

Name: \_\_\_\_\_

# Color Change Challenge

## Problem Solving by Trial and Error



### Introduction

Scientists use many different strategies to solve problems. One such strategy is known as *trial and error*. The term may lead some to believe that when a test (the trial) leads to an incorrect solution (the error), then the experiment has failed. This activity will help students discover that learning what does not work is just as valuable in science as discovering what does work.

### Concepts

• Chemical change • Problem solving • Nature of science • Trial and error

### Purpose

The purpose of this experiment is to mix four solutions labeled A, B, C, and D in the correct sequence to produce a series of color changes—from colorless to orange, then to bluish-black, and finally back to colorless again.

**Materials:** Bleach solution (sodium hypochlorite, 5%), Potassium iodide solution, KI, Sodium thiosulfate solution,  $\text{Na}_2\text{S}_2\text{O}_3$ , Starch, Beral-type pipets,

### Procedure

1. Read the purpose of the experiment.
2. Write an “action plan” to test the possible combinations of solutions. Included in the action plan should be a way to clearly communicate observations and results.
3. Once the action plans have been approved by the instructor, test your plans using the prepared unknown solutions.



### Action Plan

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### Data

Experimental data must be organized. In the space below record your data in an organized fashion until you have reached the solution. You must include data from every step taken in order to assure efficient and accurate results. (ex.  $A + B = \text{Orange}$ ;  $A + B + C = \text{Bluish/Black}$ )

All chemicals being used are safe to handle without the possibility of a volatile reaction. Use **5** drops of each solution at a time.

### Results

Use the spaces below to show the proper sequence to obtain the desired results.

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### Conclusion

Answer the questions below based on your experiment and the results.

1. How many steps did it take your group to discover the solution? \_\_\_\_\_

2. Do you think the solution could have been discovered in fewer steps?

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3. If you think the solution could have been discovered in fewer steps, explain how? (not just by making lucky guesses) If not, explain why your group was able to discover the solution in the fewest possible steps.

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4. Would another problem solving method have been better than trial and error for this activity? Why or why not?

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5. Adding solution A to solution B would produce the same results as adding solution B to solution A. Would reversing the entire order in which the four solutions were added produce the reverse of the color changes desired? Explain.

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6. Think of a situation in which trial and error would not be a good problem solving technique. Briefly describe the problem and suggest alternative strategies for solving the problem.

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