

Partition Coefficient

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Liquid-liquid extraction involves the distribution of a solute between two immiscible layers of solvent. In general, one of the solvents will be water and the other a far less polar organic solvent like diethyl ether, dichloromethane, petroleum ether.

Polarity H ₂ O bp 100°C density 1.0 capable of dissolving salts: RCOONa RNH ₃ Cl	>	diethyl ether > bp 35°C very flammable 0.7	>	dichloromethane > bp 40°C 1.3	>	petroleum ether bp 40-60°C very flammable 0.7 incapable of dissolving salts
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By taking advantage of the differing solute/solvent solubility as well as solvent/solvent insolubility, compounds can be selectively separated.

In this experiment, a given organic compound will be partitioned between an organic solvent and water by liquid-liquid extraction. The partition coefficient, K_D , for a solute between the two immiscible phases is a numerical quotient for the distribution or solubility, C , of the solute in each solvent. The distribution value or solubility, C , for the solute in each solvent will be determined by liquid-liquid extraction and a partition coefficient, K_D , for solute in a given pair of solvents determined.

Solubility at equilibrium in two immiscible phases



$$\frac{C_2}{C_1} = K_D \quad \text{where} \quad C = \frac{\text{grams solute}}{\text{liters solution}}$$

Additional Information

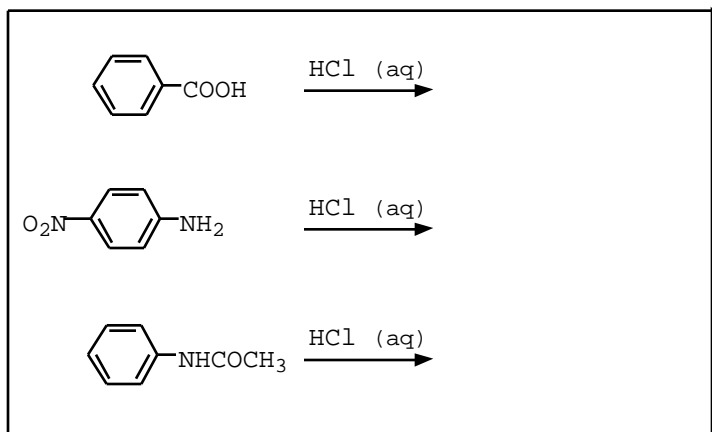
1. Know your densities
2. Flow Chart of Separation
3. Drying Agents
4. Hazards associated with dichloromethane

Liquid-Liquid Extraction of a Three Component Mixture

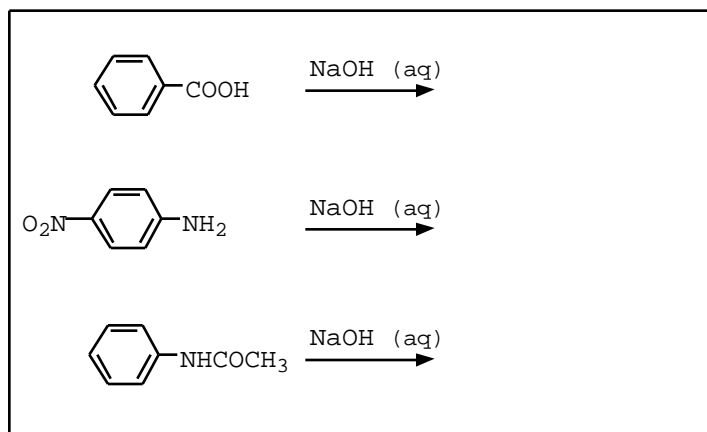
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1. Differences in pH will affect the solubility of carboxylic acids and amines; amides are neutral compounds and not affected.
2. Acid-Base Reactions to be aware of.

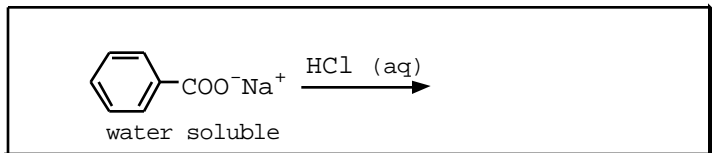
Acidify



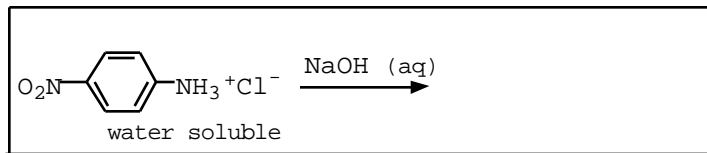
Basify



Neutralization with acid



Neutralization with base



3. Temperature of the extraction mixture - Never extract hot solutions
4. Venting the Funnel - Invert once, open the stopcock, and gently swirl. Close stopcock, shake vigorously three times, open the stopcock and vent; beware of possible emulsions)
5. Densities - You must know. Keeping track of which layer is which
6. Flow Chart of Separation and Purification
7. Washing the Organic Phase
8. Salting Out
9. Drying Agents
10. Avoiding Emulsions
11. Cleaning the Separatory Funnel