

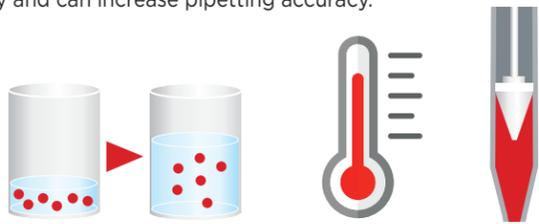
# Pipetting viscous solutions

## Best Practices

### 1 Reconsider your methods

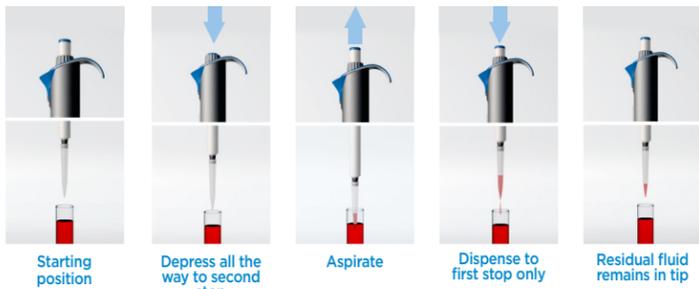
Positive displacement is the preferred method for pipetting viscous solutions and should be used whenever possible. The disposable piston inside the pipette tip makes direct contact with the sample and is used to push all the solution out of the tip.

If a positive displacement device is not available, consider steps to make the solution easier to pipette. Diluting the solution to a known concentration or warming the solution (if doing so will not degrade the solution) decreases viscosity and can increase pipetting accuracy.



### 2 Use reverse mode pipetting

If an air displacement device must be used, use reverse mode. This technique results in the sample volume plus an additional overage being aspirated into the tip. This is achieved by pressing to the first stop to expel only the target sample volume. The overage volume remaining in the tip is discarded.



Forward mode pipetting is not recommended, as it often leaves a residual volume of undelivered sample in the tip. If forward mode must be used, rinse the tip in the destination container following dispense in order to flush out any residual solution. Any liquid remaining in the tip is sample volume that was not delivered.

### 3 Use the appropriate pipette tip

Pipette tips with wider openings are better suited for pipetting viscous solutions and allow thicker liquids to flow more freely. Some manufacturers offer specialized 'wide bore' tips for this purpose. Low retention tips can also be beneficial, depending on the liquid (consult manufacturer's recommendations).

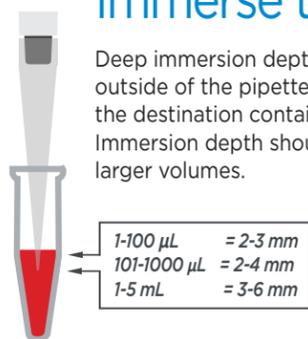
Never trim the bottom of a pipette tip to widen the opening. Cutting the tip significantly decreases volume accuracy.

Certain pipettes cannot be used for reverse mode pipetting at nominal volume, as there is not enough space in the tip to accommodate the additional volume required.



### 4 Immerse tip to the proper depth

Deep immersion depth increases the amount of solution coating the outside of the pipette tip, which may be inadvertently transferred to the destination container in addition to the desired sample volume. Immersion depth should track with the liquid level, especially for larger volumes.



### 5 Reduce the plunger speed

Viscous liquids are more resistant to movement and flow more slowly into and out of the pipette tip. A slower plunger speed reduces the chance of air bubble formation and increases consistency of volume delivery.



### 6 Pause sufficiently after aspiration and dispense

Once the plunger is released following aspiration, pause with the tip still immersed in the solution to allow the entire volume to flow into the tip. Similarly, once the plunger is depressed, pause to allow the full volume to flow out of the tip.



The one-second pause duration recommended for aqueous liquids is typically not sufficient for viscous solutions. The specific duration of the pause will depend on a variety of factors including solution viscosity, temperature, target volume, and pipette tip size. The appropriate pause duration should be determined at the outset and kept consistent each time.

To determine whether the pause after aspiration is long enough, examine the filled tip after removing from solution. If a trailing air gap forms, a longer pause was needed.



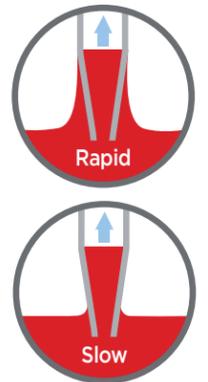
After dispensing, examine the bottom of the pipette tip while maintaining pressure on the plunger. If a droplet forms, a longer pause was needed.



### 7 Remove tip slowly from solution

Removing the pipette tip too quickly from solution following aspiration can contribute to excess liquid coating the outside of the pipette tip.

Slow tip removal allows gravity and surface tension to help remove excess fluid from the outside of the pipette tip and can reduce the need for tip wiping.



### 8 Examine the tip and wipe carefully

Even with proper immersion depth and slow removal, viscous solutions can still cling to the outside of the pipette tip. The tip should be wiped with a lint-free cloth to avoid transferring this additional volume.

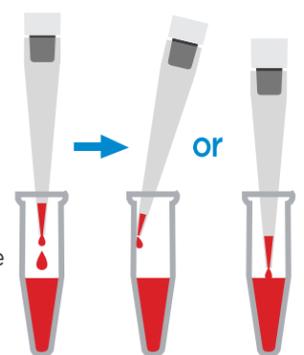
Wipe only the outside surface of the tip and stay clear of the opening to avoid wicking liquid out of the tip and potentially introducing sample contamination. If wiping is not permitted due to the requirements of your assay, be aware that you may experience increased volume delivery and variability.



### 9 Perform a free dispense followed by a tip touch

A free dispense, sometimes called non-contact dispense or jet dispense, is preferable to dispensing directly against the side of the container in order to avoid pooling of the solution between the tip and the container wall. It also increases reverse-mode accuracy by reducing the chance that excess volume will be wicked out of the tip.

A small liquid droplet will often cling to the bottom of the pipette tip following an air dispense. Touch the droplet to the side of the container or the surface of the liquid to separate the droplet from the pipette tip.



### 10 Avoid air bubbles

Handle solutions carefully to avoid the formation of air bubbles. Air bubbles in viscous solutions take a long time to dissipate and can significantly reduce volume accuracy.

Invert to mix, if necessary; do not shake solutions up-and-down. Use an orbital shaker or centrifuge to remove existing bubbles.



**ARTEL**  
trust your results