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What is a pipette?

Pipettes are an essential tool in laboratories which are used to transfer volumes of liquid from one vessel to another. They can be made from glass or plastic and can be manual or electronic.

Types of pipettes

The most basic type of pipette is a Pasteur pipette which are disposable and can't be used for accurate and precise measurements. For accurate and precise measurements it is necessary to use a volumetric pipette or a single or multichannel pipette. Single or multichannel pipettes are not disposable and typically use an air-displacement design to dispense consistent volumes of a liquid using a disposable pipette tip.

A multi-pipette allows the user to dispense replicate volumes of liquid without having to refill the pipette tip every time like a single or multichannel pipette.

Factors affecting pipette accuracy

Before using a pipette check that it's calibration is in date. This is to ensure that your pipette is working within a predetermined acceptable accuracy and precision range. Calibration of laboratory equipment is important for traceability and reliability of results. See our technical note on [The Importance of Lab Equipment Calibration](#).

Before using a single or multichannel pipette you must ensure you have the correct tip for the pipette. Using a high quality tip which is designed for your pipette type will lead to the most accurate and precise results.

It is most common to use the forward pipetting technique but for viscous or volatile liquids there can be a benefit to using the reverse pipetting technique. The reverse method can lead to over-delivery so the difference between the techniques can be compared by your laboratory.

Once pipette, tip and technique are selected then the following factors can help to produce consistent results:

- Pre-wet the pipette tip

Intake and expel the amount of liquid you will be pipetting in triplicate before preparing a sample. The benefits of doing this is that it reduces evaporation from the pipette tip.

- Temperature

Working at a consistent temperature so equipment and chemicals are all at ambient temperature before pipetting. Single or multichannel pipette generally use air displacement and this is affected by temperature.

- Residual droplets

Before dispensing the liquid in the pipette tip be sure to remove any droplets from the outside of the pipette tip by touching the side of the container but beware not to touch off the end of the pipette. After expelling the liquid be sure to touch the tip off the side of the container to remove any residual droplets.

- Pausing consistently

After filling the pipette tip by releasing the plunger steadily, pause for a second as liquid will continue to be drawn up for a short time. The liquid in the tip can also begin to evaporate so by being consistent with drawing up your liquid and pausing before removing the pipette tip from the vessel can improve accuracy of results.

- Immersion depth and angle

Best practice when drawing up liquid into the pipette tip is to immerse the tip vertically around 1 cm into the liquid. By immersing the tip too deeply it can cause liquid to cling to the outside of the pipette tip and by touching the bottom of the container can restrict the liquid from being drawn up. If the pipette is at an angle during filling or removal it can alter the volume taken up by the pipette. This is especially important for small volumes. For best results draw up from the centre of the liquid holding the pipette vertically. The most important factor with pipetting is to be consistent with your technique as this will have the greatest affect on your results.

Other guidance which should be followed is to always use gloves and do not touch pipette tips. Return the pipette to the stand after use and store vertically when not in use.



- The top picture demonstrates the best practice pipetting technique. The pipette is entering the beaker vertically and the pipette tip is immersed 1 cm into the liquid. This technique will lead to the most accurate and precise results.
- The bottom picture depicts poor pipetting technique. The pipette is angled and immersed too far into the liquid.

By following the best practice technique this will lead to reliable results which you can be confident in.