

# INSTANT FREEZE WATER

**Also known as 'Bottle Slam'**

# Our experiment

Our experiment is under the category Energy. It explains what happens when molecules are heated and cooled.

## YOU WILL NEED

-ice

-Sparkling water

-rock salt

# WHAT TO DO

1. Take the water bottle and put it in a bowl of ice. Make sure the ice covers as much of the bottle as possible.
2. Take your rock salt and sprinkle it on top of the ice.
3. Put a thermometer in the bowl and wait until it shows  $-7^{\circ}\text{C}$ .
4. Take the bottle out and slam it off the table.
5. Finally step back and watch the magic happen!



## HOW DOES IT WORK?

We used the salt and ice to drop the mixture below the normal freeze point.

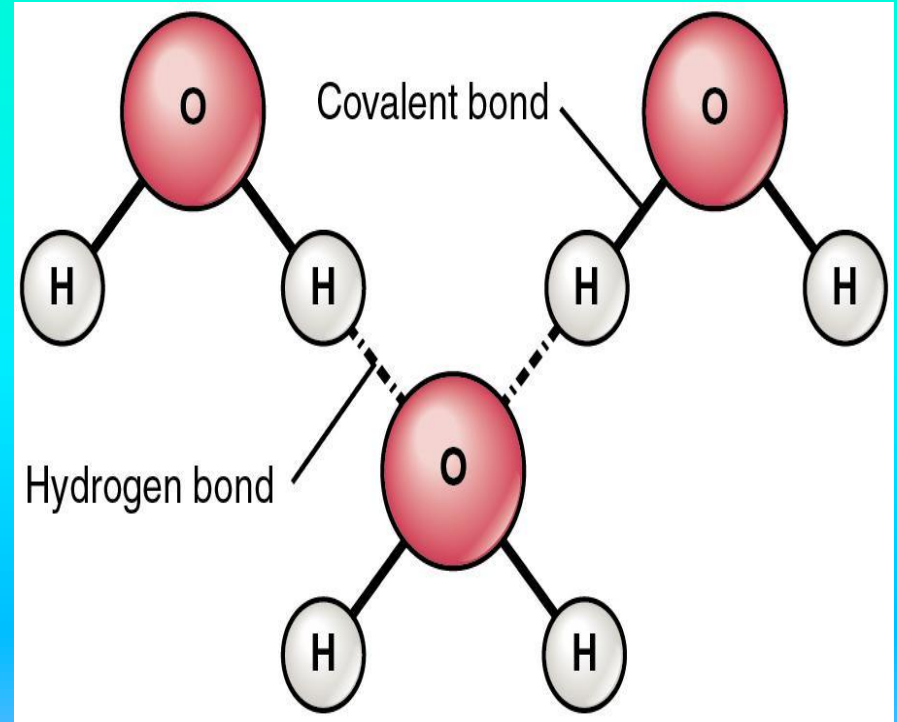
This is called “freezing point depression”.

This cold water can then be used to cool other water or soda samples below the freeze point.

That can be used to see which one can be supercooled.

# HOW DOES IT WORK?

When the water freezes, the molecules come together in an orderly way and they form a crystalline structure. As a result of this the frozen water molecules have less energy than water molecules as liquid. This means that in order to change the water from a liquid to a solid, the molecules have to lose heat energy.

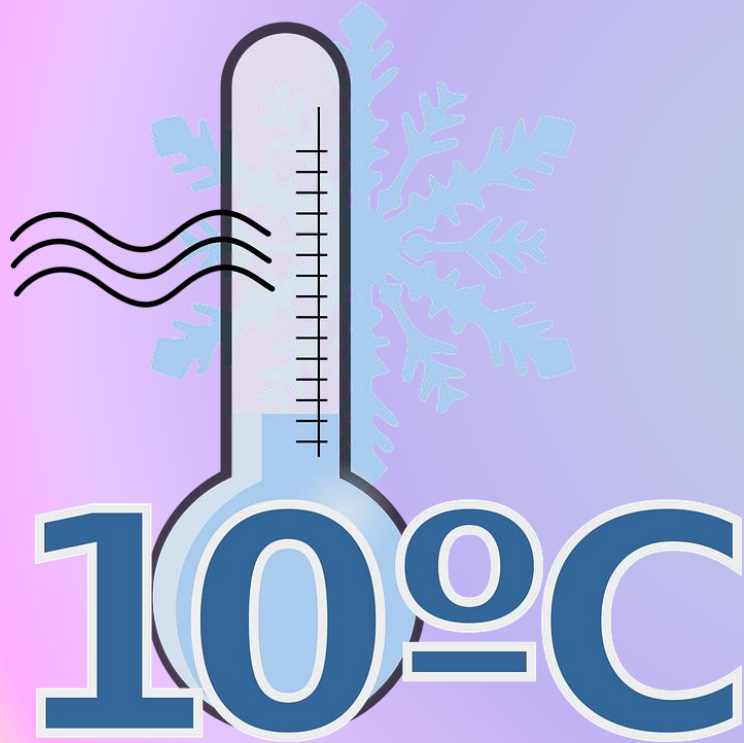


# HOW DOES IT WORK?

This heating may allow only ten or twenty percent of the water to freeze and because of that there is slush in the bottle and not a big solid chunk. The ice crystals form very quickly but the heat flows slowly through the water.



# HOW DOES IT WORK?



When you cool water to its freezing point, ice crystals can begin to collect in the water.

Just like snowflakes, these crystals need something to grow on and they use microscopic impurities in the water to do just that.

If you work with really pure water and cool it slowly to produce supercool water as a liquid, there will be a different outcome.



# HOW DOES IT WORK?

When you supercool soda water, there are some other factors to consider. When soda water is produced large quantities of additives (sugar, colors and flavorings) as well as CO<sub>2</sub> are pumped into water.

These additives are called solutes, when solutes are added to liquids like water, the freezing point drops.

By lowering the freezing point of the soda, it now must reach a much colder temperature than water to freeze.

# HOW DOES IT WORK?

The carbon dioxide in the soda is maintained only if the bottle is sealed. When the bottle is opened and you hear the sound of gas and foam rushing out of the bottle, the concentration of solutes in the water quickly goes down. The freezing point goes up and without those solutes, the soda freezes really quickly.



# HOW DOES IT WORK?

Of course, all those bubbles provide places for the ice crystals to begin forming. You can test this by tapping a supercooled bottle of soda without opening it. Bubbles will form after the tap and freezing will likely occur.



# THANK YOU FOR YOUR TIME!

And we hope you enjoyed our experiment

By Delia and Sean

This is the video showing how to do it.

<https://youtu.be/JEWQRJ49CPo?t=32>