



# A Salty Solution



## Consider This!

Why do road crews put salt on roads in the winter to keep them safe?

The answer to the above question can be answered by studying how ice cream is made. How great is that? Follow the directions below to begin your study.

### Container 1: One coffee creamer per student

Find the mass of each coffee creamer and record in your notes.

1. Place 50 grams of table salt in the bottom of a small plastic container that has a lid.
2. Place your coffee creams in the container (no more than 4 per container).
3. Fill the rest of the container with ice and then add 30 ml of water. Seal the lid tightly.
4. Shake the container for 5-7 minutes.
5. Open the container and take the temperature of the water and ice solution. Find the new mass of your coffee creamer after you pat it dry. in your notes.
6. Open the coffee creamers and inspect. Record your observations in your notes.

### Container 2: One coffee creamer total

Find the mass of each coffee creamer and record in your notes.

1. Place just one coffee creamer into the container.
2. Fill the rest of the container with ice and then add 30 ml of water. Seal the lid tightly.
3. Shake the container for 5-7 minutes.
4. Open the container and take the temperature of the water and ice solution. Record in your notes.
5. Open the coffee creamers and inspect. Find the new mass of your coffee creamer after you pat it dry. Record your observations in your notes.

**Why do you think the coffee creamers in the two containers reacted so differently?**

### **Class Discussion Time!**

Your teacher will hold a class discussion to see if you can figure out how ice cream is made using this process. Listen carefully and participate! There is a lot of science going on here!

### **Reconsider This!**

**Now that you have experienced the science behind making ice cream, Reconsider why we put salt on roads in the winter? What science is involved?**

### **Design It!**

**Using what you learned in this lab, design an idea that would chill a warm can or bottle of soda as quick as possible. Explain your design here.**

# Teacher Notes

## Materials for a class of 30

16 containers with lids	38 coffee Creamers
Table Salt	Ice
Thermometers	Scale

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# Class Discussion

There are several areas of science that can be discussed during this lab. Try to have the students make sense of what is happening before giving them any of this information. Research shows that the students will remember more if they had to figure at least some of it out on their own before being given the information.

## Law of Conservation of Mass

Students should be familiar with the Law of Conservation of Mass starting in 5th grade. The students should find the mass of the coffee creamer before and after the physical change and determine that they are the same. Because this is a closed system there was no loss or gain of particles during the change and therefore no change of mass. Make sure the coffee creamers is pat dry at the end though to avoid the appearance of added mass.

## Freezing Point Depression

The point in having one container with no salt is to show that no the coffee creamer will not freeze in the presence of ice alone. Ice takes energy from its surroundings when it melts. However, a melting ice and water solution will never get below the freezing point of water: 32 F or 0 C. Coffee creamers have a freezing point below water's freezing point so no matter how much ice you use the creamers will never freeze.

When salt is added to the solution the freezing/melting point drops. Depending on how much salt is used the freezing point can drop into the low 20s F. This is under the freezing point of the creamers so the creamers can now freeze. As the ice melts, energy is taken away from the water and coffee creamer.

## Salting Roads

When water on the roads gets to 32 F or 0 C it changes states and freezes creating hazardous road conditions.

When salt is added to the road it mixes with the ice and water and significantly lowers the freezing point of that solution. This means that it has to get much colder before that water freezes on the road.

If it is really cold outside the road crews can add additional chemicals to the road that will lower the freezing point even more. Once the temperatures get into the single digits though then few chemicals will keep the road safe.

