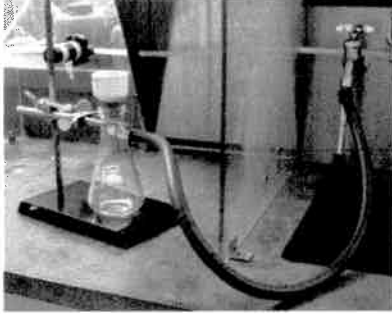


## Methods of Separating Mixtures

### 1. Filtration - Particle size.

- gravity
- vacuum



### 2. Crystallization - Solubility.

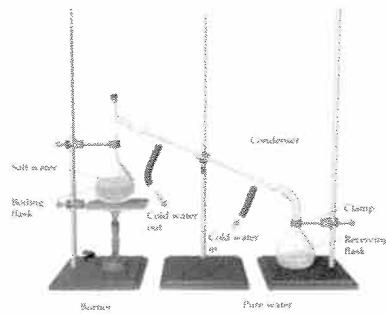
- Most substances are more soluble in hot water than cold.
- Dissolve impure material, drop temperature, allow pure crystals to "freeze out"
- Making rock candy.

<http://chem-lp.net/lab/Techniques/RecrystallisationAnimation.htm>

### 3. Distillation - Boiling point.

- Boil impure solvent, pass through condenser, collect pure solvent.
- Fractional distillation - purifying crude oil.

<http://science.bowstufuoka.com/emi/environmental/energy/oil-refining2.htm>



### 4. Extraction - Solubility

- Usually one piece of mixture is polar, one piece nonpolar
- Polar solvent is added, dissolving polar piece of mixture
- Layers separate
- Use a separatory funnel

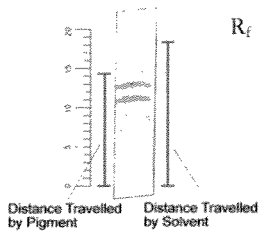
<http://faculty.kvu.edu.sa/ALKHULAIWI/DocLib4/%D8%B9%D9%85%D9%84%D8%BA%DB%A8%20%D9%B1%D8%B5%D9%81%20%D8%B8%D8%A7%D8%A6%D9%8C%D8%B3%D8%A7%D8%A8%D9%84%20%D9%8B%D9%8D%D8%A8%D8%B3%D8%A7%D8%A9%D9%84.pdf>

5. Chromatography - Size, affinity

- stationary phase
- mobile phase

a. paper chromatography - ink affinity to paper

- stationary phase - paper
- mobile phase - water



$$R_f = \frac{\text{distance traveled by pigment}}{\text{distance traveled by solvent}}$$

$R_f$  values characterize materials

<http://chem-ed.jp.net/lab/Techniques/TLC/Animation.htm>

b. size exclusion chromatography - particle size relative to pore size within column

- stationary phase - packed column
- mobile phase - solvent

<http://www.gelsciences.com/APTRX/loop20919.nsf/4a2f132842ea4154a29685d0011fa04/00c845d025b16ba0c1258e92003a585b3f4e4e/Gel%20Filtration.swf>