

Physical and Chemical Properties

- **Physical Properties:** Attributes and characteristics that describe what the chemical species is.
 - **Examples:** color, melting point, density
- **Chemical Properties:** Attributes and characteristics that depend on how a chemical species reacts.
 - **Examples:** solubility, miscibility, chemical reactivity

You will determine various physical and chemical properties of three liquids.

- **Density:** Ratio of mass to volume.
$$\text{Density} = \frac{\text{Mass (g)}}{\text{Volume (mL)}}$$
- **In a mixture, the species with lower density will “float” and the species with higher density will “sink”.**
 - **In an oil & water mixture, the less dense oil will float on top of the more dense water.**

- **Miscibility**: Ability of two liquids to completely mix with each other. (Liquid dissolving in another liquid.)
 - Alcohol and water mix completely, they are miscible with each other.
- **Immiscible**: Characteristic of liquids which do not mix with each other. (Liquids will form 2 layers when combined.)
 - Oil and water form layers when mixed, so they are immiscible with each other.
- **Solubility**: Ability of a gas or solid to dissolve in a liquid.
 - Sugar is soluble in water, but sand is insoluble in water.
 - Carbon dioxide(g) dissolves in water (slightly soluble) to form carbonated beverages.
- **Solvent**: The solution that does the dissolving (present in the greater amount).
- **Solute**: The substance that is dissolved (present in the lesser amount).

Common Lab Techniques:

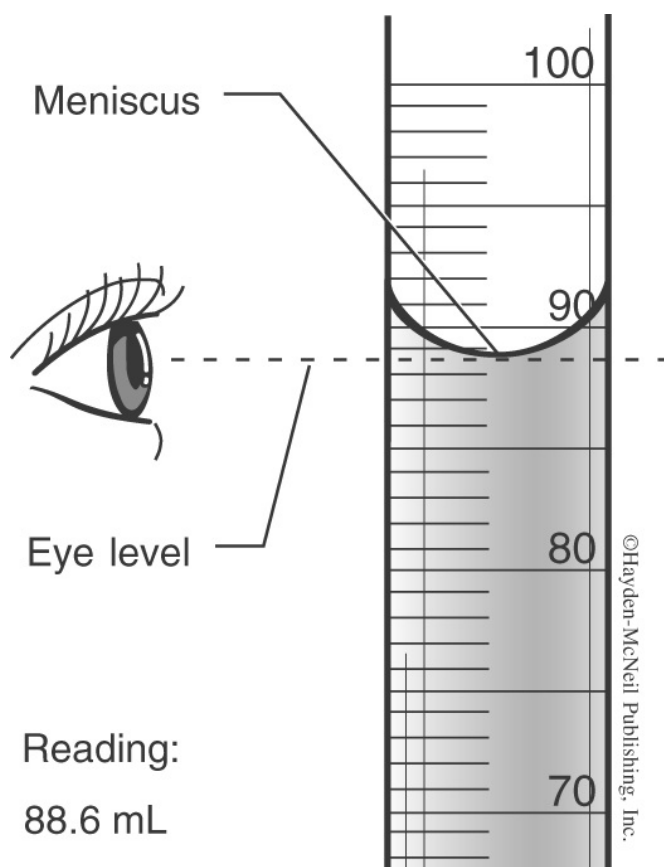
Volume Measurements:

- **Meniscus**: the curvature of a liquid in a column due to intermolecular forces between the liquid and the walls of the container.

In a graduated cylinder, the volume of the liquid is determined by reading the BOTTOM of the *meniscus*.

To correctly do this, you must be at eye level with the meniscus.

You must estimate the last digit of the reading. In the figure, the volume is slightly more than half way between 88 and 89, so the reading is 88.6 mL.



Mass Measurements:

- **Never place chemicals directly on a balance !**
- **Clean up any spilled chemicals in or around the balance IMMEDIATELY !**

Two techniques for weighing chemicals are weighing by difference and taring the container.

- **Weighing by Difference:**

- a) The mass of the empty container is determined.**
- b) The mass of the container with chemical is determined.**
- c) The difference between the two masses is the mass of the chemical.**

- **b) mass of water and cylinder: 31.26 g**
a) mass of cylinder : 25.72 g
c) mass of water: 5.54 g

- **Taring the Container:**

- a) Place the empty container on the balance.**
- b) Push the "Tare" button on the balance.
(This recalibrates the balance to read "zero" with the container on the balance.)**
- c) Place the chemical in the container. The mass showing will be the mass of the chemical.**
- d) When finished, remove container and retare the balance.**