Micropipetting Practice

Contributors

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Intended Audience

<table>
<thead>
<tr>
<th>K-4</th>
<th>5-8</th>
<th>9-12</th>
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Intended Audience

<table>
<thead>
<tr>
<th>Classroom Setting</th>
<th>Requires special equipment</th>
<th>Uses hands-on manipulatives</th>
<th>Requires mathematical skills</th>
<th>Can be performed individually</th>
<th>Requires group work</th>
<th>Requires more than one (45 min class) period</th>
<th>Appropriate for special needs student</th>
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Introduction

Description
In this activity, students will get hands-on experience using micropipettes.

Abstract
Students will learn how to correctly use micropipettes and be able to use this knowledge to correctly measure out varying volumes of liquids into test tubes.

Core Themes Addressed

<table>
<thead>
<tr>
<th>Core Themes Addressed</th>
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<tbody>
<tr>
<td>Microbial Cell Biology</td>
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<tr>
<td>Microbial Genetics</td>
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<tr>
<td>Microorganisms and Humans</td>
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<td>Microorganisms and the Environment</td>
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<tr>
<td>Microbial Evolution and Diversity</td>
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<tr>
<td>Other –Molecular Biology</td>
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Keywords
DNA, Science and Technology, Pipette

Learning Objectives
At completion of this activity, students will be able to:

1. Demonstrate the ability to transfer correct volumes of liquid into test tubes.

National Science Education Standards Addressed

Standard E: Science and Technology

- Understandings about science and technology
Micropipetting Practice

Student Prior Knowledge

Students will need a general understanding of what micropipettes are and why they are used in science.

Teacher Background Information

Micropipettors are standard laboratory equipment in micro and molecular biology laboratories. They are used to measure and transfer small volumes of liquids.

Disposable plastic tips are placed on the end of the micropipettor for use in measuring liquids.

The plunger on top of the micropipette can be twisted to set the desired volume of liquid to be measured. It also has two different stopping points when depressed. The first stopping point is used to measure out the desired volume of liquid. The second stop is only used for the complete discharging of liquid from the tips.

Micropipettes are expensive and certain rules should be followed.

- Never adjust the volume beyond the specific micropipettors range.
- Always keep pipettes upright when liquid is in the plastic tip.

Class Time

This activity will require a minimum of one 45 minute class period

1. Teach the students the proper way to use a micropipette (powerpoint 5 minutes)
2. Students complete first part of handout (5 minutes)
3. Handout materials (5 minutes)
4. Students complete activity (15 minutes)
5. Teacher checks for accuracy (10 minutes)
6. Clean-up (5 minutes)

Teacher Preparation Time

This lesson will require approximately 20 minutes of preparation time.

1. Teacher must know how to use a micropipette to teach students (10 minutes)
2. Make copies of handout (5 minutes)
3. Setup tubes with food coloring (5 minutes)

Safety Precautions

Safety goggles and aprons can be worn to protect clothing and eyes.

Materials and Equipment (3 per group)

1. 1.5 mL tubes (6 per group)
2. Food coloring in a 1.5 mL tube (1 per group)
3. Water in a 1.5 mL tube (1 per group)
4. 5-50ul micropipette (1 per group)
5. 1.5 mL tube rack (1 per group)
6. Pipet tips (1 per group)
7. Permanent maker (1 per group)

Methods

1. Students fill out the correct order on how to micropipette (once this is completed correctly students are able to get their micropipette and begin the activity).
   a. Students often have a hard time remembering how far to push the plunger into the micropipette and may get too much liquid.
2. Students place 6 of the 1.5 mL tubes into the tube rack
3. Tubes are then labeled 1-6
4. Students then use the micropipette and tips to pipet the correct amount of water into each tube.
5. Students repeat with the food coloring.
   a. Students may want to have aprons on for this step sometimes the 1.5 mL tubes can be hard to open food coloring can stain clothing.
6. Teacher checks amount of liquid in each tube.
   a. If students completed it correctly there will be 50 uL in each tube. It is helpful to have a tube with 50 uL of liquid to compare to the students tubes.

Tips/Suggestions

1. This activity could be done with groups from 1-3 students depending on the availability of micropipettes.
Answers to Student Handouts

1) What is the correct order when preparing for pipetting?
   - Push down on the plunger to the second stop
   - Push down on the plunger to the first stop
   - Put on pipette tip
   - Release pipette plunger
   - Prepare all liquids
   - Place pipette in liquid
   - Slowly release the pipette plunger
   - Place pipette over new container
   - Push down on the plunger to the first stop
   - Set your pipette to the correct volume

   9  4.8  3  10  1  5  6  7  4.8  2

End of lab question:

Does the food color and water stay separate or mix together? What is this process called?

   The water and food color mixes together, this process is called diffusion.
Introduction

Micropipettors are standard laboratory equipment in micro and molecular biology laboratories. They are used to measure and transfer small volumes of liquids. The measurement scale on micropipettes is in microliters (μl). Micropipettes are expensive instruments and should be handled with care.

Student Background Knowledge

The plunger on top of the micropipette can be twisted to set the desired volume of liquid to be measured. It also has two different stopping points when depressed. The first stopping point is used to measure out the desired volume of liquid. The second stop is only used for the complete discharging of liquid from the tips.

Micropipettes are expensive and certain rules should be followed.

- Never adjust the volume beyond the specific micropipettors range.
- Always keep pipettes upright when liquid is in the plastic tip.

Vocabulary

Micropipette: a slender pipette used to transfer minute amounts of liquids.

Pipette Tip: the disposable plastic piece that connects to the end of the micropipette to prevent direct exposure of liquids to the inside of the micropipette.

Test Tube: A hollow cylinder made of plastic with one end closed, used in chemical and biological experimentation and analysis.

Safety Considerations

Safety goggles and aprons can be worn to protect clothing and eyes.

* Food coloring can stain clothing
Materials Checklist (per group)

<table>
<thead>
<tr>
<th>(6) 1.5 mL tubes</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>(1) Tube of water</td>
<td></td>
</tr>
<tr>
<td>(1) Tube of food coloring</td>
<td></td>
</tr>
<tr>
<td>(20) pipet tips</td>
<td></td>
</tr>
<tr>
<td>(1) Micropipet</td>
<td></td>
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<tr>
<td>(1) 1.5mL tube rack</td>
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</table>

Procedure

1. Fill out the correct order on how to micropipette (see handout)
   a. Get your teacher to check your answers
2. Collect materials
3. Place 6 of the 1.5 mL tubes into the tube rack
4. Label tubes 1-6
5. Using the techniques previously learned use the micropipette and tips to pipet the correct amount of water into each tube.
6. Repeat with the food coloring

Table 1: The amount of liquid to be placed in each tube.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Amount of water</th>
<th>Amount of food coloring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45 uL</td>
<td>5 uL</td>
</tr>
<tr>
<td>2</td>
<td>40 uL</td>
<td>10 uL</td>
</tr>
<tr>
<td>3</td>
<td>25 uL</td>
<td>25 uL</td>
</tr>
<tr>
<td>4</td>
<td>20 uL</td>
<td>30 uL</td>
</tr>
<tr>
<td>5</td>
<td>10 uL</td>
<td>40 uL</td>
</tr>
<tr>
<td>6</td>
<td>5 uL</td>
<td>45 uL</td>
</tr>
</tbody>
</table>

7. When you are done check the amount of liquid in each tube.
   a. Set pipet to 50 uL
   b. Pipet out all liquid from tube 1
   c. Check for empty space at the bottom of your pipet tip or excess liquid in tube
   d. Place liquid back in tube 1
   e. Repeat for tubes 2-6
8. Clean up
Micropipetting Practice

1) What is the correct order when preparing for pipetting?
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   - Push down on the plunger to the first stop
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   - Release pipette plunger
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   - Place pipette in liquid
   - Slowly release the pipette plunger
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Does the food color and water stay separate or mix together? What is this process called?