Standard Operating Procedure (SOP) on the Use of Micropipette

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Standard Operating Procedure (SOP) on the Use of Micropipette

Purpose

To describe the correct procedure for handling, operating, and maintaining micropipettes to ensure accurate and precise measurement of liquid volumes in the laboratory.

Scope

This SOP applies to all laboratory personnel and students using micropipettes in practical laboratories and research activities.

Responsibilities

- Laboratory staff and students are responsible for following this SOP.
- Laboratory supervisors are responsible for ensuring proper training of users and maintenance of micropipettes.

Parts of a Micropipette

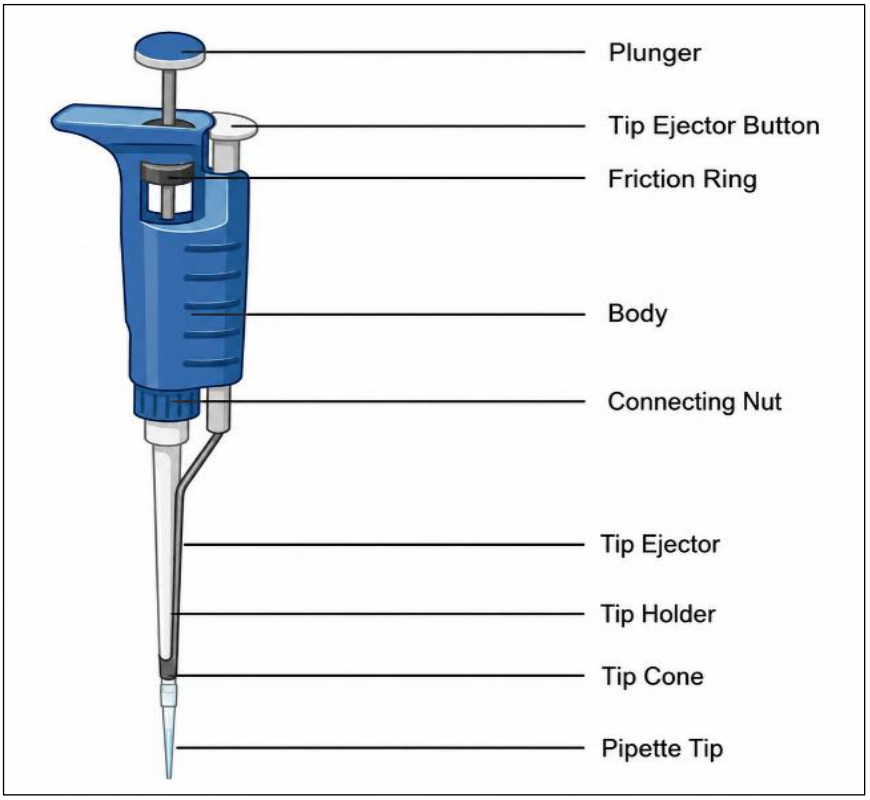

Figure 1. Parts of Micropipette (Source: https://share.google/08U8VqaVFHVu6l0CJ)

Plunger: Used to aspirate (draw up) and dispense the required volume of liquid by controlled pressing and releasing.

Ejector button: Activates a metal ejector mechanism that releases the used pipette tip safely without direct handling.

Volume adjustment knob: Allows the user to set the desired volume by rotating the dial to increase or decrease the setting. This feature is absent in fixed-volume pipettes.

Volume window: Displays the selected volume setting, with digit positions varying depending on the pipette's capacity range.

Shaft: A hollow, air-filled chamber in air-displacement pipettes. Movement of the piston changes air pressure within the shaft, enabling liquid uptake during aspiration and release during dispensing.

Tip cone: The tapered section of the pipette where the disposable tip is securely attached.

Pipette tip: A disposable polypropylene plastic component that directly contacts the liquid, ensuring accuracy and preventing contamination.

Tip Color	Capacity Range	Compatible Micropipette	Common Name
White/Clear Tip	0.1–10 µL	0.5–10 µL micropipette (P10)	Micro tips / 10 µL tips
Yellow Tip	2–200 µL	20–200 µL micropipette (P200)	Yellow tips / 200 µL tips
Blue Tip	100–1000 µL	100–1000 µL micropipette (P1000)	Blue tips / 1000 µL tips

Figure 2. Pipette Tips (Source: https://cdn11.bigcommerce.com/s-k069xfmhqb/images/stencil/1280x1280/products/4995/5903/ST_Tip_Group__00322.1692535210.jpg?c=1)

Principle

Micropipettes are precision instruments used to accurately measure and transfer small volumes of liquids, usually in microliters (µL).

Most commonly used micropipettes work on the air displacement principle, where movement of an internal piston creates an air cushion that aspirates and dispenses liquid through a disposable tip. These pipettes are widely used in routine laboratory work because they are convenient, accurate, and suitable for most aqueous solutions.

Some micropipettes operate on the positive displacement principle, in which the piston comes into direct contact with the liquid inside the disposable tip. This eliminates the air cushion and provides greater accuracy when handling viscous, volatile, foamy, or high-density liquids.

However, positive displacement micropipettes are less commonly used and are mainly reserved for specialized laboratory applications.

Materials and Equipment

- Micropipette (P10, P20, P200, P1000, etc.)
- Appropriate disposable pipette tips
- Sample solutions
- Waste container
- Tissue paper or lint-free wipes

Procedure

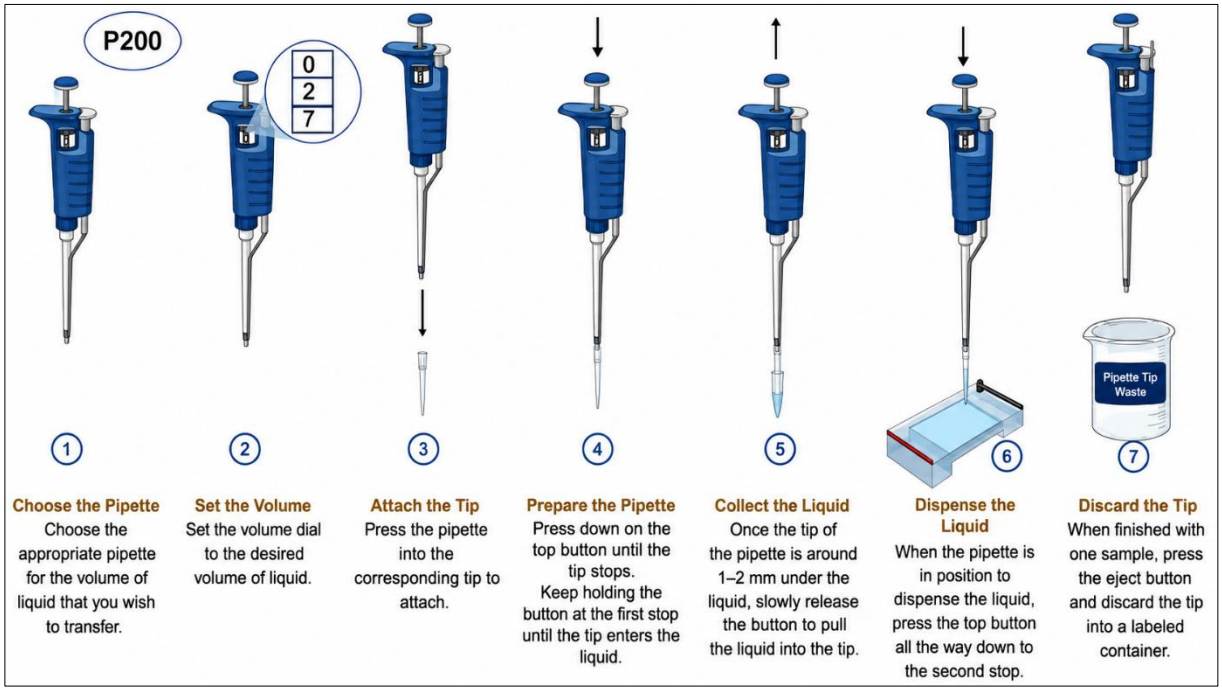

Figure 3. Steps of Using a Micropipette (Source: https://share.google/FJ58pAlKObVTbvaaw)

1. Selection of the Micropipette

Choose the appropriate micropipette according to the required volume range.

Table 1. Volume ranges of micropipettes

Classification	Volume Range (µl)	Increment (µl)
P2	0.2 – 2	0.002
P10	0.5 – 10	0.02
P20	2 – 20	0.02
P50	5 – 50	0.1
P100	10 -100	0.2
P200	20 – 200	0.2
P1000	100 – 200	1.0

2. Setting the Volume

1. Hold the micropipette upright.
2. Rotate the volume adjustment knob until the desired volume appears on the display.
3. Do not exceed the recommended volume range.

3. Attaching the Tip

1. Select a compatible sterile tip.
2. Firmly press the micropipette into the tip.
3. Ensure the tip is tightly fitted.

4. Aspirating the Liquid

Figure 4. Steps of Aspirating liquid

1. Press the plunger to the **first stop**.
2. Immerse the tip slightly (2–3 mm) into the liquid.
3. Slowly release the plunger to aspirate the liquid.
4. Avoid rapid release to prevent air bubbles.

5. Dispensing the Liquid

1. Place the tip against the wall of the receiving container.
2. Press the plunger smoothly to the **first stop** and then to the **second stop** to expel all liquid.
3. Withdraw the pipette while keeping the plunger depressed.
4. Release the plunger after removing the tip from the container.

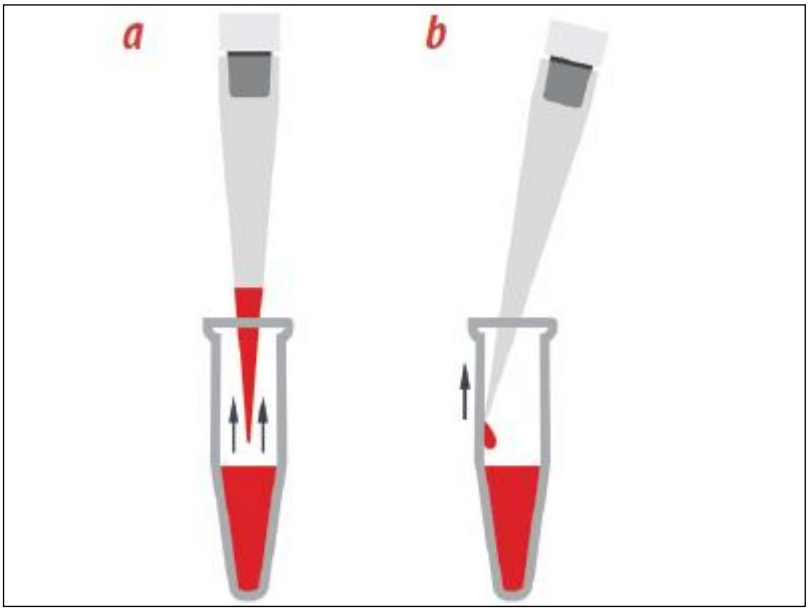

Figure 5. Dispensing the Liquid (Source: https://share.google/qPYKcqi8UaTi6WhoH)

6. Discarding the Tip

1. Press the tip ejector button.
2. Dispose of the used tip into an appropriate waste container.

Precautions

- Always use the correct volume range.
- Never lay a micropipette horizontally when containing liquid.
- Use a fresh tip for each sample to avoid contamination.
- Pipette slowly and smoothly for accuracy.
- Avoid touching the tip with hands.
- Store micropipettes vertically on a stand after use.

Cleaning and Maintenance

- Wipe the exterior with 70% ethanol after use.
- Check regularly for damage or leakage.
- Calibrate micropipettes periodically according to laboratory policy.
- Do not use damaged micropipettes.

Safety

- Wear laboratory coat, gloves, and protective equipment when handling hazardous samples.
- Dispose of contaminated tips according to laboratory biosafety guidelines.

References

1. Laboratory Biosafety Manual – World Health Organization (WHO)
2. Manufacturer's instruction manual for micropipettes
3. Good Laboratory Practice (GLP) Guidelines

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