

Winter advisory lab: The effect of salt on the freezing point of water

Name _____ Period ___ Date _____

Purpose: To investigate how salt affects the freezing point of water and how it can be used by road crews to keep the roads safe for drivers.

Materials needed:

Salt – Sodium Chloride (NaCl)

2 Beakers

2 Thermometers

Ice

Teaspoon (scoop)

Stirring Rod (spoon)

Cold Water

Timer (clock)

Safety Check: Goggles Required!

Lab directions:

Important: As you conduct the experiment, DO NOT TOUCH THE SIDES OF THE BEAKERS.

1. Fill two beakers half-way with cold water. Label one beaker “A” (the variable beaker) and the other “B” (the control beaker).
2. Add ice to the cold water in both beakers, filling them to the top.
3. Record the temperature of each beaker and the time on the lab worksheet.
4. Predict what will happen as salt is added: Will the temperature of the water rise or fall as more salt is added?
5. Add 1 teaspoon of salt to beaker A and stir. After 3 minutes record the temperature of each beaker.
6. Add another teaspoon of salt to beaker A and stir. Record the temperature.
7. Continue to add salt to beaker A every 3 minutes for up to 15 minutes, stirring constantly.
8. Record the final temperature readings for each beaker. Create a line graph to plot the change in temperature over time.

Data:

Time (Minutes)	Temperature/ Beaker A –variable (Salt brine)	Temperature/Beaker B - Control
Starting		
3 min		
6 min		
9 min		
12 min		
15 min		

Data Analysis: On a separate sheet of paper, create a line graph using the data collected.

Name _____

Part 1: Analysis questions

1. What happened as the salt was added to the ice water?
2. Why do you think the water temperature fell?
3. If the salt brine lowers the freezing point of water, then what would be the benefit of applying the solution to municipal streets before a snowstorm?
4. If a winter storm begins before the salt bring solution can be applied, would it be beneficial to apply it directly to the snow or ice? Why or why not?
5. Salt brine is considered an anti-icing agent, and rock salt is a de-icing agent. How are anti-icing and de-icing agents different? Which do you think is more effective? Why?

Part 2: Career connection

Environmental scientists are concerned that the salty brine and salt slush created by winter road treatments are killing plants and other foliage on the side of the road, and ultimately affecting animal habitats. **Chemical engineers** have been given the task of finding a suitable replacement for rock salt that is more environmentally friendly. Think of some alternative substances that could be used. Explain why you have selected each new alternative. Then, select one of the new agents you have proposed and explain how it may be more “kind” to the environment.

New agent	Properties that make this new agent an effective alternative