

## Activity 2.2

### Crushing test

#### Can you identify the unknown crystal by crushing the different crystals and comparing them?

A hardness test is used to identify rock samples, so a similar test may provide some information about the crystals. In this activity, students will try to design a crushing test and discover that identifying and controlling the variables may be difficult. Although the crushing test will not give conclusive results, it is a good opportunity to discuss variables and why they are sometimes difficult to control. This crushing test is also a good example of how a particular test does not always give enough information to answer a question.

#### Materials needed for each group

Salt in cup  
Epsom salt in cup  
MSG (Accent<sup>®</sup>) in cup  
Sugar in cup  
Kosher salt in cup (unknown)  
Black construction paper,  $\frac{1}{2}$  piece  
Plastic teaspoon

#### Notes about the materials

- **Be sure you and the students wear properly fitting goggles.**
- Use the crystals in labeled cups from *Activity 2.1*. These will be reused again in *Activity 2.3*.
- Use the piece of black construction paper labeled in *Activity 2.1*.

#### Activity sheet



Copy *Activity sheet 2.2—Crushing test*, pp. 85–86, and distribute one per student when specified in the activity.

#### Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 108–109. 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”.

## Activity 2.2

### Crushing test

#### Question to investigate

## Can you identify the unknown crystal by crushing the different crystals and comparing them?

### 1. Have students help design a fair test.



In *Activity 2.1*, students may have suggested crushing the crystals. Distribute *Activity sheet 2.2—Crushing test* so students can plan a crushing test. Then lead a class discussion so that students can suggest ways to compare the “crushability” of the crystals. Important considerations to elicit from students involve controlling variables such as using the same object to crush each pile of crystals and trying to use the same amount of force for the same length of time. Discuss the importance of keeping variables the same in an experiment so that the test is fair. As a class, decide on the materials and procedure the groups will follow. You and the students can, of course, decide to use a can, a rolling pin, or any other safe object and a safe method to apply a consistent amount of force to the crystals in the same way. The procedure below is just one possible experimental design. Be sure students wear safety goggles when crushing the crystals.

### 2. Have students conduct the experiment.

Students may use the crystals they placed on the black construction paper from *Activity 2.1*. If they do, they can skip Steps 1 and 2.

#### *Procedure*

1. Use masking tape and a pen to make a small label for each of the five crystals as shown.



2. Spread a little of each of the five crystals in their labeled areas on the black paper.
3. Use your thumb in the bowl of a plastic spoon to press down on each pile of crystals, as shown. Rock the spoon back and forth to help crush the crystals.
4. Listen to the sounds the crystals make as they break. Notice any difference in the way the crystals feel when they break. Compare the residue left behind on the black paper.

### 3. Have students share and interpret their results.

Have students record their ideas about the identity of the unknown on *Activity sheet 2.2—Crushing test*.

Ask the following questions:

- Can you single out any crystal that is definitely *not* the unknown?
- Are any crystals similar enough to the unknown that they might be the unknown?
- Do you have enough information from this crushing test to say that you definitely know the identity of the unknown?

***Expected results:*** Although students may have detected slight differences in the crystals during the crushing test, they probably cannot identify the unknown at this point.

Ask students whether comparing the sound, feel, or residue from each crystal is the best way to identify the unknown. Students should recognize that problems using a consistent amount of force to crush each crystal would make this test inconclusive. Students should conclude that they need more information to identify the unknown.