Mastering micropipetting

Activity Guide

In this activity learners will become familiar with what a micropipette is, what it is used for and how to accurately micropipette small volumes of liquid. Learners can also practice their micropipetting skills through competitive or artistic activities.

Suitable for: age 9+
Estimated duration: 30-45 minutes

You will need (per pair of learners):

- P20 or P200 micropipette
- Box of micropipette tips
- Waste disposal container
- Tubes of food dye
- Printed copy of micropipetting instructions

Depending on the activity chosen, you will also need:

- Laminated micropipetting target practice sheet and non-permanent marker pen, **or**
- Laminated pipette pointillism template and filter paper, **or**
- Laminated micropipetting masterpiece coordinates sheets and 96-well plate

Introduction

In a laboratory, scientists will regularly need to use tiny volumes of liquids in their experiments. These volumes are usually measured in microlitres (µL), which is one thousandth (1/1000th) of a millilitre (mL). Scientists use micropipettes to accurately and precisely measure and transfer these very small volumes in their daily work. Accurately using a micropipette is an essential skill for many scientists.

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These activities will allow learners to master the art of micropipetting, with each activity emphasising slightly different elements:

1. **Micropipetting target practice** will help learners to become familiar with a micropipette, how to change the volume and accurately dispense a specific volume onto a target. It also helps them to visualise small volumes and competition can be used as a strategy to encourage accuracy and precision.
2. **Pipette pointillism** motivates learners to become familiar with a micropipette and accurate dispensing of volumes, as they create pipette art. Templates and colours are provided, but students can use their creativity to make individual and different images in this task.
3. **Micropipetting masterpieces** combines gaining familiarity with a micropipette with communication skills and interpretation of simple coordinates. Successful teamwork is rewarded by production of an image.

Setting up the activity

You will need to aliquot and label different food dyes (blue, red and yellow) into microfuge tubes, or other suitable small containers in advance. Printed copies of the micropipetting method will also be helpful for learners to refer to whilst micropipetting. In addition:

1. For **micropipetting target practice**, you need to print and laminate the target practice sheets. Non-permanent marker pens can be used to write student names on the laminated sheets.
2. For **pipette pointillism**, you need to print and laminate image templates and ensure that you have filter paper of a size that covers the template.
3. For **micropipetting masterpieces**, you need to print coordinate sheets and have a 96-well plate for each pair.

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Running an activity

Warm up discussion

- Begin the activity by explaining that in a laboratory, scientists often use tiny volumes of liquids in their work. Discuss why these liquids need to be accurately and precisely measured and dispensed, before introducing the tool used to do this - a micropipette. Explain that using a micropipette is an essential skill for some laboratory scientists.
- Explain how the parts of a micropipette function and demonstrate how to change the volume, add a tip, aspirate and dispense a sample, and safely eject a used tip into a designated waste disposal container. You might like to use the PowerPoint slides, alongside the activity sheets, to show a diagram of a micropipette, and to demonstrate how to change the volume and use a micropipette.

How to complete an activity

1. **Micropipetting target practice**. Learners work in pairs to practice pipetting different volumes of food dye into a target circle on the laminated micropipetting target practice sheet. Using a whiteboard marker, learners can write their names on the micropipetting target practice sheet before beginning their practice. After completing the practice, they can compare their accuracy and precision to one another.
2. **Pipette pointillism**. Learners pipette given volumes of food dye onto a laminated template. Learners can choose which template and colours of food dye they would like to use, then pipette the volumes shown in the centre of each circle onto the template. Once pipetting is complete, a piece of filter paper is carefully placed onto the template to transfer the food dye and produce a picture on the filter paper.

3. **Micropipetting masterpieces** involves teamwork to create a picture in a 96-well plate. Learners work in pairs, with the first reading coordinates and the second pipetting food dye into specific wells of a 96-well plate. Partners swap roles part way through. Once completed, learners can identify the image produced.

Risk assessment
Activities in mastering micropipetting use household food dye and a micropipette for a short period of time. The risks associated with these activities are extremely low, however assessment of these risks is given below for completeness.

Hazard: Chemical substances - food dye
Description: Purchased from a supermarket and meets food safety standards
Risks: Contact with food dye
Safety precautions: Use good laboratory practice to avoid contact with skin and eyes
Emergency procedures: Wash hands under tap or eye using an eye bath
Likelihood: Possible
Severity: Minor
Overall risk: Low

Hazard: Ergonomics – micropipetting posture
Description: Using a micropipette involves using shoulder, wrist and hand movements that could cause muscular injury if used repeatedly over at least 2 consecutive hours per working day
Risks: Shoulders / wrists / hands sore from micropipette use
Safety precautions: Don't micropipette for long periods (>2 hours) without a break, and stretch every 20 minutes to minimise risk
Emergency procedures: If shoulders, wrists or hands become sore, stop pipetting and stretch
Likelihood: Unlikely
Severity: Minor
Overall risk: Low