

## Activity: Instant Freeze

On SCOPE's Things that.. are cold episode, you saw Julia instantly freeze a bottle of soft drink. Here's how she did it:



### What you need:

Large bucket full of ice

Rock salt

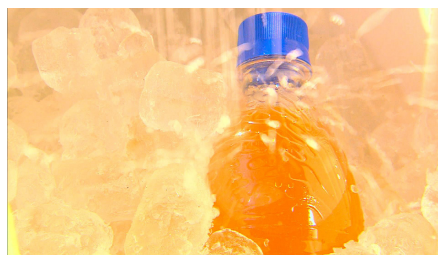
Thermometer (make sure it can go down to  $-8^{\circ}\text{C}$ )

Your favourite soft drink in a plastic bottle

Stopwatch

### What to do:

1. Bury the bottle of soft drink in the bucket of ice.
2. Sprinkle a layer of rock salt over the ice.
3. Use the thermometer to check when the temperature in the bucket is  $-8^{\circ}\text{C}$ .
4. When it reaches  $-8^{\circ}\text{C}$ , start the stop watch and leave the soft drink in the bucket for another 10 minutes.
5. After 10 minutes, take out the soft drink bottle. You will notice that the soft drink is still in liquid form.
6. Open the bottle and watch the liquid instantly freeze!



### What's happening?

What you are doing is super-cooling the soft drink, or in other words, making it colder than its freezing point. Normally, water freezes at  $0^{\circ}\text{C}$ , but salt lowers the freezing point of water. So, by sprinkling the rock salt in the ice bath, the temperature decreased to around  $-8^{\circ}\text{C}$ .

In a similar way, the solutes that are added to the soft drink ensured it did not freeze in the ice bath. When the bottle was opened though, the carbon dioxide bubbles rushed out, and without the dissolved carbon dioxide, the liquid instantly froze!

The bubbles rushing out of the bottle had another effect. At  $-8^{\circ}\text{C}$  the super-cooled soft drink was ready to freeze, and the bubbles created from opening the bottle provided a surface for ice crystals to begin forming or "nucleating".

This experiment is a bit tricky, so you might have to do it a couple of times before it works, but when it does, you will be amazed!