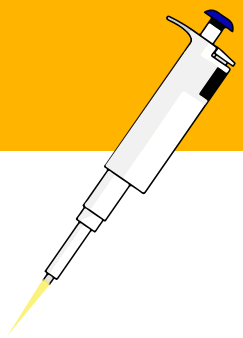
Pipette-it Kit

Learn to pipette like a pro



Welcome to the world of DNA technology.
Your first task: learn to pipette like a professional.

An essential prerequisite to manipulating DNA is demonstrating accurate and consistent pipetting. Biotechnology research and development requires that small volumes of liquid, sometimes less than 1 millionth of a litre, be accurately pipetted. This exercise is a robust way to practice and demonstrate your pipetting skills while also learning data management (collecting results, processing data, and showing data in a chart).

With this kit, you will learn these pipetting basics:

What is a micropipette?
What are pipette tips?
Which pipette and tips to choose based on the desired volume of liquid to be transferred
What are the stop points for aspirating and dispensing?
How deep in the liquid the tip should be while aspirating
How to give enough time during aspiration to get your desired volume
Practice with a small volume micropipette such as a 2 uL, 2.5 uL, or 10 uL pipet.
How do most common breakage of a small volume micropipette happen?
Practice ejecting tips

How will I learn?

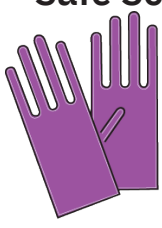
With the Pipette-it Kit, you will practice pipetting different volumes of water with varying pipettes from a source tube into smaller tubes. You will then weigh your tubes and enter the data into a prepared spreadsheet with data processing to see how close you are to the expected result! You will see your accuracy and skill levels grow by practicing the pipetting exercise at least a few times.

To get familiar with the pipetting basics, you will also watch a video when you are ready to get started. Now, let's gather our materials.

What do I need?

- **P1000 pipette** for volumes of 100 to 1,000 uL
- **P100 pipette** for volumes of 10 to 100 uL
- **P10 pipette** for volumes of 0.5 to 10 uL
- 1 box of tips for each of the pipettes above
- 3 decimal point scale and necessary batteries
- Pipette-it Kit with your tubes
- "Beat the Prof or Robot" spreadsheet
  www.amino.bio/beat-the-prof

Safe Science Supplies



- Nitrile gloves
- Discard container

Prepare:

1. Gather your materials and find a clean, stable surface to work on. Since you will only be using water, you can work at a regular desk or table. Place your discard container near you. You will use it to discard used pipette tips.

2. Put on your gloves. Even though you won't be touching bacteria or reagents, it's always best practice to do science with gloves on. You also don't want to contaminate your pipettes with hand bacteria! If you need, review the safe science guidelines at www.amino.bio/practicesafescience.

3. Make a copy of the "*Beat the Prof or Robot*" spreadsheet by visiting www.amino.bio/beat-the-prof

4. From your kit, fill your 10 mL red-top tube with ~8-9 mL of tap water. This will be your source tube.

5. Unpack your 3 decimal point scale (0.000 g) and add the necessary batteries if you have not yet. Set the scale on a flat, stable surface without vibration (for example, don't set it on your lab bench if a microcentrifuge is on, nor do you want any wind blowing at the scale).

6. You are now ready to watch the pipette introduction video. Find it at www.amino.bio/pipette Don't hesistate to rewatch or pause and review if you need it! On the same page, you will find a link to a Follow-along quiz. Open this quiz in a separate tab and complete it as you watch the video or afterwards. This quiz will help you make sure you understand and are ready to start pipetting.

7. Complete the pipette diagram found at www.amino.bio/pipette.

After watching the pipetting video and completing the quiz and diagram, you are ready to start your first pipetting hands-on exercise. Let's go:

8. Open your copied spreadsheet and read the *Introduction to data analysis* tab.

9. Navigate to the *Raw data* tab. Read *Replication, a key for success* and the information in the *Raw Data* Zone. You will be filling out some of the data tables next.

10. Label your three 1.5 mL tubes (the bigger tubes in the baggy) as tubes #1, 2, 3.

Note: Since you will be trying the same experiment (pipetting the same volume) three times, each time will be called a "Replicate experiment." Therefore, each tube is considered a "Replicate." In your spreadsheet tube 1 will be called Replicate 1, tube 2 Replicate 2 and tube 3 Replicate 3.

11. Label your three 0.2 mL tubes (the smaller tubes in the baggy) as tubes #1, 2, 3.

12. TARE ("zero") the scale by pressing "Tare".

13. Weigh your **empty** 1.5 mL tube #1 and enter the weight in your spreadsheet on the Raw Data tab under Experiment/Try 1, 450 uL Pipetting test table. Note that when your tube is empty, it is your "dry tube" on the spreadsheet.

14. Choose the correct pipette to transfer a volume of 450 uL and place on a tip.

15. Pipette 450 uL of water from your source tube into tube #1 of your 1.5 mL tubes.

16. Press TARE again, and weigh tube #1 and enter the weight in your spreadsheet on the *Raw Data* tab in the appropriate area. Once your tube has water, it is now the "wet tube" on the spreadsheet.

17. Repeat Steps 12 to 16 for the 1.5 mL tubes #2 and #3.

You will now repeat the exercise with the 0.2 mL tubes:

18. TARE ("zero") the scale by pressing "Tare".

19. Weigh your **empty** 0.2 mL tube #1 and enter the weight in your spreadsheet on the Raw Data tab under Experiment/Try 1, 50 uL Pipetting test table. Remember, an empty tube is a "dry tube"

20. Choose the right pipette to transfer a volume of 50 uL and place on a tip.

21. Pipette 50 uL of water from your source tube into the 0.2 mL tube #1.

22. Press TARE again, and weigh tube #1 and enter the weight in your spreadsheet on the *Raw Data* tab in the appropriate area. Remember, once your tube has water, it is now the "wet tube" on the spreadsheet.

23. Repeat Steps 18 to 22 for the 0.2 mL tubes #2 and #3.

Analyze your data:

24. Navigate to the *Mean, Standard Deviation, Coefficient of Variance* tab. Read through the information you find there, and have a look at your processed data. Note that your data from the *Raw data* tables will automatically populate into the processed data tables.

> Did you beat the robot at coefficient of variation? Don't worry if not; beating a robot is hard, and you have more chances to try later. You might still beat the prof or robot at error percent...let's find out.

25. Navigate to the *Percent Error / Systematic Error* tab and read up on these concepts. This is your chance to see if you did better than a prof or the robot on your first try... it would be quite the feat! You can also look at the last tab to visualize your data from your first try in a graph. How did you do?

Repeat the exercise to improve your skills:

26. Remember when you learned that replicating an experiment is essential in science? Well, not only is it important to replicate the pipetting in your first try with several tubes, but it is also important for you to complete more than 1 try. Like all new and improving skills, practice is key. Complete the same pipetting and weighing exercises from the previous step at least 2 more times, and fill out the tables for Try 2 and Try 3. Did your data change?

This pipetting exercise is something you can do repeatedly as you get started and over time if you are getting back into the lab after some time. Have fun!