

Three States of Matter

Lesson Concept	Physical properties of matter can be observed on the macro and micro level. On the macro level solids keep their shape, liquids take the shape of their container, and gases expand to fill the container. On the micro level the spacing and movement of particles defines whether a substance is a <i>solid, liquid or gas.</i>
Link	In the previous lesson students learned about observable physical properties of matter.
Time	1 class period
Materials	<u>Whole class</u> 2 1-pound bags of split peas <u>Per Group (e.g., groups of 4, groups of 2)</u> Various objects in different states of matter (e.g., eraser, balloon filled with air, block, water with food coloring, juice) Glass Water Ice <u>Individual</u> States of Matter Placemat Glue Science notebook

Advance

Preparation 1. Gather materials and make a model of the States of Matter Placemat.

Procedure:

Engage (15 minutes) *On the macro level solids keep their shape, liquids take the shape of their container, and gases expand to fill the container.*

1. Distribute various objects, which are in different states of matter (e.g., eraser, balloon filled with air, block, water with food coloring, juice).
2. Have students sort the objects into three groups.
3. Have students discuss their rationale for sorting the objects.

4. Introduce the vocabulary of solid, liquid and gas if students have not already used the vocabulary.

Explore / Explain (15 minutes) On the micro level the spacing and movement of particles defines whether a substance is a solid, liquid or gas.

5. Have students use hand movements to model the movement of molecules in various states of matter. Have students: clasp their hands together to model the movement of molecules in a solid, slide their hands one over the other to model movement of molecules in a liquid, and move their hands over their heads to model movement of molecules in a gas.
6. Section off a part of the room and have students enter the space as molecules. At first model a gas by having very few students in the space. These students can move freely and quickly. Next, model a liquid by adding more students and have them move about, now more slowly but still fluidly. Finally, send in many more students, resulting in a very impacted space, which doesn't allow movement (a solid). One could also do this activity in reverse. Moving from very dense to less dense.
7. Introduce students to the States of Matter Placemat (See: States of Matter Placemat). Explain to students that the model demonstrates the way particles (molecules) are arranged in solids, liquids, and gases that give each state of matter its properties.
8. Once students have been shown the spatial distance between particles, ask students why the state of matter will affect its movement and characteristics. Encourage students to think about how easily it is to move when they are: 1.) crowded into a space or 2.) in an open space.
9. Distribute "placemat" on which split peas will be glued to illustrate the molecules of liquids, gases and solids.
10. Use a document camera/overhead transparency to demonstrate what the final product will be.

Extend (15-20 min.) On the micro level the spacing and movement of particles defines whether a substance is a solid, liquid or gas.

11. Display glass of water with ice in it. Have students draw what the molecules look like in the water and in the ice cubes. *Discuss whether the molecules of water or ice are packed more closely. How can you tell?
12. Left hand page of science journal: "Missing Poster Activity " Students design posters for solid, liquid, gas and identify characteristics of each for their poster
 - a. Example: Wanted-Liquid: Identifying Characteristics: Takes the shape of any container, molecules easily slip past each other, Warning! If heated it may evaporate, often found in a variety of examples, sea-water, lemonade, and tea. Students may illustrate a variety of examples, i.e., cup of coffee, bottle of olive oil.

Evaluate (15 minutes)

13. Have students write a response to the following questions in their notebooks: How are solids, liquids, and gases different from each other? Expected student response: Solids keep their shape, liquids take the shape of their container, and gases expand to fill the container. The spacing and movement of particles defines whether a substance is a solid, liquid, or gas.