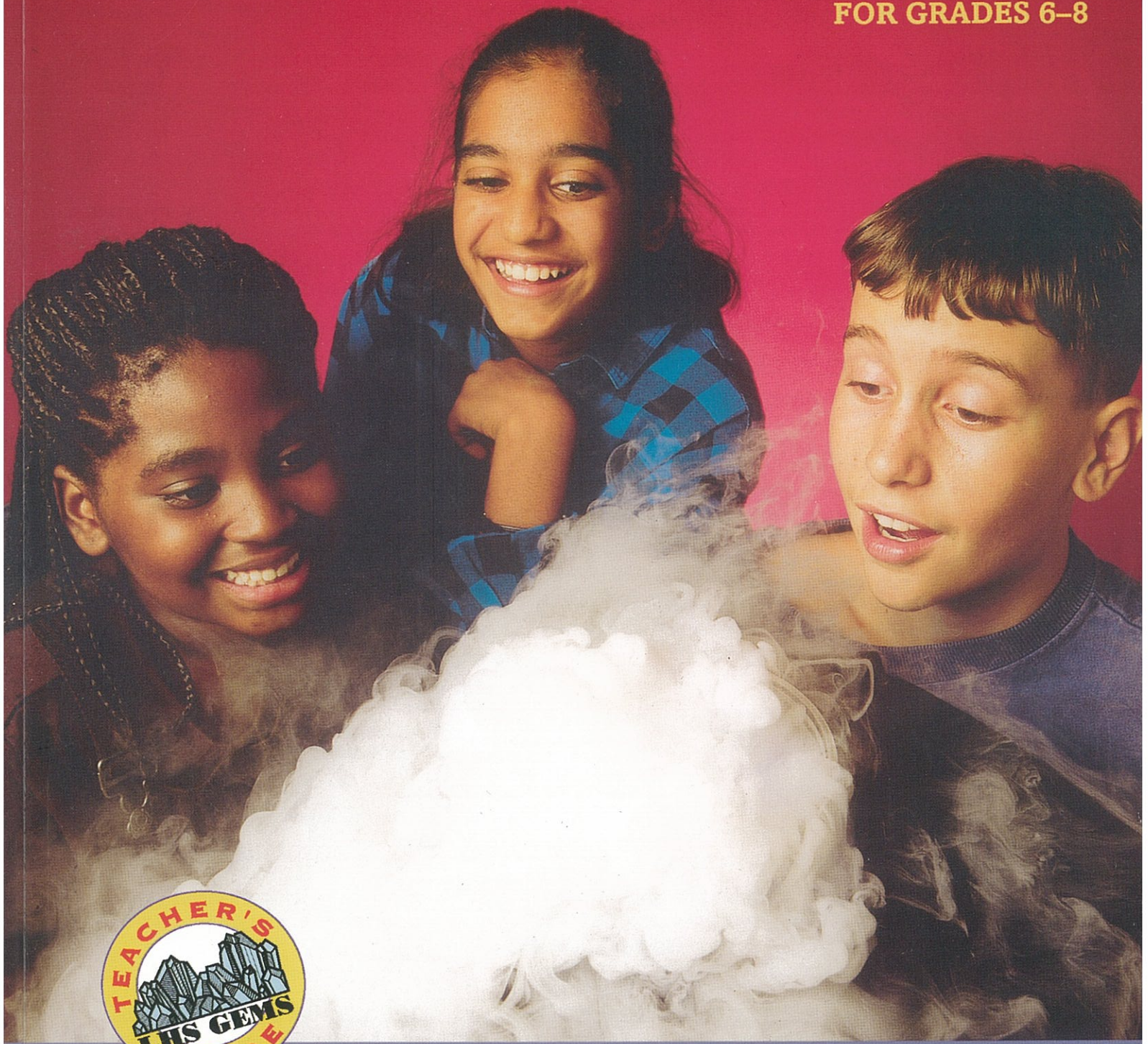
Dry Ice Investigations

FOR GRADES 6–8



TEACHER'S GUIDE

LHS GEMS

Lawrence Hall of Science • University of California at Berkeley

What You Need for the Whole Unit

The quantities below are based on a class size of 32 students. Depending on the number of students in your class, you may, of course, need different amounts of materials.

This list gives you a concise "shopping list" for the entire unit. Please refer to the "Getting Ready" sections for each activity. They contain more specific information about the materials needed for the class and for each team of students.

Non-Consumables

- ❑ a pencil, ruler, or other easily accessible object to model making observations
- ❑ a pair of plastic-handled adult scissors or another object to serve as the mystery object you describe to the class
- ❑ small insulated container for storing pulverized dry ice
- ❑ hammer
- ❑ 2 cloths (old T-shirts or T-shirt sized rags)
- ❑ 1 hot plate or electric skillet
- ❑ 1 extension cord (if needed for hot plate or overhead projector)
- ❑ 1 leather work glove (for the teacher to wear)
- ❑ 6–8 plastic cups with regular ice cube
- ❑ 6–8 plastic cups with dry ice
- ❑ 3 plastic Petri dishes (about 4" in diameter)
- ❑ a handful of BBs
- ❑ overhead projector
- ❑ 1 cold water dispenser, such as a dishtub or cooler (or access to a sink)
- ❑ 1 hot water dispenser (such as an electric coffee maker)
- ❑ 16 trays
- ❑ 12–16 tweezers
- ❑ 48–96 clear plastic cups
- ❑ 6–16 cups that will not melt with hot water in them (such as heavy plastic or styrofoam)
- ❑ 12–16 medicine droppers
- ❑ 12–24 plastic spoons (or 32 leather gloves)
- ❑ 12–16 small plastic flasks or vials (without lids)
- ❑ 12–16 pennies or other metal objects
- ❑ 1 high-sided transparent container, such as an empty aquarium or a large (5 gallon) heavy-duty glass cylindrical container

An overhead transparency of each of the following:

- ❑ Atoms in History (master on page 45)
- ❑ Molecular Diagram of a Solid (master on page 46)
- ❑ Energy and Matter Questionnaire (master on page 47)
- ❑ Phase Change Diagram A (master on page 72)
- ❑ Phase Change Diagram B (master on page 73)
- ❑ Planning Our Investigation (first page only; master on page 108)
- ❑ Sorting Questions 1 (master on page 112)
- ❑ Sorting Questions 2 (master on page 113)
- ❑ Question Strips (front side only; master on page 114)
- ❑ Investigation Rubric (master on page 126)

Optional:

- ❑ 1 flat piece of metal to place on top of a burner or skillet with high sides

Consumables

- ❑ ice cubes (one ice cube per team of 4–6 students)
- ❑ 1 or 2 blocks of dry ice (See "Obtaining and Maintaining Dry Ice" on page 7 for more information.)
- ❑ 1 box of ziplock sandwich bags
- ❑ 1 box of drinking straws
- ❑ 12–16 balloons (9" or 12" balloons both work well)
- ❑ 6–8 ziplock sandwich bags
- ❑ dishwashing soap
- ❑ cup with very small amount of bubble solution or diluted liquid dishwashing soap (approximately 2 tablespoons of soap in 1 cup of water)
- ❑ about 5 straws or a few bubble blowers
- ❑ matches
- ❑ a cup of hot water
- ❑ material needed for Activity 4, Session 3—as indicated by student groups

Copies of the following:

- ❑ 32 Scientific Journals (masters at back of guide)

or

32 each of the following student sheets:

- __ Notes from an Extraterrestrial (master on page 25)
- __ As if Seeing It for the First Time (master on page 34)
- __ Comparing Substances (master on page 35)
- __ Adding Energy (master on page 36)
- __ Energy and Matter Questionnaire (master on page 47)
- __ Dry Ice Explorations (master on pages 58–61)

__ Marge's Systematic Observation (master on page 71)
__ Mystery of the Floating Bubbles (master on page 80)
__ Marge's Experiment: Take 1 (master on page 90)
__ Marge's Experiment: Take 2 (master on page 91)
__ Materials List (master on page 120)
__ Our Dry Ice Investigation (master on pages 121–122)
__ Follow-Up Investigation (master on page 127)

and

16 each of the following student sheets:

__ Planning Our Investigation (master on pages 108–111)
__ Sorting Questions 1 (master on page 112)
__ Sorting Questions 2 (master on page 113)
__ the two-sided Question Strips (masters on pages 114–115)
__ Systematic Observation or Experiment? (master on page 116)

Optional:

- ❑ newspapers to cover work surface
- ❑ 6 Dry Ice Challenges (master on page 62)
- ❑ 32 copies each of Phase Change Diagrams A and B (masters on pages 72–73) for students to add to their Scientific Journals

General Supplies

- ❑ 32 pencils
- ❑ 7–8 pieces of butcher paper
- ❑ 1 marker
- ❑ masking tape
- ❑ glue
- ❑ an overhead pen
- ❑ 16 envelopes

Optional:

- ❑ 32 file folders for the Scientific Journal pages