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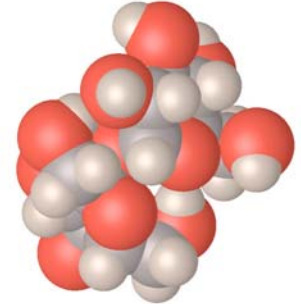
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CoolScience

Boiling **COLD**?? Freezing **HOT**?? **CoolScience** can really **heat** stuff up! Here's what probably happened today.

We played with *stuff*. Liquid stuff, solid stuff, even stuff in the air. All stuff is made out of *really, really, really* tiny bits called **molecules**. Those molecules usually stick together like puzzle pieces, to make up the stuff around us. Even if something looks big and solid, it's really just lots of molecules stuck together. You are made up of a few billion, billion, billion of them!



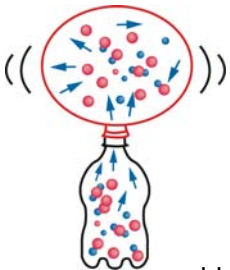
Molecules are always shaking around. When things feel **cold**, it's because their molecules are **shaking slowly**. When we say stuff gets "**hotter**" it means its molecules start **moving faster**. And faster! And *faster!* Remember when we held hands and started moving around? It got hard to hold hands as we moved faster. If a molecule shakes hard enough, it can break away from the others. This is how things **melt** or evaporate or **boil**. Some molecules stick to each other very tightly, like water. Some don't. **Water** needs to take in a lot of heat to **evaporate** or **boil**, but **nitrogen** molecules break away easily and fly through the air by themselves, rarely sticking together. In fact, to get nitrogen to stick together in the air, the molecules would have to be so slow that it would read -320°F (-196°C) on a thermometer. It would probably **freeze** the thermometer!

Using a fancy **insulating** thermos called a *Dewar*, we brought **cold**, slow nitrogen molecules to stick together as a liquid. They were so **cold** that they **froze** a banana hard enough to hammer a nail into a board! But those nitrogen molecules were so easy to break apart that if any spilled on the ground, they instantly boiled and flew away into the air, leaving a dry (but **cold**) ground behind.



This is how we **cooled** down our ice cream! We poured liquid nitrogen right into the ice cream mix. The nitrogen molecules **warmed** up and started bouncing around, taking the **heat** from the milk and cream. *The nitrogen flew away into the air, taking the heat with it.*

Wait a second! That sounds familiar: liquid disappearing into the air, taking heat away and **cooling** things down. That sounds like...**sweating!** We sweat to **cool** off. As we dry off, water takes our **heat** away into the air. It's the same thing! The ice cream **froze** by "sweating" nitrogen!



There were a lot of other **cool** things you did by speeding up or slowing down molecules. We put some nitrogen in a bottle and saw the molecules go bouncing around in a balloon. The molecules flew around and bumped into the walls of the balloon, **stretching** out the balloon. Those molecules sure spread out a lot! A few drops of liquid could fill a huge balloon, and even make it **pop!**

In the other direction, we **cooled** down balloons and did a "magic trick" of packing tons of balloons into a tiny bucket. What a great way to pack for vacation! The molecules slowed down, and the balloons shrank with all the air still inside! Do you remember what happened when we blew on them with our **warm** breath? The molecules sped up, started bumping into the rubber of the balloon again, and the balloon expanded to its original size! Try putting your own balloon in the freezer, and see what happens.

BONUS RECIPE: Slow down YOUR OWN ice cream molecules, using the recipe on the back of this sheet!



RECIPE: Slow down YOUR OWN ice cream molecules!

Materials Needed:

- 1/2 cup half-and-half or 1/4 cup milk and 1/4 cup cream
- 1/2 teaspoon vanilla or chocolate syrup to taste
- 1 or 2 tablespoons sugar
- 1-quart Zip-Lock™ bag (use good quality bags so the salt can't leak in)
- 1 gallon Zip-Lock™ bag
- 4 cups crushed ice
- 4 tablespoons salt
- winter gloves



Directions:

1. Put the following ingredients into a 1-quart zip-lock bag and seal it: 1/2 cup half-and-half, 1/2 teaspoon vanilla or chocolate syrup and 1 tablespoon sugar.
2. Put the following ingredients into a 1-gallon zip-lock bag: 4 cups crushed ice and 4 tablespoons salt.
3. Put the little bag in the big bag, and start squishing it around, until the ice cream in the little bag is frozen.



Suggestion: wear winter gloves so only the ice cream freezes.

For more detailed instructions, and to find out more about molecules, visit www.wondergy.com, and call or email us with questions, or to bring WONDERGY to your school or party!



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