

# Making Frost

## By melting ice!



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### How can you make frost by melting ice?

1. Fill an aluminum can or tray with ice cubes.
2. Wait for the ice cubes to melt a little bit.
3. Add 2 table spoons of salt to the ice/water mixture.
4. Mix the salt/icewater mixture.
5. Let sit for about a half hour.
6. After the half hour, look at the outside of the aluminum container.
7. What do you see?

## How does it work? – Melting Point Depression

You need to know some facts about what's going on *inside the container* and some facts about what's going on *outside of the container*. And, you need to know some facts about the container itself.

### The container

1. Is made from aluminum.
2. Aluminum is an excellent temperature conductor.
3. In a short amount of time, the aluminum container's temperature will be the same as whatever is inside of it.
4. Conduction is for a later unit.

### Inside the container

1. Salt (Sodium Chloride – NaCl) dissolves into ions in water. The ions here are the elements, Sodium and Chlorine.
2. When liquid water falls below 0°C (32 °F), it changes state to solid ice. This is the melting point
3. These ions get in the way of ice forming bonds until the temperature is as low as -9 °C (15 °F). So the salty ice water cannot freeze!
4. Also, the salty ice water solution uses heat from the ice to break down the ice bond structure in the ice, melting it!
5. The temperature of the water and container falls below 0°C (32 °F). This is called melting point depression.

### Outside the container

1. The air around the container has humidity. That means tiny drops of water are in the air.
2. The temperature of the air touching the container falls below 0°C (32 °F).
3. The water in the air freezes and becomes ice on the container.
4. There is no salt in the water that freezes on the outside of the container.
5. Frost!



### Melting point depression questions

1. Where did the frost on the outside of the aluminum come from?
2. How could you use melting point depression to prepare a tasty treat?
3. Why do you need a little bit of liquid water to melt the rest of the snow?
4. What would melt if the temperature outside was lower than the melting point depression temperature?

שולחן ערוך, אורח חיים ש"כ, ט  
ט השלג והברד, אין מרסקין אותם, דהינו לשברם לחתיכות דקות כדי שיזובו (יב) מימיו, אבל נותן הוא לתוך כוס של  
יין או מים והוא נמוח מאליו ואינו חושש;

**Shulchan Aruch, Orach Chaim, 320:9**

Snow and hail may not be crushed on Shabbat for the purpose of melting it. But you may place them into water so that they automatically melt.

