same vapor

Thin Layer Chromotography

- used to isolate individual compounds from a complex mixture
- stationary phase (solid medium) & mobile phase (liquid)
- diff. compounds will adhere to stationary phase w/ diff. strengths
    - POLAR compounds bound TIGHTly to the silica gel – eluting poorly into the less polar solvent
- R_f = dist. compound / dist. of solvent
- *Reverse phase chromatography* – very nonpolar stationary phase instead of silica gel

Electrophoresis

- Separates macromolecules based on *isolectric point*
- If pH = *isoelectric* point → protein doesn't move
- If pH > isoelectric point → protein deprotonated

SDS & Agorose Gel Electrophoresis

- Separates molecules based on SIZE

MP and BP trends

BP:

- increases with chain length due to dispersion forces
- decreases with branching

MP:

- increases with branching because the molecules can pack tightly
- increases with chain length again due to dispersion forces