

Solid, Liquid, Gas!

4th or 5th Grade

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Benchmarks:

(4th) SLC 11: B.) Students will distinguish between physical change, and chemical change, and changes that are chemical as well as physical.

(5th) SLC 8: Students will identify physical and chemical changes and compare their properties.

Objectives:

To teach students the definitions of solid, liquid, and gaseous objects and how to recognize these properties.

Materials:

- Ice cubes
- 1 mixing bowl
- 1 metal spoon
- 2 cups corn starch
- 1-cup water with a few drops of food coloring

Initial Demonstration:

Give each student a table with three columns (headings are: solids, liquids, gases). Give them 10 minutes to write down as many items under each heading as possible. After 10 minutes stop the class and ask them how they would describe a solid, liquid and a gas. Discuss the different definitions given until a class definition is decided on. Once the children have decided on a definition, ask them to write it down for later.

Ask the students to read out their lists under the gases column. Does everyone agree with the items listed? Do they all match the class definition? Discuss any substances that should be in a different column, or not in the lists at all. Students often list fire as a gas – discuss with the class if this is actually a gas or not. Allow students to add gases to their column that their classmates have come up with.

Repeat the process with the other column headings until all students are agreed on the lists produced. Students can then alter their tables to include extra items or change entries already included.

Target Observations:

- Some solids are tables, chairs, chalkboard, glass, plastic, paper, etc...
- Some liquids are water, pop, juice, milk, gasoline, etc...
- Some gases are cooking gas, air, oxygen, smoke, etc...

Target Model:

-Solids are things that are kind of hard.

-Liquids are things that are kind of gushy and pourable.

-Gases are things that are in the air.

Procedure:

Turn to the explanation page of the packet and have them read it out loud. Examine the pictures and review the concepts. Ask for any questions before letting them see what it all means.

Give each student an ice cube and a Dixie cup. Holding the ice cube talk about its solid characteristics. Make sure they drip the water into the cup. Refer back to the definitions of each state. Discuss the states as the ice cube turns to liquid, then as you boil all the collected liquid into a gas.

Target Observations:

- As the ice melts, it loses its shape but not its volume
- As the ice is boiled, it loses its shape and its volume

Target Model:

-A solid has a definite shape and a definite volume.

-A liquid has a definite volume but no definite shape.

-A gas has no definite shape or volume.

Procedure:

Split the class up into groups of four. Mix the following ingredients together.

- 1 mixing bowl
 - 1 metal spoon
 - 2 cups corn starch
 - 1-cup water with a few drops of food coloring
1. Mix ingredients in the bowl with the spoon until smooth.
 2. The magic matter should look like a liquid. Poke your finger in it in several places.
 3. Take a spoonful in your hand and roll it into a ball.
 4. Place it on a table. What does it do?
 5. Pick it up again and roll it into a ball: Keep it in your hand. What happens to it?

Results: When the ingredients are mixed together, the matter looks like a liquid. The matter rolls up into a solid, but when placed upon the table it forms into a liquid again. Why? Starch is a solid. Water is a liquid. The water and starch are a suspension known as a colloid. A colloid is a material that consists of one substance suspended within one another. The suspended material is comprised of particles so small that they don't sink to the bottom of the second substance. Together, the two materials display properties unlike those of their separate components. Matter exists in three states solids, liquids, and gases. However there are many materials that consist of one substance that doesn't conform to these neat designations, such as fog, protoplasm, homogenized milk, synthetic rubber, and mayonnaise, which are all colloids.

Ask the students what kind of properties it displays. Why they think it might act like a solid and a liquid?

Target Observations:

- When the matter is rolled up, it looks like a solid.
- When the matter is placed on the table, it behaves like a liquid.

Target Model:

- A solid has a definite shape and a definite volume.
- A liquid has a definite volume but no definite shape.
- A gas has no definite shape or volume.
- Some materials are neither a solid, liquid, or gas, but display properties of all three.*

Solids are objects that have a definite shape and definite volume.



Liquids have a definite volume, but take the shape of their container.



The liquid state

Compared to solids, liquids are free to move around at random but still touch.



Because the particles are still close, liquids have densities similar to solids.

Since they can move, liquids take on the shape of the container they are in.

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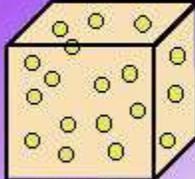
Gases can take the shape of any container and also fill any volume.



The gaseous state

In this state, the particles have sufficient energy to overcome all forces that attract them to each other.

Each particle is completely separated from the others.



This results in low densities and the fact that gases completely fill the container that holds them.

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Please read and answer all three questions.

1) Name one thing that is a solid. _____

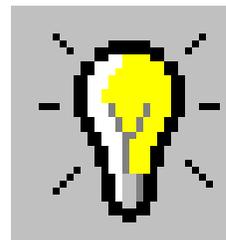
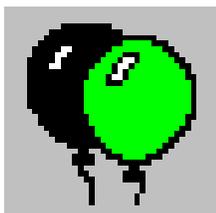
Why is it a solid?

2) Name one thing that is a liquid. _____

Why is it a liquid?

3) Name one thing that is a gas. _____

Why is it a gas?



Name:

Date:

Write down as many items under each topic as you can. Some items may be in more than one category.

Solid

Liquid

Gas