

Micropipetting with Food Dye

Increasing your micropipetting skills while exploring volume, ratio, and percentages

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Introduction

Welcome, young scientists! In this lab exploration, we'll be diving into the world of micropipetting, a crucial skill in biology, chemistry, and beyond. We'll use food dye to visually represent volumes and practice calculating percentages and ratios – a perfect blend of **math** and **science**! Get ready to create some colorful mixtures and sharpen your laboratory techniques.

Name: _____

Date: _____

Materials

- P-20 μl micropipette per participant
- 15 micropipette tips per participant
- Food dye colors (e.g., red, blue, green, yellow)
- Fine paintbrush
- Water (for rinsing)
- Paper towels
- Gradation Template (laminated, provided separately)
- Bar Chart template (non-laminated, provided separately)

Level 1 Exploration: Drop Ratios

In this exploration, you'll be working with drops of food dye to create different mixtures. This will teach you how to control ratios visually. Use the same micropipette volume for each drop of dye.

Procedure

1. **Choose your Colors:** Select two different food dye colors.
2. **Set the Volume:** Set your micropipette to a volume between 2 and 10 microliters and *do not change this volume for the remainder of the Level 1 Exploration*. Use the same tip when obtaining the same color, then eject the drops into the mixtures.
3. **Create Mixtures:**
 - For Mixture 1, add 10 drops of Color A and 0 drops of Color B onto the Gradation Template.
 - For Mixture 2, add 9 drops of Color A and 1 drop of Color B. Mix the two colors by aspirating and ejecting the mixed solution back and forth two or three times. ***Only press your micropipette down to the 1st stop point when you are applying this mixing technique until the final ejection!***
 - Continue creating mixtures with new micropipette tips, decreasing Color A by one drop and increasing Color B by one drop each time, until you reach 0 drops of Color A and 10 drops of Color B for Mixture 11.
4. **Record Data:** Record the number of drops of each color in the Mixture Table below. Calculate the percentage of each color in each mixture.
5. **Observe and Compare:** Compare the colors of the mixtures on the gradation template. What do you observe about the color change as the ratio of the two dyes changes?

Mixture Table (Level 1)

Mixture #	Drops of Color A	Drops of Color B	% Color A	% Color B
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Color A: _____ Color B: _____

Level 2 Exploration: Microliter Precision

Procedure

- Choose your Colors:** Select two different food dye colors.
- Total Volume:** Each mixture should have a total volume of **20 microliters (µL)**.
- Create Mixtures:** Place your allocations in the corresponding circles of the Gradation Template.
 - For Mixture 1, use 100% of Color A and 0% of Color B.
 - For Mixture 2, use 90% of Color A and 10% of Color B. Mix the two colors by aspirating and ejecting the mixed solution back and forth two or three times. **Only press your micropipette down to the 1st stop point when you are applying this mixing technique until the final ejection!**
 - Continue creating mixtures, decreasing Color A by 10% and increasing Color B by 10% each time, until you reach 0% of Color A (0 µL) and 100% of Color B (20 µL) for Mixture 11.

4. **Record Data:** Record the percentage of each color and the calculated volume (in microliters) in the Mixture Table below.
5. **Observe and Compare:** Compare the colors of the mixtures on the gradation template. How does the color change relate to the volume of each dye?

Mixture Table (Level 2)

Mixture #	% Color A	μL of Color A	% Color B	μL of Color B
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				

Color A: _____ Color B: _____

Let's Chart It!

Graphing Your Data In A Bar Chart

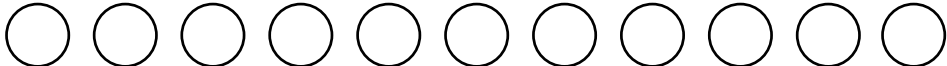
Procedure

1. **Label your chart:** One axis should be your varying measurements of one of the food dyes in each mixture while the other axis should be the varying measurements of the other dye.
2. **Label your axes:**
 - If you did the Level 1 Exploration, your axes should be marked with the number of drops used of each dye.
 - If you did the Level 2 Exploration, your axes should be marked with either the percentage or actual volume used of each dye.
 - Do NOT start your 0 at the point of origin. Your first mark on each axis should be 0.
3. **Paint your bars:**
 - Starting with Mixture #1 on the left, paint the bar with the mixture from your Gradation Template on the corresponding location of the correct measurement of the dye on the x-axis, painting it to the height of the correct measure of the dye on the y-axis.
 - Paint the correct corresponding bar for all 11 mixtures.
4. **Observe and Compare:** Compare the colors of the mixtures against the gradation template. How does the color change relate to the volume of each dye?

Conclusion

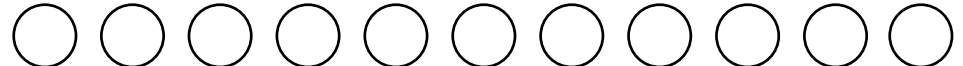
Through these explorations, you have gained experience with micropipetting techniques and the importance of accurate measurements. By manipulating ratios and volumes of food dye, you've also reinforced your understanding of percentages and proportions. Use this experience as you continue your journey as scientists!

GRADATION TEMPLATE



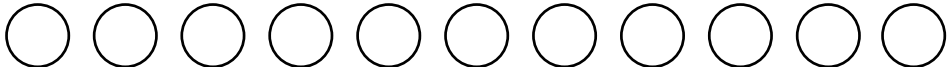
Mixture #1 Mixture #2 Mixture #3 Mixture #4 Mixture #5 Mixture #6 Mixture #7 Mixture #8 Mixture #9 Mixture #10 Mixture #11

GRADATION TEMPLATE



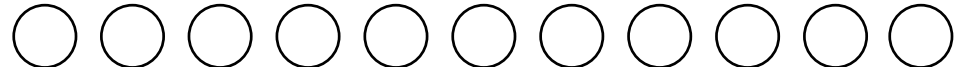
Mixture #1 Mixture #2 Mixture #3 Mixture #4 Mixture #5 Mixture #6 Mixture #7 Mixture #8 Mixture #9 Mixture #10 Mixture #11

GRADATION TEMPLATE



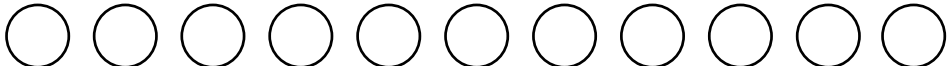
Mixture #1 Mixture #2 Mixture #3 Mixture #4 Mixture #5 Mixture #6 Mixture #7 Mixture #8 Mixture #9 Mixture #10 Mixture #11

GRADATION TEMPLATE



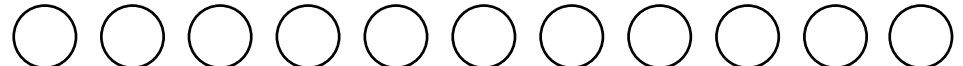
Mixture #1 Mixture #2 Mixture #3 Mixture #4 Mixture #5 Mixture #6 Mixture #7 Mixture #8 Mixture #9 Mixture #10 Mixture #11

GRADATION TEMPLATE



Mixture #1 Mixture #2 Mixture #3 Mixture #4 Mixture #5 Mixture #6 Mixture #7 Mixture #8 Mixture #9 Mixture #10 Mixture #11

GRADATION TEMPLATE



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GRADATION TEMPLATE

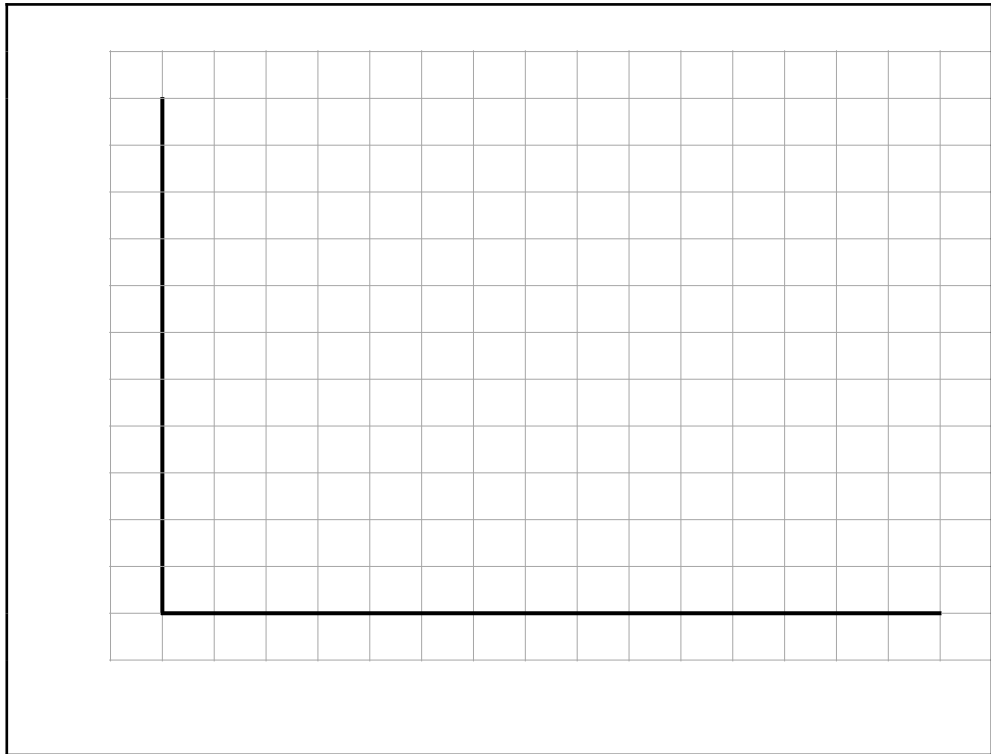
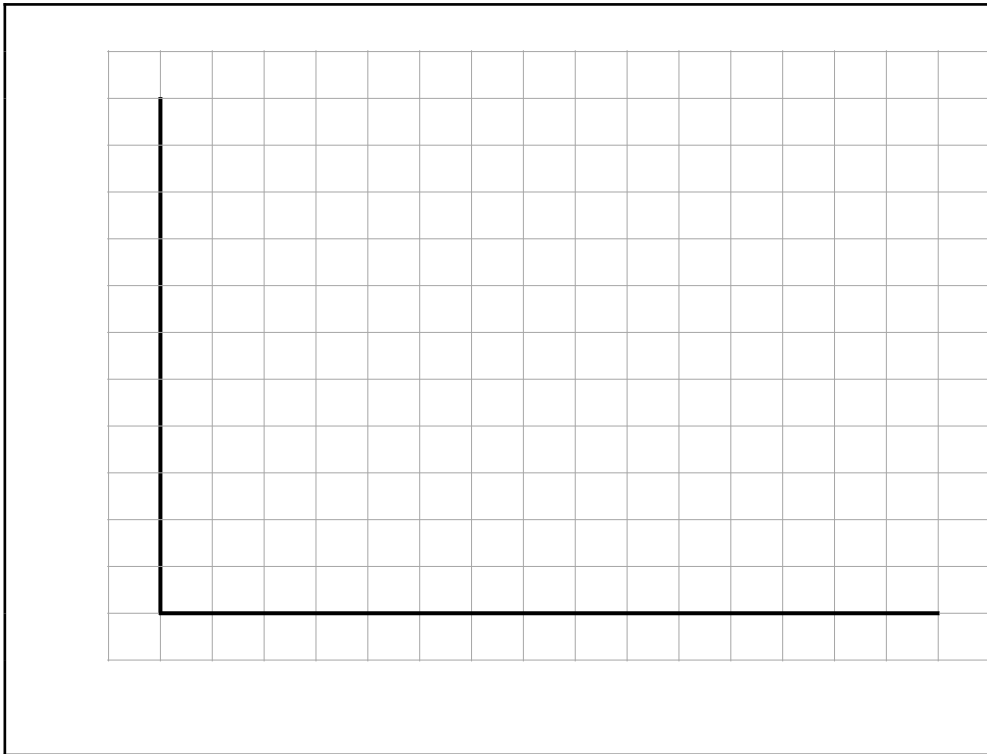


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GRADATION TEMPLATE



Mixture #1 Mixture #2 Mixture #3 Mixture #4 Mixture #5 Mixture #6 Mixture #7 Mixture #8 Mixture #9 Mixture #10 Mixture #11



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