

Activity 1.6

M&M's in different sugar solutions

Does the amount of sugar already dissolved in water affect how fast an M&M coating dissolves?

In previous activities in this investigation, students explored different factors that affect the speed of dissolving—namely, the color of the M&M and the temperature of the water. Students also looked at the movement of dissolved M&M coatings in water. The sugar and color dissolve, sink, and move along the bottom of the container. In this activity, students will investigate whether having sugar already dissolved in water affects the speed of dissolving and the movement of sugar and color through the water.

Materials needed for each group

3 Same-color M&M's	Crayons or colored pencils
3 White plastic or foam dessert plates	Permanent marker
Room-temperature water	Sugar
Round film canister lid or a quarter	Teaspoon
3 Plastic cups, 3½ ounces	Bucket or large bowl
2 Plastic cups, 9 or 10 ounces	Paper towels

Notes about the materials

- Be sure you and the students wear properly fitting goggles.

Preparing materials

- You may wish to draw concentric circles in the center of plates ahead of time. Or students can draw them as part of the activity. The procedure for drawing these is described in *Activity 1.2*, p. 30.

Activity sheet



Copy *Activity sheet 1.6—M&M's in different sugar solutions*, pp. 50–51, and distribute one per student when specified in the activity.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 52–53. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either “Good”, “Satisfactory”, or “Needs Improvement”.

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Question to investigate

Does the amount of sugar already dissolved in water affect how fast an M&M coating dissolves?

1. Ask students to design an experiment to investigate the question.

Ask students to predict what might happen if they place an M&M in sugar water instead of plain water. Would the sugar and color dissolve as quickly from the M&M as they do in plain water? Would the sugar and color from the M&M flow through the water as quickly or in the same way? Then ask students how they could set up an experiment to find out whether the amount of sugar already in water affects how fast the color coating dissolves from an M&M. Students should recognize that they will need to test the same-color M&M in water with different amounts of sugar. They should talk about testing a range of sugar concentrations and begin to talk about variables that must be kept the same.

2. Identify variables and how they are controlled in the procedure provided.



Distribute *Activity sheet 1.6—M&M's in different sugar solutions*. Direct students to think about the procedure they discussed and look at the procedure on the second page of *Activity sheet 1.6* as they identify the variables in the experiment. Students should recognize that the only variable that will be different in each plate is the amount of sugar dissolved in the water. Everything else, including the size and type of plate, amount and temperature of water, and color of M&M, should all be kept the same. The M&M's should also be placed in the plates at the same time and in the same position.

3. Have student groups conduct the experiment and record their observations.

As students conduct the procedure written on *Activity sheet 1.6*, they should be sure to compare both the amount of color left on the M&M and the size of the circle of color around each M&M. The amount of color left on the M&M is an indicator of how much of the coating has dissolved. The size of the circle of color can be attributed to the amount of the coating that has dissolved, but also how readily the dissolved sugar and color are flowing through the water.

Procedure

1. Use small pieces of paper to label each of three cups and three plates **no sugar**, **1 teaspoon sugar**, **3 teaspoons sugar**.
2. Pour $\frac{1}{4}$ cup of water into each cup.
3. Add 1 teaspoon of sugar and 3 teaspoons of sugar to their labeled cups. Stir until the sugar in each cup dissolves.
4. Pour the water and the sugar solutions into their labeled plates. The water should be deep enough that an M&M would be completely submerged in the water.



no sugar 1 teaspoon sugar 3 teaspoons sugar

5. With the help of your partners, place each of the same-color M&M's in the center of each plate at the same time. Wait about 1 minute.
6. Record your observations on *Activity sheet 1.6—M&M colors in sugar solutions*.

Expected results: The M&M coating will dissolve most quickly from the M&M placed in plain water and least quickly from the M&M placed in the most concentrated sugar solution. The circle of color will also be the largest in the plain water and the smallest in the most concentrated sugar solution.

4. Discuss student observations.

Ask students what they think about the prediction they recorded on *Activity sheet 1.6* at the start of this activity. Ask them: Does the amount of sugar already dissolved in water affect how fast an M&M coating dissolves? Using observations from this activity, how do you know?

Explain to students that dissolving sugar in water makes the solution more dense. When an M&M is placed in a sugar solution, the dissolved sugar and color from the M&M cannot push this more-dense solution out of the way. This keeps the circle of color smaller and more color remains on the M&M.