

# D11

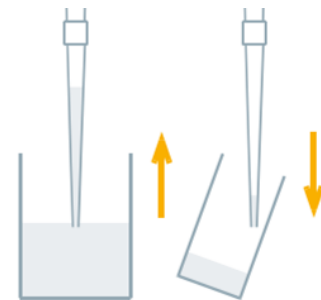
# Automatic Micropipettes



**SCIENCE LEARNING CENTER**

# Introduction

- Automatic micropipettes are used to accurately transfer small liquid volumes.



# After this module, you will be able to:

- **Select** a micropipette based on sample volume.
- **Set** and **interpret** the volume correctly.
- Accurately **transfer** a sample from one container to another.

# Overview: Part 1

1. **Select a micropipette**
2. Set the volume
3. Transfer sample

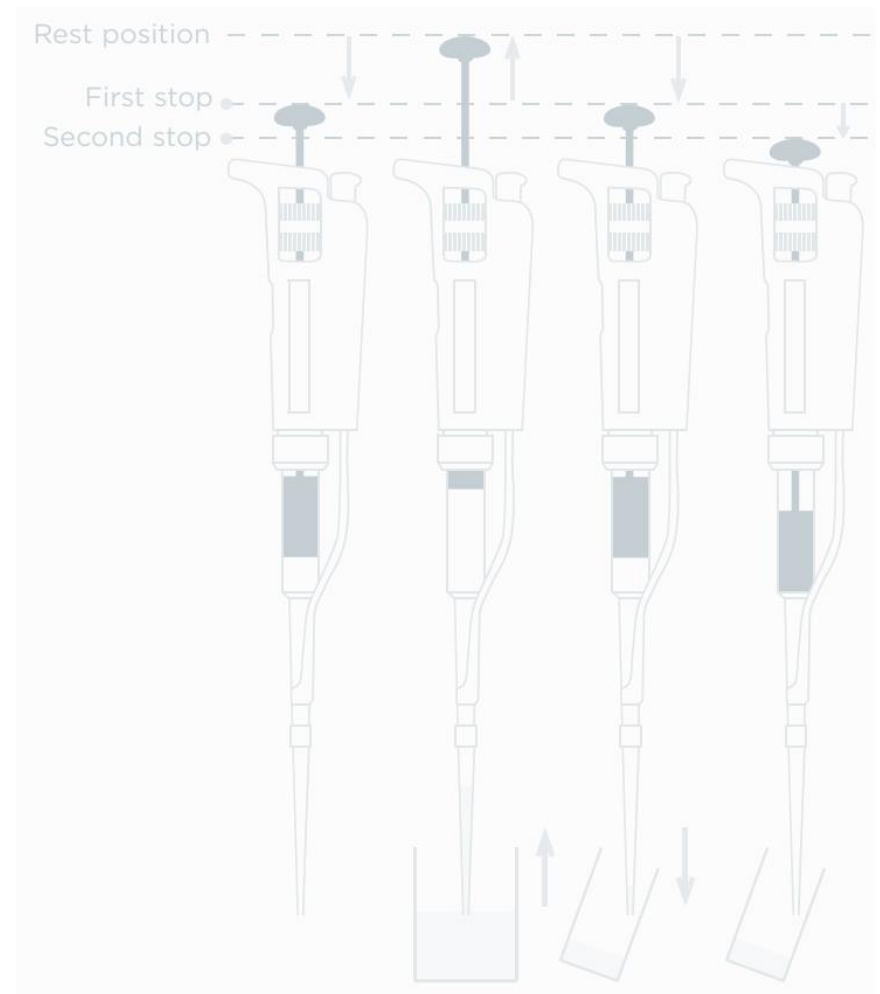


Figure from <http://www.gilson.com/>

# Select a Micropipette

You will use these pipette models in lab:



<b>Pipetman Model</b>	<b>Used for (<math>\mu\text{L}</math>)</b>
P20	2 to 20
P200	20 to 200
P1000	200 to 1000

The name of the pipette indicates its maximum volume in  $\mu\text{L}$ .

# Milliliter vs. Microliter

1 liter (L) is the size of a bottle of dish soap.



1 milliliter (mL) is ~20 drops, less than a spoonful.

$$1,000 \text{ mL} = 1 \text{ L}$$

$$1 \text{ mL} = 1 \times 10^{-3} \text{ L}$$



1 microliter ( $\mu\text{L}$ ) is the size of a grain of salt.

$$1,000,000 \mu\text{L} = 1 \text{ L}$$

$$1 \mu\text{L} = 1 \times 10^{-6} \text{ L}$$

$$1000 \mu\text{L} = 1 \text{ mL}$$

$$1 \mu\text{L} = 1 \times 10^{-3} \text{ mL}$$



Automatic micropipettes measure volumes in microliters ( $\mu\text{L}$ ).

# Problem Set 1

Refer to the end of the module for solutions.

<b>milliliters</b>	<b>microliters</b>	<b>Which pipette would you use?</b>
_____ mL	= 5.26 $\mu\text{L}$	
_____ mL	= 91.5 $\mu\text{L}$	
0.58 mL	= _____ $\mu\text{L}$	
0.069 mL	= _____ $\mu\text{L}$	

# Overview: Part 2

1. Select a micropipette
2. **Set the volume**
3. Transfer sample

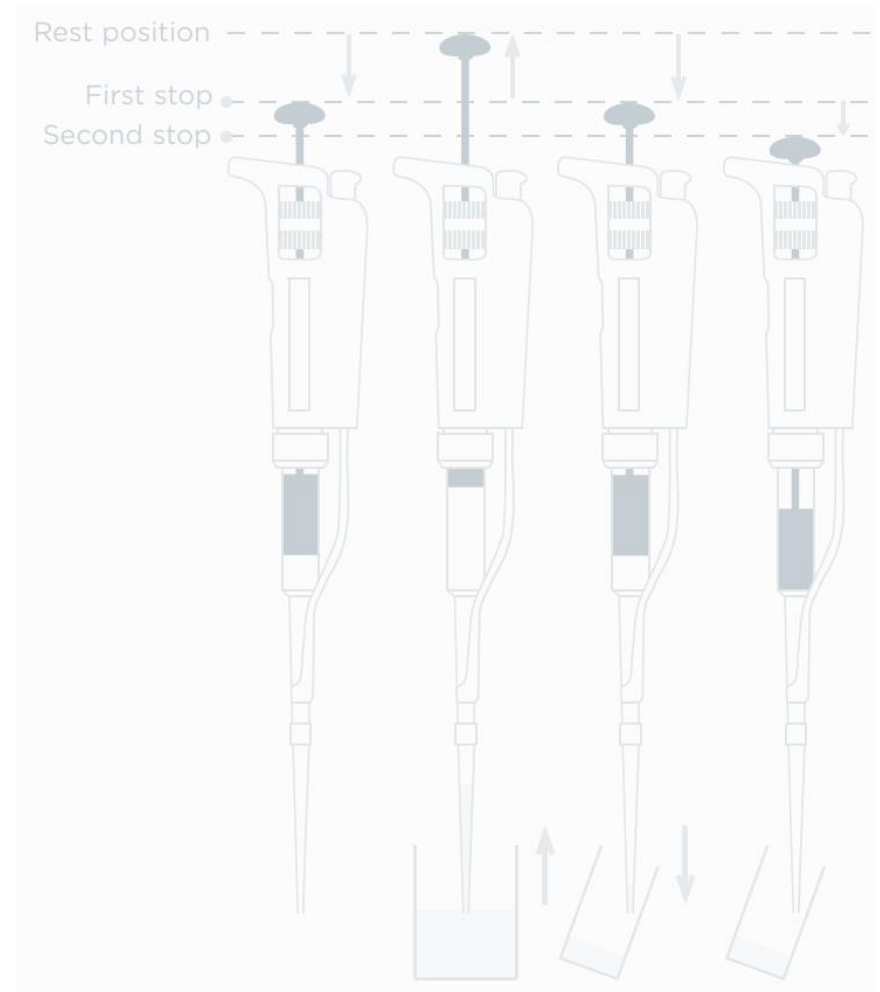


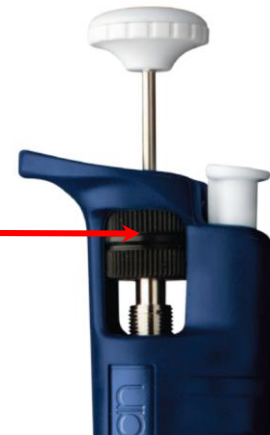
Figure from <http://www.gilson.com/>

# Setting the volume

Turn the volume adjustment knob to set the desired volume.

- For more accurate results, first set a slightly larger volume, then slowly turn back to the desired volume.
- The volume knob controls how far the plunger can move.

Note: there is a single knob to control the volume.



# Reading the volume

- The volume display consists of three dials and is read from top to bottom.
- Notice that **similar** readings on the volume display correspond to **different** volumes on different pipettes.



P20  
4.8  $\mu\text{L}$



P200  
48  $\mu\text{L}$



P1000  
480  $\mu\text{L}$

# P20 Volume Display



- On a P20, the max volume is 20  $\mu\text{L}$ . Therefore the **tens** place is shown on the top dial.
- 6.44  $\mu\text{L}$  looks like:



0 tens

6 ones

4 tenths

4 hundredths

# P200 Volume Display



- On a P200, the max volume is 200  $\mu\text{L}$ . Therefore the **hundreds** place is shown on the top dial.
- 192.4  $\mu\text{L}$  looks like:



1 hundreds

9 tens

2 ones

4 tenths

# P1000 Volume Display



- On a P1000, the max volume is 1000  $\mu\text{L}$ . Therefore the **thousands** place is shown on the top dial.
- 512  $\mu\text{L}$  looks like:



0 thousands

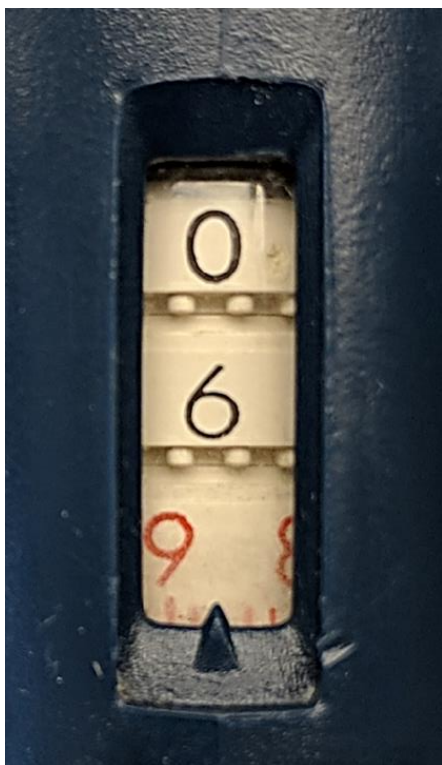
5 hundreds

1 tens

2 ones

## Problem Set 2

Refer to the end of the module for solutions.



P20: \_\_  $\mu\text{L}$



P200: \_\_  $\mu\text{L}$



P1000: \_\_  $\mu\text{L}$

# Overview: Part 3

1. Select a micropipette
2. Set the volume
- 3. Transfer sample**

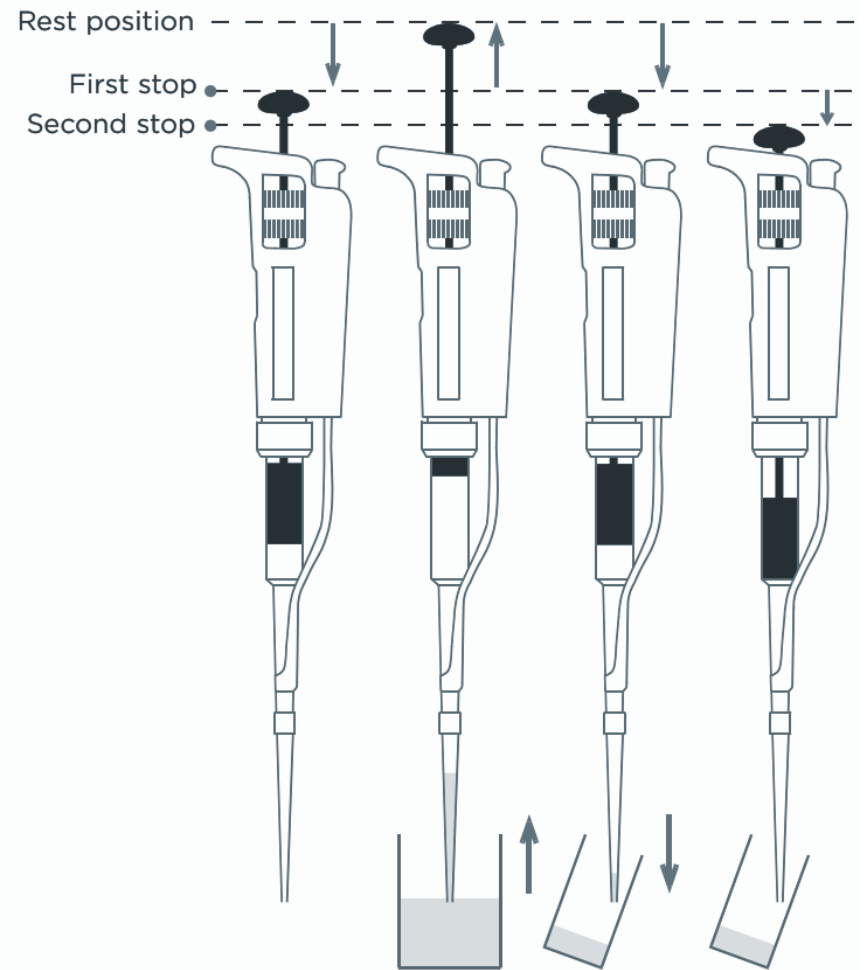


Figure from <http://www.gilson.com/>

# Transfer: Attach Tip

- a. Attach a disposable tip:
- Open a box of the proper sized tips.
  - Firmly press the shaft of the micropipette into a tip.
  - **Do not touch** the tip with your fingers.



# Transfer: First Stop

b. Depress the plunger to the **first stop** (first point of resistance).

- Do this **before** immersing the tip to prevent air bubbles.
- This is similar to squeezing the bulb of an eyedropper.

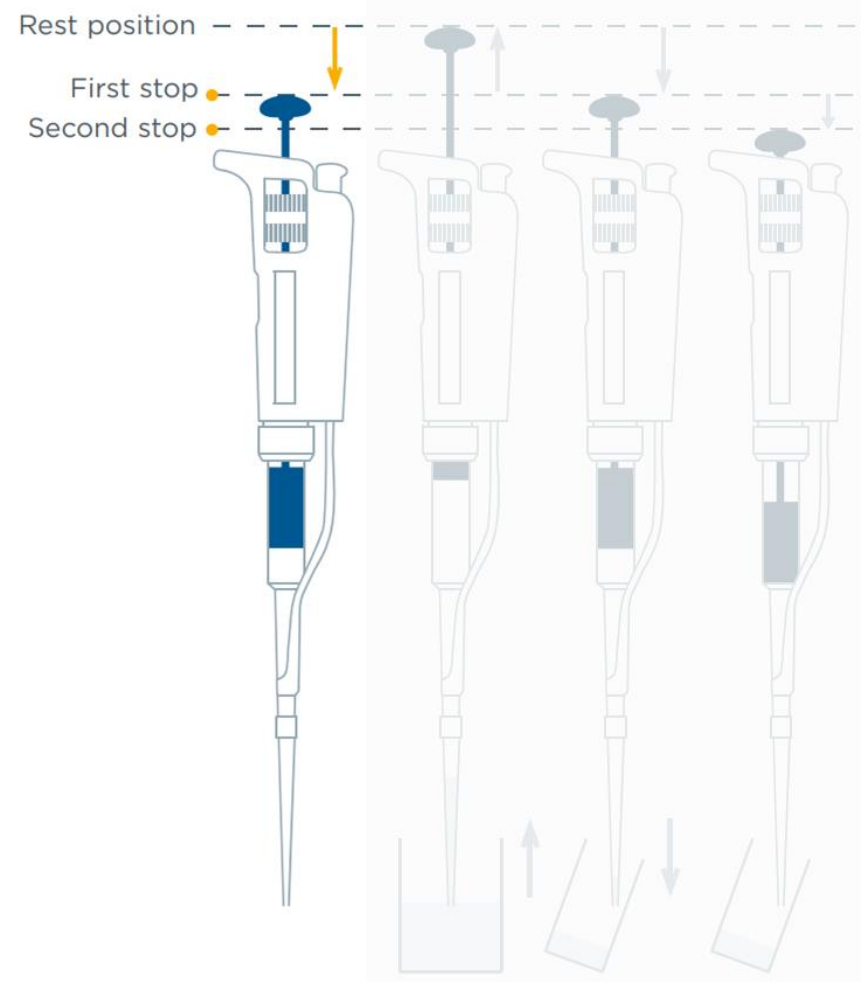


Figure from <http://www.gilson.com/>

# Transfer: Draw Up Sample

## c. Draw up the sample:

- Keep the tip **2 to 4 mm** below the surface of the sample.
  - Do not rest the tip on the bottom of the container.
  - Keep the pipette upright.
- Release the plunger **slowly and smoothly**, then wait 1 second.
  - Do not let the plunger snap up.

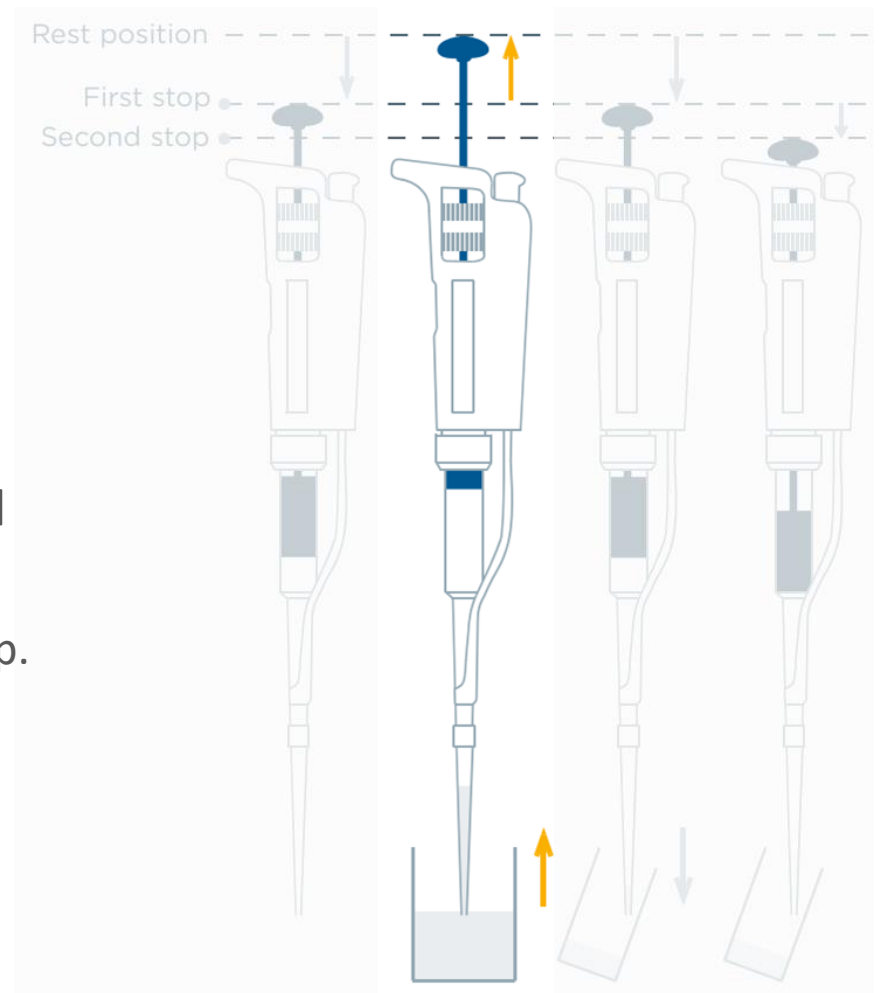


Figure from <http://www.gilson.com/>

# Transfer: Dispense Sample

- d. Dispense the sample:
- Touch the tip to the **inside wall** of the receiving container.
  - Slowly depress the plunger to the **first stop** and **wait** 1 second.
  - Continue to the **second stop** to expel any remaining liquid.
  - Keep the plunger **down** while withdrawing the pipette.

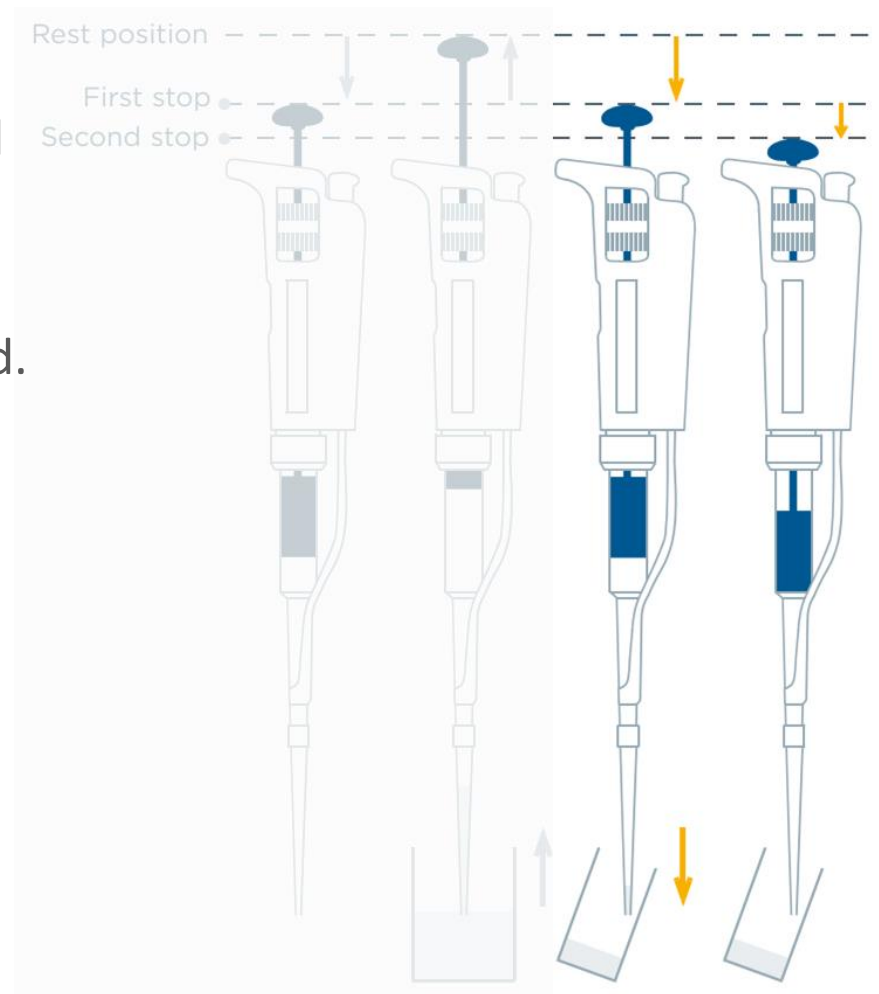


Figure from <http://www.gilson.com/>

# Transfer: Release Plunger and Discard Tip

e. Allow the plunger to return to its up position.

- After withdrawing the pipette, release the plunger **slowly** and **smoothly**.
- Do not let it snap back up.



f. Discard the tip by pressing the tip ejector button.



# Do you know all the steps?

1. Select a micropipette
2. Set the volume
3. Transfer sample:
  - a. Attach a disposable tip.
  - b. Depress the plunger to the first stop.
  - c. Immerse the tip and slowly draw up the sample.
  - d. Dispense the sample into the receiving container.
  - e. Allow the plunger to return to its up position.
  - f. Discard the tip.

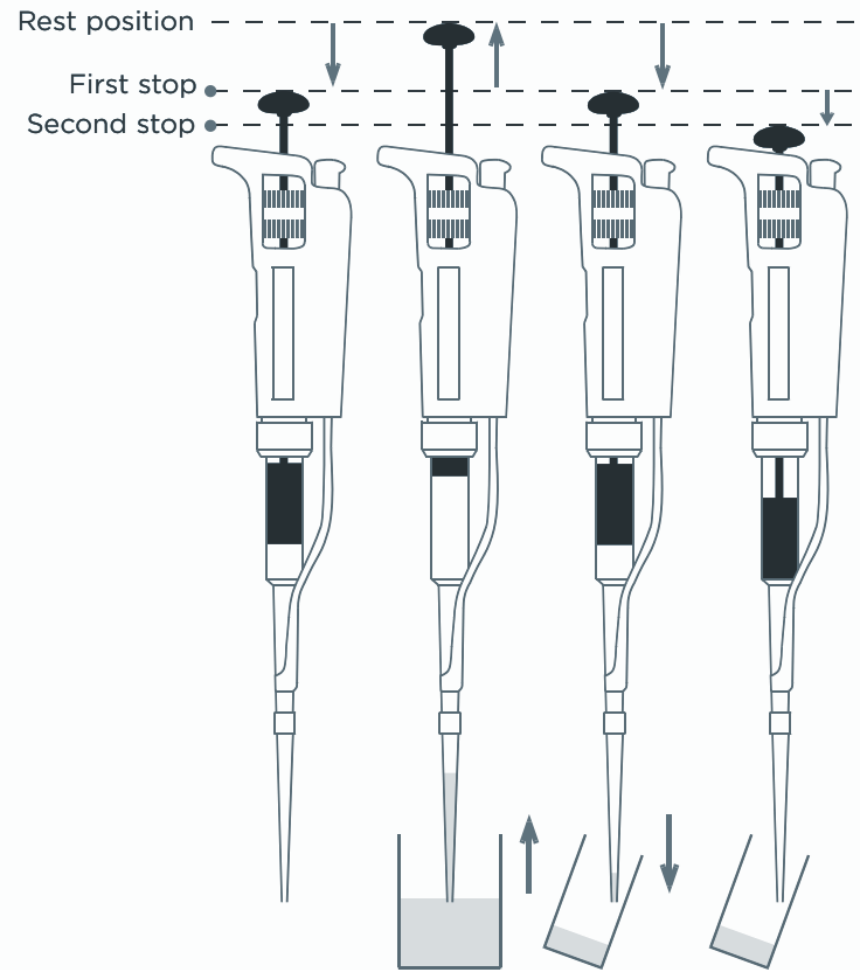
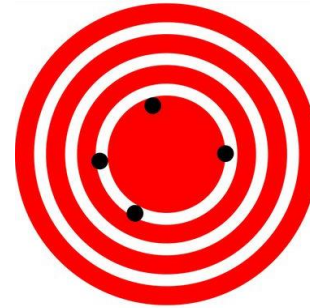


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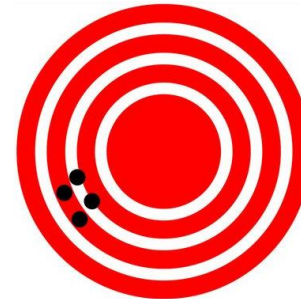
# Accuracy and Precision

**Accuracy** means how close the dispensed volumes are to the **target volume**.



Accurate but not precise

**Precision** means how close the dispensed volumes are to **each other**.



Precise but not accurate

# Pipetting Accurately and Precisely

- **Don't rush.** Work smoothly and consistently.
- Pay attention. If you get **air bubbles** in the tip, dispense the sample into the original container and try again.
- Keep the pipette **upright** while transferring.
- For solutions that **leave a film** inside the tip, pre-rinse the tip, and use the same tip for successive measurements.
- For very dense, viscous, or high vapor pressure liquids, use a different type of micropipette (positive displacement, not air displacement).



## PROBLEM SET 1 ANSWERS:

0.00526 mL	= 5.26 $\mu$ L	P20
0.0915 mL	= 91.5 $\mu$ L	P200
0.58 mL	= 580 $\mu$ L	P1000
0.069 mL	= 69 $\mu$ L	P200

## PROBLEM SET 2 ANSWERS:



P20 = 6.86  $\mu$ L



P200 = 132.4  $\mu$ L



P1000 = 262  $\mu$ L