

Lesson Plan Format

Author: Louise Liable-Sands,
Andi Martin

Topic or Unit of Study: Dry Ice
Properties of Matter & Physical Changes Part 1

Grade/Level: 4th – 6th

Lesson Start and End Time: 45 minutes

Outcomes

Academic Standards:

PDE Standards:

3.2.4.A1

- Identify and classify objects based on measurable physical properties
- Compare and contrast solids, liquids, gases

3.2.6.A1

- Distinguish differences of properties in solids, liquids, gases
- Difference between volume and masses

Next Generation Science Standards:

5-PS1-3. Make observations and measurements to identify materials based on their properties.

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Objectives: SWBAT describe the properties of materials in a quick write by observing physical changes of several substances.

Instructional Materials: Be sure to name materials and resources so that they match your descriptions in the procedure of the Lesson Plan. List all websites or texts according to APA reference procedures.

Pre-Trip Information

- Three states of matter and their transitions
S \leftrightarrow L \leftrightarrow G, S \leftrightarrow G
- Review solid, liquid, and gas properties

Helpful Web Resources

3 States of Matter Rap – <https://www.youtube.com/watch?v=pag2zq-gE0E> (2:38 min)

3 States of Matter Song - <https://www.youtube.com/watch?v=fhhFwdJqvfw> (1:39 min)

Crash Course Kids (short science videos targeted for 5th grade)

- Homepage: <https://www.youtube.com/channel/UCONtPx56PSebXJOxbFv-2jQ>
- 16 videos on Physical Science: Properties of Matter
<https://www.youtube.com/playlist?list=PLhz12vamHOnaY7nvpgtQ0SIbuJdC4HA5O>

Teacher - What will the teacher need?

- 10 lbs ice cubes (get from 4th floor)
- 15 lbs dry ice (need to pick this up)
- Balloons

Student – What will each student or group of students need?

- Notebook
- Pen/Pencil
- Observation form

Procedures with Time Span

Introduction (time span – 15 minutes): Informing Students of objectives and rationale for the lesson, Gaining Attention, Activating Background Knowledge, Inquiry into the topic/concept.

Teacher pairs students up as they walk into the classroom. Students sit down as pairs.

Safety Talk

- **Safety glasses on at all times**
- Do not eat the ice
- Dry ice stays on the table

Introduce objectives and rationale.

Teacher Demonstration with Student Volunteers

Purpose: Engage students through kinesthetic learning and activate their prior knowledge.

States of Matter – Ask for student volunteers to act out the difference of the particle proximity in different states of matter: solids, liquids, and gases.

1. Solids – students stand close together with restricted movement (students link arms)
2. Liquid – students stand arm distance from one another, have more motion and can interact (students are not linked, have to push to move around)
3. Gas – students are far apart from one another (think down the hall, out of ear shot) and have free movement to roam (use 2 students – one person goes to the other side of the room) -- football field analogy for distance between gas particles

Discussion:

- Students act out what happens with the ice.
- What was the change of state that occurred?

Developmental Activities (time span – 25 minutes): Guided Practice, Checkpoints for Understanding, Independent Practice.

(Ice cube has already been on table and is melting.)

Ice Cube v. Dry Ice Demonstration

Purpose: Observe the different states of matter

1. Ice cubes
 - a. Start the ice cube melting on the table – one for each pair of students.
 - b. Over the course of time, watch the ice cubes become a puddle of water.
 - c. *Observe solid --> liquid*
 - d. Students write down observations (not conclusions) -- comment on shape, color, state/phase

2. Dry ice

- a. Put the dry ice plate on the table. Over the course of a few minutes, watch the dry ice disappear. (*The dry ice should give off what looks like steam as it sublimates. There may also be some water vapor that melts onto the table, and some that deposits on the surface of the dry ice pieces.*)
 - b. *Observe solid --> gas*
 - c. Students write down observations (not conclusions) -- comment on shape, color, state/phase
 - d. Put small pieces of dry ice in a balloon. As the dry ice sublimates, observe how the balloon expands (*since it is changing into a gas*)
- What happened inside of the balloon?
 - e. Pop the balloon – *and see that there is no liquid, sublimation from solid to gas, no liquid phase*
 - f. *Optional* – put ice cubes in a balloon and compare what happens to the balloon with the dry ice and the balloon with the ice cube

Closure/Summary (time span – 5 minutes): Making connections, Summarizing/Generalizing learning.

Teacher leads a discussion that summarizes particle proximity in solids, liquids and gases.

Wrap Up - Relate particle with macro

- What did you see?
- What happened?
- Why do we call it dry ice? (*There is no liquid phase, as the solid changes directly into a gas through sublimation.*)

Quick Write prompt

- Why is dry ice called dry ice?
- Describe two differences between ice cubes (solid water) and dry ice.

Assessment: Name the task used in your introduction, development or closure that documents student achievement of the LO.

- Quick Write – prompt: Why is dry ice called dry ice? Describe two differences between ice cubes (solid water) and dry ice.
- Observation form

Rating Scale: Rubric or other measure of student achievement of LO:

3 – Exemplary: The student clearly describes physical changes in both activities; the student is able to compare/contrast physical changes in ice cubes and dry ice articulately.

2 – Proficient: The student clearly describes physical changes in most of the activities, but more detail could enhance the students' explanations.

0-1 – Unacceptable: The student does not clearly describe physical changes in most of the activities; the task was not submitted.

Observation form

Student Name:

Activity #1: Ice Cubes	Activity #2: Dry Ice
Observations before melting: (<i>Think about color, state/phase</i>)	Observations before sublimation: (<i>Think about color, state/phase</i>)
Observations during/after melting: (<i>Think about color, state/phase</i>)	Observations during/after sublimation: (<i>Think about color, state/phase</i>)

Student Name:

Quick Write – Why is dry ice called dry ice?

Describe two differences between ice cubes (solid water) and dry ice.