

Mix It Up! It's Refreshing

Topic: Matter	Overview: Students conduct simple experiments to learn more about solids, liquids, and gases.
Standards: K.1 a, b, c, g, j; K.2 a, b; K.5 a 1.1 a, d, f, g, h; 1.3 b, c 2.1 a, b, d, e; 2.3 a, b 3.1 a, c, h, j; 3.3 b, c 4.1 a, b, c, d 5.1 g, h; 5.4 a, b, c	Objective: The students will: <ul style="list-style-type: none">• Identify/classify examples of different states of matter• Conduct investigations in which dry ice is placed in water
Materials: Per student: <ul style="list-style-type: none">• clear cup• pitcher of juice or flavored drink mix — enough for the whole class• three or four small pieces of dry ice• spoon• plates	Cooperative Learning: Single Round Robin Think-Pair-Write

Content Information:

This investigation yields a high degree of student engagement and discussion. Guide students in the completion of the “**Mixing it Up: It’s Refreshing**” investigation. This activity will show students an example of how a solid (dry ice) transforms immediately into a gas as it is placed in the small cups of flavored drink mix. When dry ice warms up, it does not follow the typical steps of becoming a liquid and then a gas. Under normal atmospheric pressure, carbon dioxide goes straight from a solid state to a gaseous state. This process is called *sublimation* and will be illustrated in this activity. *Students should not be expected to master the term *sublimation* at this time. They will encounter this at the middle school level. The content focus at the second grade level is the identification of the various forms of matter and how temperature (heat energy) influences changes in states of matter. Dry Ice can be obtained for this activity at many of the local grocery stores for around \$2.00.

Safety Note: Dry ice can cause burns if it touches skin. Instruct the students never to let dry ice touch their bare skin, but always to use insulated gloves when handling dry ice. Please discuss this with students. Do not allow students to handle dry ice.

Dry ice can be kept for several hours in a closed cooler. To find dry ice in your area, look up “Dry Ice” in the Yellow Pages of the phone book.

Matter is everything around us that has mass and takes up space (volume). Matter can be described by its physical properties: color, size, shape, smell, feel, and sound. There are four states of matter: solid, liquid, gas, and plasma. In elementary school, the students are held responsible for solid, liquid, and gas.

- **Solid:** the state of matter in which the molecules are close together; it has a definite volume and shape.
- **Liquid:** the state of matter in which the molecules are further apart; it has a definite volume but takes on the shape of its container.
- **Gas:** the state of matter in which the molecules are very far apart; it takes on the volume and shape to fill its container.

Instructional Sequence:

Introduction:

1. If necessary, go through a review of the states of matter.
2. Ask the students to think of instances in which they have seen a material change from one state of matter to another. Good examples include water freezing or melting.
3. Remind the students that such changes often depend on temperature: if ice is heated, it becomes a liquid (water); if it is heated even more, it becomes a gas (water vapor, or steam).
4. Tell the class that in this experiment, they are going to get a chance to see a solid turn directly into a gas, a process called *sublimation*.

Procedure:

1. Pass out a cup of juice to each student. The cups should be no more than two-thirds full.
2. Tell students to take a small sip of their juice and record observations on the data sheet. *Safety: Remind students that they should never taste science materials without the direction of the teacher.*
3. Tell students to form a hypothesis. If dry ice is added to the drink, then...**SINGLE ROUND ROBIN:** Students should share their hypothesis with their teammates.
4. Add three or four small pieces of dry ice to each student's cup. Have students observe what is happening and record observations.
5. Once the bubbling has completely stopped, have the students stir the liquid, drink it, and enjoy! Ask: Is it any different from what you are used to?

Observations and Conclusions:

Lead a class discussion, using the following questions:

- What happened when the solid (dry ice) was dropped into the liquid (drink)? (The dry ice warmed up and became a gas. This gas, carbon dioxide, was seen in the form of bubbles.)
- How did the dry ice change the drink? (The drink became carbonated, like a soda. It also became cooler.)
- Name some other carbonated drinks. How are all these drinks similar? (All of them have gas bubbles in them – that is, all are mixtures of two states of matter.)

- Ask students, “Based on what you know about dry ice, can you explain the results of your experiment?”

Sample Assessment:

- **THINK-PAIR-WRITE:** Students **think** about the three parts of the conclusion and what they might write. They then **pair** to discuss it with their partners. Students **write** conclusion including three key parts:
 - Statement saying if the results support or do not support the hypothesis.
 - Summary of the results and data
 - Explanation of results

Extension:

- Allow students to experiment with other liquids, including carbonated beverages.