



# **FREEZING POINT DEPRESSION**



**Celina High School - Mr. D. Scott**  
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## **INTRODUCTION**

Water is a chemical that affects our lives each day. The unique properties of water allow for its many uses and makes it essential for life to exist. In this experience, the ability of water to absorb a large amount of heat while melting (Heat of Fusion) together with the colligative property of Freezing Point Depression will be used.

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## **PROCEDURE**

1. Obtain one (1) quart size zip lock bag and one (1) gallon size zip lock bag.
2. To the small zip lock bag, add the following:
  - Half and Half (or Milk)..... 150 mL or 1 cup or 8 fluid oz
  - Sweetened Condensed Milk (only IF Milk is used).....5 mL or 1 teaspoon
  - Sucrose (granulated) ..... 15g
  - Vanillic Aldehyde ..... 10 drops or 0.5 mL (omit if chocolate milk is used)
3. Close the bag making sure to remove as much air as possible. Carefully mix the materials by kneading the bag.
4. To the large zip lock bag, add the following:
  - Ice.....about 500-600 mL
  - Rock Salt (impure NaCl) ..... 150 mL
  - The small zip lock bag and its contents
5. Close the large bag making sure to remove as much air as possible. Carefully knead or churn the bags. Gloves may be worn if the low temperature becomes uncomfortable. Gradually the mixture in the small bag will become more and more viscous. There are phase changes taking place throughout this activity in both bags. The kneading action is necessary to prevent the solid particles in the small bag from becoming very large. During this time period observations should be made and recorded. After several minutes, insert a thermometer into the large bag and check the temperature of the ice, salt, water mixture.
6. When the mixture in the small bag has reached the desired consistency, stop kneading, remove the small bag from the large bag, dump the contents of the large bag into the sink and prepare to analyze the mixture in the small bag.
7. Obtain a clean plastic spoon. Test the properties of the mixture. Record your observations and answer the questions.
8. Clean up as directed by your teacher.



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## Report Page

Name \_\_\_\_\_ Date \_\_\_\_\_

### OBSERVATIONS

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1. Describe all phase changes taking place.

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2. Why did some bags of the mixture freeze in less time than others?

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3. Would twice as much ice make it freeze twice as fast? Explain your answer.

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4. How would the absence of salt affect the outcome of this process?

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5. Final temperature of the ice and salt-water mixture \_\_\_\_\_. (When your ice cream is ready.)

6. van't Hoff factor for sodium chloride \_\_\_\_\_.

7. Calculate the molality of the ice-water-sodium chloride mixture/solution using the above data.

8. Write the equation for the dissociation of sodium chloride in water.

9. The molality of the "ice cream" solution is (more) or (less) than the ice-water-salt mixture? Circle one.

10. Explain your reasoning for the previous question.

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11. Why is salt sometimes placed on roads, sidewalks and highways in the winter?

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12. Which salt would be more effective as a "road salt"; (sodium chloride) or (calcium chloride) Circle one.

13. Explain your reasoning for your choice in the previous question.

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