**Proper Pipetting Procedures**

**Proper Air Displacement Pipetting**
Conventional pipettes displace a cushion of air between the plunger and the liquid in the tip. For accurate pipetting, liquids must have physical properties similar to water:
- Density
- Viscosity
- Vapor Pressure (volatility)

*Hot tip!* For viscous or volatile liquids, use a positive displacement pipette, such as the BRAND Transferpette®.

**Preparing the Pipette**
- Attach a BRAND or other high quality pipette tip.
- Ensure the volume setting is correct.

**Aspirating the Sample**
- Press the pipetting button to the first stop.
- Hold the pipette vertically and immerse the tip 2 to 3mm into the liquid (1/8”).
- Release pipetting button slowly and wait 1-2 seconds for level equilibration, and touch the tip against container wall before removing. (ISO 8655 prescribes pre-wetting of the tip once prior to aspiration of a measured volume).

**Discharging the Sample**
- Hold the pipette shaft over a suitable disposal container and press the tip-ejection key to the stop.
- Push the pipetting button to the second stop. (Blow-out) while wiping the tip against the wall.
- Remove the pipette from the container, and release the button.

**Ejecting the Tip**
- Hold the pipette shaft over a suitable disposal container and press the tip-ejection key to the stop.

Get to know the BRAND family of pipettes at www.brandtech.com.

**Transferpette® S**
Simple service, Easy Calibration™, multichannel & repeating pipettes too!

**PLT™ Pipette Leak Tester**
For daily functional validation between calibrations. Visit www.brandtech.com for more information.

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**Accuracy and Precision**

*Calibration* is the process of determining the performance of an instrument without mechanical or electronic adjustment.

*Adjustment* is the manipulation of the instrument post-calibration so that the instrument is aligned within the specified tolerances.

*Accuracy* of measurement is how close the result comes to the target value.

*Precision* (reproducibility) describes how closely grouped results are in a set of measurements, in units of volume.

**Calibration Calculations**

**Mean Volume** is calculated gravimetrically, then converting the weight to volume with a "Z-factor" compensating for temperature/density, pressure and buoyancy, per ISO 8655.

\[
\text{Mean value } \bar{V} = \sum \frac{x_i}{n} \quad x_i = \text{results of weighings} \\
\text{n = number of weighings}
\]

\[
Z = \text{correction factor} \\
\text{(e.g., 1.00296L/mL at 20°C, 1013 hPa)}
\]

Find a table of Z factors for typical ambient temperatures in the SOP manuals for BRAND pipettes. Or, consider EasyCal™ software to perform these calculations for you, and document the results. Find Z factors and EasyCal™ at www.brandtech.com.

**Accuracy** is defined as the difference between the measured mean volume and the specified volume, measured as a percentage of the specified volume.

\[
\text{Accuracy} = \frac{V_m - V_s}{V_s} \times 100 \\
V_m = \text{nominal volume}
\]

**Precision or Coefficient of Variation (CV%)** is defined as the standard deviation of a set of measurements, measured as a percentage of the mean volume.

\[
\text{Standard deviation } s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} \\
\text{Coefficient of variation } \text{CV%} = \frac{100}{\bar{V}} \times 100
\]