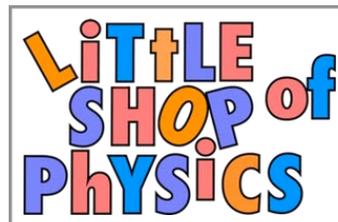


States of Matter

An overview of the activities in the kit



What are the states of matter?

In the kit, we give kids a chance to work with different states of matter, solid, liquid and gas. We'll keep the atomic model in mind, thinking about what the atoms (or molecules) are up to.

Building Blocks: Making Matter Atom by Atom



Overview

In the kit, we give you a model of sodium chloride—table salt. In a solid, the atoms or molecules are joined together in a regular way, and this leads to certain characteristics: A solid isn't easily deformed, and the arrangement of the atoms can lead to ordering on a larger scale.

Seeing Structure in Solids

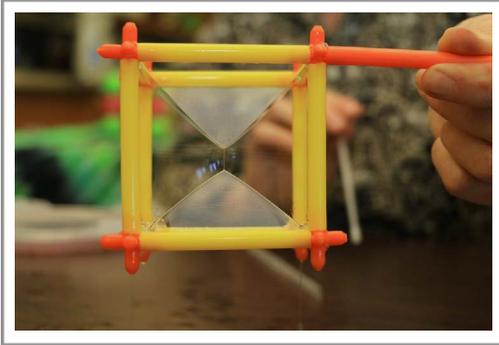


Overview

The basic arrangement of atoms in salt is a *cubic lattice*, as the above model makes clear. When you look at crystals of salt, this structure shows on a larger scale—the grains are usually cubes.

You can also look at sand and other solids. For crystalline solids like salt, sugar and many types of sand, you'll see evidence of the atomic-level ordering on a larger scale.

What Can Bubbles Teach Us About Liquids?



Overview

The structure of a bubble is really due to the properties of water. Water flows, but the molecules are sticky, and they like to be together. This leads to surface tension effects that lead to some dramatic consequences. Square bubbles? Oh, yeah.

Does Air Weigh Anything?



Overview

All matter is made of molecules, and so it has mass. It's hard to imagine, but it's easy to measure with an accurate balance. Pump some air into a bottle, and measure it on the scale!

How Can You Feel the Weight of the Air?



Overview

If you have a large enough container of air, the mass of the air is actually big enough to sense. If you play catch with a giant beach ball, you'll feel the weight of the air in a direct and dramatic fashion!

Changing Phase

Once we know about phases of matter, we can talk about phase changes—solid to liquid (melting), liquid to gas (evaporation).... Each of these involves energy; it takes energy to pull molecules apart, and you can get energy back if they come back together.

Be the Molecule



Overview

What are the molecules doing when you go from a solid to a liquid? A liquid to a gas? This kinesthetic activity will let your students explore these concepts in a memorable fashion.

Solid to Liquid: Melting Water



Overview

Ice on a hot plate changes from solid to liquid, and you can watch the change as it happens. But be quick! It doesn't take long. If you keep watching, you'll see the liquid water turn to gas as well.

Solid to Liquid: Melting Metal



Overview

Gallium metal melts at about 30°C , which is about the temperature of your skin. It will melt in your hand! Let your students see it before and after the change. And then let it go back. Very dramatic!

Liquid to Solid: Heat Packs



Overview

When liquids freeze, energy is released. These heat packs contain a supercooled liquid so that you can feel the heat released. The liquid actually warms up on freezing!

Liquid to Gas: Palm Glass



Overview

The palm glass has liquid and vapor in it, and nothing else. When you warm the liquid, you can see it change to a gas by the increased pressure of the gas.

Gas to Liquid: "Sweating" Glass



Overview

The glass isn't actually sweating... There is water vapor from the air condensing on the outside of the glass.

Sheila says that this works well with a margarita.

Updates

We regularly update the detailed documents for the activities described above. You can get updated versions at the Little Shop web site:

<http://littleshop.physics.colostate.edu/matter>