

**TITLE:** The effect of salt on ice

**AIM:** Find out why salt is put on roads during winter.

**HYPOTHESIS:** If salt is put onto ice, then the ice will melt faster because the ice will lower the freezing point of the water which means the water will freeze at a lower temperature and will eventually cause the water to melt if the temperature outside is going to stay consistent.

**VARIABLES**

Independent variable	Dependent variable	Controlled variable(s)
The concentration of salt	The temperature of the ice	-Size of test tube -Room temperature -Time used to measure rate

**MATERIALS:** Scale (digital), 2 test tubes, 20 grams of ice, 0.2 grams of salt, thermometer, test tube rack, mixing spoon, 2 50ml beakers, one container, timer(phone), Spark

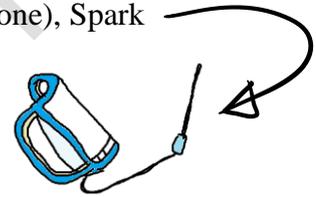
**\*Margin of error (Uncertainty)**

Digital scale=  $\pm 0.05g$

Thermometer= $\pm 0.5^{\circ}C$

Spark= $\pm 0.05^{\circ}C$

Timer= $\pm 0.005seconds$



**METHOD:** 1) Wear safety glasses and the robe.

2) Get two test tubes and a thermometer and put it on the table.

3) Put the salt container on the scale and set it as zero.

4) Bring the salt container with you and measure 0.2 grams of salt.

5) Put the 50ml beaker on the scale and set it as zero.

6) Crush the ice and put it in the containers

7) Measure them until each one is 10 grams

8) Get a spark thermometer

9) Put the test tubes on the rack and put the ice in the tubes.

10) Put salt in one of the tubes and mix them well.

11) Put both the thermometers in each glass (spark on the one with salt) and start timing with the phone.

12) Turn on the spark as starting the timer.

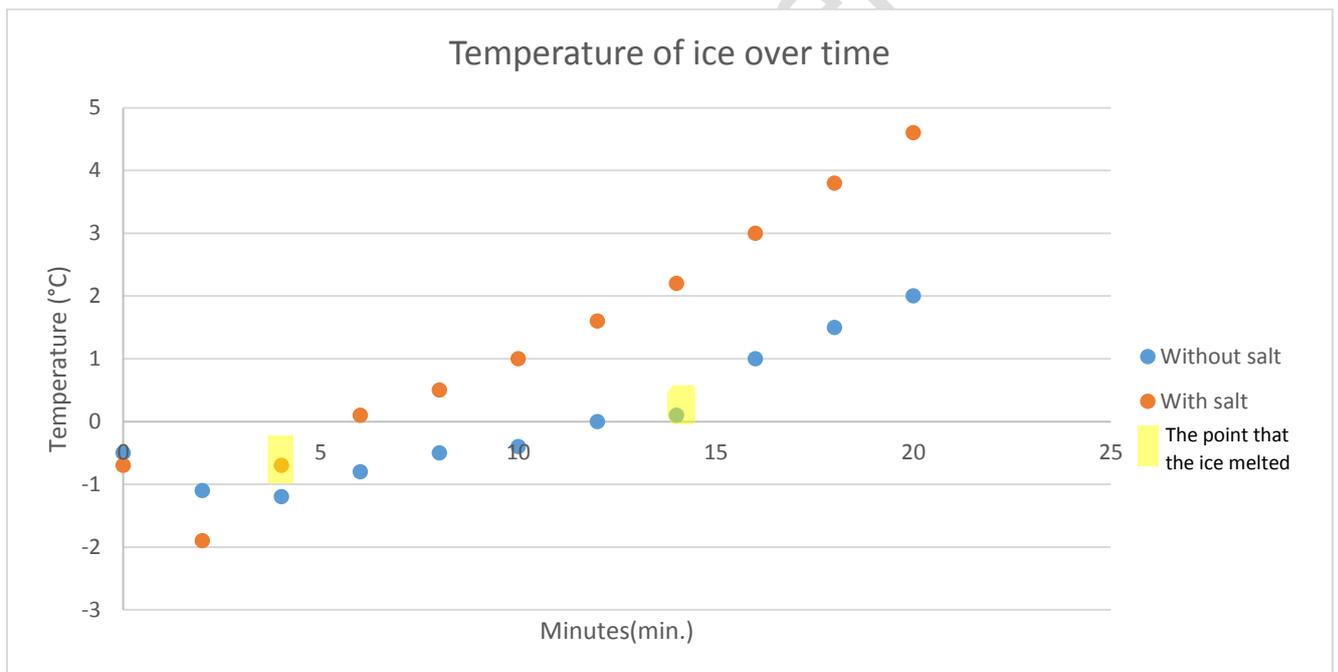
13) Record both the temperatures of the ice every 2 minutes.

## RESULTS:

### Temperature of ice over time

Minutes(min)	Temperature of test tube with salt (°C)	Temperature of test tube without salt (°C)
0	-0.7	-0.5
2	-1.9	-1.1
4	-0.7	-1.2
6	0.1	-0.8
8	0.5	-0.5
10	1.0	-0.5
12	1.6	0
14	2.2	0.1
16	3.0	1
18	3.8	1.5
20	4.6	2

### Analysis:



## **Conclusion:**

At the start, the ice was mostly frozen and solid. However, as time went, both ice melted, but in a different matter. The ice with salt melted faster, which was predicted in the hypothesis. This is because salt lowers the freezing point of water (which is normally  $0^{\circ}\text{C}$ ). This means that the ice usually freezes below  $0^{\circ}\text{C}$ , but as the freezing point lowers, it means that the water will freeze at a lower temperature, which causes the ice to eventually melt even if it is in the same temperature of what it was when it is frozen. The water can still be frozen, but it will only freeze at a lower temperature than what water usually freezes at. The data indicates that the ice with salt melted at a much lower temperature, which is  $-0.7^{\circ}\text{C}$  (and is below normal ice freezing level), and the ice without salt melted at  $0.1^{\circ}\text{C}$  which is above freezing level.

However, at the beginning, the sudden down in the temperature (which the temperature went down until  $-1.9^{\circ}\text{C}$ ) of the ice with salt was not predicted, and this is because as the ice turns into water, the salt mixes with the water. In order for salt to mix with water, it needs energy, so the salt absorbs heat energy from the water and decreases the temperature of water. So, the reason for putting salt on roads in winter is not only because salt mixes with the snow and prevents ice from freezing, but also because salt will melt the ice by lower its freezing point.

As time elapsed, the ice which had no salt stayed stable and consistent, even if it was melting bit by bit, but the ice with salt had an increase and decrease in temperature very rapidly and melted faster as well. The graph for ice shows an uphill, which indicates that there is a small change in temperature, but the graph for ice with salt is very steep especially between 16 minutes to 20 minutes and has many little bumps which means that it is less consistent than the graph for only ice and also that a huge change happened in a short period of time, which would be the temperature of the ice.

## **EVALUATION:**

The main inaccuracy is that the ice were kind of starting to melt when the experiment was conducted, and there would be a more accurate data if the ice was more frozen still. Also, because the analog thermometer needed some time to adjust when it was put in, the information in the beginning are a little inaccurate. There also were different sizes of beakers, which could also affect the measuring since there were many people on the scales.

Many of the data would be accurate, but if it is conducted again, the results would possibly be quite different (but would have a similar pattern) because the controlled variables such as room temperatures would be different than the environment the experiment was done in previously. If the controlled variables were to be the same and the same conditions as how the experiments were done the first time, the result would be similar to the results that were gotten this time.

Next time the experiment is to be conducted, it would be beneficial if there would be specific timings of when to put the salt in, and when to put the thermometers in because that would also change the results. The amount of salt should be increased as well, because then it will show more significant data of the ice melting. However, all the other processes went well and enough data to process were made.

## SOURCES CITED:

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