



Micropipetting 101 Learning Lab

Micropipette Mastery Activity



Teacher's Instructions

This activity can be performed individually or in groups. The smaller the groups, the more hands-on experience each student will gain.

Activity setup

Each group will need

- One 2-20 μl micropipette
- One Pipette Practice Card
- Micropipette tips
- 200 μl water (tap water is fine)
- 80 μl blue micropipetting practice dye (or colored water)
- 80 μl yellow micropipetting practice dye (or colored water)
- 80 μl red micropipetting practice dye (or colored water)
- Beaker or similar container for used tips

For use with Micropipetting 101 Learning Lab.

Product no. KT 1510-10



Teacher's notes

Preparing colored water

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This activity comes with blue, yellow and red practice dyes that you can use to practice micropipetting.

You may also use common store-bought food coloring. Exact color densities are not important, but try to use approximately equal amounts of dye per each solution. Adding a single drop of food coloring to 1 - 1.5 ml of water in a microtube works well and can be done by students at their benches, or make a larger volume and distribute it to groups.

Reducing waste - micropipette tips

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General pipetting best practices dictate that a new micropipette tip should be used every time you pipette a new volume of liquid. This can be very important in avoiding contamination in molecular biology use. Unfortunately, this also creates a considerable amount of plastic waste. For this activity, to reduce unnecessary waste, we recommend reusing tips, especially for the first section when only pipetting water.

Picking up liquids

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When picking up liquids off of the card expect that a very small amount will always remain behind. In the first activity, students will observe the amount that is typically left behind when using the same volume to pick up what they dispensed. Despite the small amount left on the card, if done correctly, the liquid should fill the entire tip, with no space containing air at the end of the tip.

Common sources of error

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- Confusion over when to use the first and second stop. This may lead to very large error.
- Limits of pipette precision. Even well calibrated micropipettes will have some small variation in the volume they pick up and dispense. This may be seen when repeatedly pipetting the same volume and seeing if it adds up to the expected volume. This amount of error should be very small.
- Evaporation. Small drops of liquid sitting on the card even for just a few minutes can sometimes lose a noticeable amount of water through evaporation. This may be observable if students consistently have a small space in their pipette tips at the end of the volume challenge (rainbow) section.



Micropipetting practice exercises

How to use a micropipette

To draw up sample:

1. Set volume using the volume adjustment wheel
2. Press a new tip onto the shaft
3. Press plunger to FIRST STOP
4. Dip tip into liquid
5. Slowly release plunger to collect liquid

To dispense sample:

1. Touch tip to dispensing surface
2. Press plunger to SECOND STOP
3. Remove tip from liquid then release plunger
4. Dispose of tip using the tip ejector



Practice micropipetting with the Pipette Practice Card

1. Add the correct amount of liquid to each circle. Try to be precise so that the liquid stays in the circle.

- If you have trouble, dry the spot with a paper towel and try again.
- Have every member of your group try at least two different volumes.

2. Try to pick up all of the liquid without leaving any behind.

- Set your micropipette to the same volume of liquid that is on one of your drops.
- See if you can pick up all of the liquid without leaving any behind.
There should be no space in the end of your pipette tip.
- Have each member of your group try at least once.



There should be no space at the end of the pipette tip

3. In the blank space at the bottom of the card, pipette several drops of 5 µl.

- Have different members of your group each add at least one drop of 5 µl.

How similar do the drops look in size? If they do not look exactly the same what could be some sources of error?

4. On a dry place on your card place 4 µl water. Add 4 µl to the same place three more times.

How much volume should you now have? _____

5. Set your pipette to that volume and try to pick up the entire drop.

Was there any liquid left on the card or was there space left in the tip of your pipette? _____



Volume challenge

Your teacher will provide you with water that has been dyed blue, yellow, and red using food coloring. Your goal is to add the correct volume pipetting precisely onto dots of your Pipette Practice Card.

1. Add 13.5 μl of blue dye to dot A
2. Add 17.5 μl of yellow dye to dot C
3. Add 17 μl of red dye to dot E
4. From dot A, pick up 2 μl and place it on dot F
5. From dot C, pick up 4.5 μl and place it on dot B
6. From dot E, pick up 3 μl and place it on dot D

Now that you have set up your card and got some micropipetting practice, your goal is to mix these dyes with great care and precision. Follow the guidance below:

1. From dot E, pick up 6 μl and mix it with the volume already present on dot F
2. From dot A, pick up 3.5 μl and mix this volume onto dot B
3. From dot C, pick up 5 μl and mix this volume onto dot D

Did you make any bubbles while you were mixing?

Calculate how much volume should now be on each dot:

Drop	A	B	C	D	E	F
Volume						

Set your micropipette to that volume and pick up each drop one by one and move to at the open space at the bottom of your card. Each time you pick up a drop, check to see if liquid was left behind, or if there is any space at the end of your pipette tip.

Was there any liquid left on the card or was there space at the tip of your micropipette that did not have liquid in it?

Based on your answer to the above questions, how would you rate your pipetting skill? (Circle one.)

A. Total Amateur

B. Intermediate

C. Pro

D. Pipette Master!

Mixing with a micropipette

- When adding a second liquid onto a dot, only press the plunger to the first stop.
- When you reach the first stop, without moving your tip, slowly release the plunger and pick the same volume back up again from where you just dispensed it.
- Repeat this up and down motion several times until the two colors look well mixed.
- When you think the solutions are well mixed, press the plunger to the second stop and remove the tip from the liquid as you normally would.
- If done well, you shouldn't have added bubbles to your sample.