

A State Debate

Although the three states of matter are solid, liquid, and gas, not all substances seem to fit perfectly into one of these groups.

Take a look at the substance below and see if you can decide whether it should be called a solid, liquid, gas, or something in between.

What you'll need

- shaving cream
- paper towel
- penny
- magnifying glass (optional)

Be safe

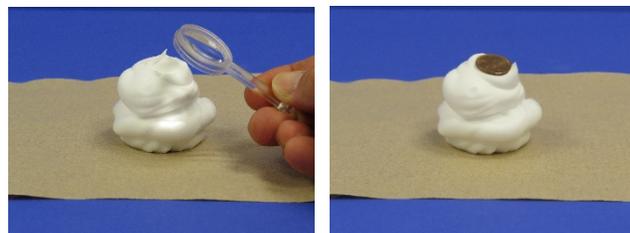
The materials in this activity are not hazardous. Always work with an adult to supervise and guide you.

Here's what to do

1. Place a small mound of shaving cream on a paper towel. Look at the shaving cream. Would you call it a solid, liquid, or a gas? Why?

One characteristic of a solid is that it keeps its shape without being in a container. Does this make the shaving cream a solid? Why or why not?

2. Shaving cream is very light. Look at it very closely or use a magnifying glass if you have one. What do you think makes it so light? Does this make you change your opinion about whether it is a solid, a liquid, or a gas?



3. Very gently place a penny on top of the shaving cream. What do you observe? Does the shaving cream act most like a solid, liquid, or gas?
4. Rub a little shaving cream between your thumb and index finger. Does it feel like a solid, liquid, or gas?
5. Leave the shaving cream blob out overnight. Look at it very closely the next day. How has it changed? Leave it for a few more days. Has its state changed?



What to expect

The mound of shaving cream keeps its shape even though it is not in a container. If you look at it very closely with a magnifying glass, you can see that it is filled with tiny bubbles. When you feel it between your fingers it feels like a slippery liquid. After leaving the shaving cream out overnight, most of the liquid evaporates and wispy thin threads of solid soap remain.

What's happening in there?

It's not always so easy to say definitely that a substance is a solid, liquid, or gas. Shaving cream seems to have an unusual state because it is a liquid soap with a lot of gas bubbles mixed in it. The gas makes it so thick and frothy that it keeps its shape and supports light objects like a solid would.

What else could you try?

Here's another substance that has qualities of a liquid and a solid depending on how you use it.

What you'll need

- Corn starch
- Water
- Cup
- Tablespoon
- Popsicle stick

Be safe

Be sure to review the safety instructions on page 1 before proceeding.

Here's what to do

1. Place 2 tablespoons of corn starch and 1 tablespoon of water in a cup.
2. Slowly mix with a popsicle stick. If the mixture is too difficult to stir and mix, add a little more water until you can stir the mixture when moving the popsicle stick slowly.



What do you notice about the mixture if you stir slowly or if you stir quickly?

Try poking the mixture quickly with the popsicle stick and then slowly. Do you notice a difference in how the mixture feels?

What to expect

When you stir quickly or poke the mixture with more force, it feels harder and acts more like a solid. When you stir slowly or poke the mixture with less force, it is easier to move and acts more like a liquid.

What's happening in there?

The cornstarch particles do not dissolve, but are suspended in the water. When the mixture is stirred or hit, the particles push together and make the liquid harder to move through. When the mixture is stirred slowly or hit more lightly, the particles have time to shift positions and move out of the way. This makes the mixture feel more like a regular liquid.