Ice Cream In a Bag

Tools and Ingredients:

- 1/2 cup Milk
- 1 tablespoon Sugar
- 1/4 teaspoon Vanilla powder
- 6 tablespoons Rock salt
- 1 quart-size Zip plastic bag
- 1 gallon-size Zip plastic bag
- half gallon Ice cubes
- towels

To Do:

1. The day before you want to make the ice cream, put the box of milk in your refrigerator. Freeze a couple trays of ice cubes.
2. To Make the Ice Cream: measure 1/2 cup Milk into the bag containing the powdered Vanilla and Sugar. Zip shut. Check to make sure it is securely zipped shut.
3. Fill the large zip-lock bag half full of ice; add the rock salt to the ice. You should now have a large bag with ice and salt, and a smaller bag with milk, vanilla, and sugar.
4. Place the entire sealed small bag inside the large one and seal the large bag carefully.
5. Take it outside – it will be messy. Shake until mixture is ice cream, about 5-10 minutes.
6. Remove the small bag from the large bag. Dispose of the large bag and the salty ice water.
7. Wipe off top of small bag (you don't want the top to be salty), then open carefully and enjoy!

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How do we get ice cream to freeze without a freezer? Phase Change and Heat Transfer

An example of a phase change is when a liquid changes to a solid or a gas —water changes to ice, or ice changes to water. Whenever a substance changes phase, a transfer of energy occurs. When our "liquidy" ice cream ingredients become a solid, it goes through a phase change. When our ice melts, it goes through a phase change.

Any foreign substance in water will lower its freezing temperature. Because of the sugar dissolved in the watery ice cream mixture, the mixture doesn't freeze at 0°C like plain water does. Its freezing point is below 0°C. So we must make the "ice-cream-to-be" colder than the normal freezing point of water.

The ice needs to absorb energy to melt. It gets the energy, in the form of heat, from the ice cream mixture. Because heat is being drawn from the ice cream mixture, the ice cream mixture begins to cool.

The salt (a "foreign" substance) lowers the freezing point of the salt water. As more ice melts, the liquid ice water gets colder and colder but stays liquid, because the salty water has a lowered freezing point. The remaining ice is now warmer than the salty water, so more ice melts. It takes heat to melt ice, so more heat is drawn from the ice cream mixture and the salty water, making everything even colder. Soon, it's cold enough for tiny ice crystals to form in the ice cream mixture.

Finally, to make the transition from cold creamy liquid to ice cream we need tiny air bubbles, to give the ice cream its characteristic texture. We do this by shaking the mixture vigorously. Shake! Shake! Shake! The bag sure gets cold, doesn't it? The shaking turns the ice cream mixture into partially frozen foam, with tiny ice crystals and air bubbles. Now, there's only one thing left to do: Eat the ice cream!

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