There are many methods used to separate a mixture containing a solid and liquid. If the solid settles well, the liquid can sometimes be poured off (decanted). If the solid has very small sized particles or forms a cloudy mixture, the mixture can sometimes be centrifuged or passed through a filter pipette (on the microscale, < 5 mL).

- **1.5A: Overview of Methods**
  The most common methods of solid-liquid separation in the organic lab are gravity and suction filtration. Gravity filtration refers to pouring a solid-liquid mixture through a funnel containing a filter paper, allowing the liquid to seep through while trapping the solid on the paper. Suction filtration is a similar process with the difference being the application of a vacuum beneath the funnel in order to pull liquid through the filter paper with suction.

- **1.5B: Decanting**
  When there is a need to separate a solid-liquid mixture, on occasion it is possible to pour off the liquid while leaving the solid behind. This process is called decanting, and is the simplest separation method.

- **1.5C: Gravity Filtration**
  Gravity filtration is generally used when the filtrate (liquid that has passed through the filter paper) will be retained, while the solid on the filter paper will be discarded.

- **1.5D: Suction Filtration**
  Suction filtration (vacuum filtration) is the standard technique used for separating a solid-liquid mixture when the goal is to retain the solid (for example in crystallization). Similar to gravity filtration, a solid-liquid mixture is poured onto a filter paper, with the main difference being that the process is aided by suction beneath the funnel.

- **1.5E: Hot Filtration**
  A hot filtration is generally used in some crystallization, when a solid contains impurities that are insoluble in the crystallization solvent. It is also necessary in crystallization when charcoal is used to remove highly colored impurities from a solid, as charcoal is so fine that it cannot be removed by decanting.

- **1.5F: Pipette Filtration (Microscale)**
  For the separation of small volumes (< 10mL) of solid-liquid mixtures, pipette filters are ideal as filter papers absorb a significant amount of material. Pipette filtration may also be used if small amounts of solid are noticed in NMR or GC samples, as both instruments require analysis of liquids without suspended solids.

- **1.5G: Centrifugation**
  Centrifugation is used for the separation of solid-liquid mixtures that are stubborn to settle or difficult to otherwise filter. It uses centrifugal force by rapidly spinning samples so that the solid is forced to the bottom of the tube. In this section is shown centrifugation of a suspension of yellow lead(II) iodide in water (Figure 1.90b).

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