

Ice-Cream: Made to Order

It doesn't get better than this.

- Which is Faster: Making Ice-Cream with Liquid Nitrogen or Water Ice & Salt?

The Problem

- The temperature of liquid nitrogen is -320°F
- Nitrogen is odorless, colorless, and tasteless.
- 78.1% of the Earth's atmosphere is made up of Nitrogen gas (N_2).
- The human body is approximately 3% Nitrogen (by weight).
- Nitrogen is responsible for the orange-red, blue-green, blue-violet, and deep violet colors of the aurora.
- Nitrogen compounds are found in foods, fertilizers, poisons, and explosives.
- The French chemist Antoine Laurent Lavoisier named nitrogen *azote*, meaning without life.
- Liquid nitrogen is often obtained by distilling the air.

Nitrogen Facts



Dewar Flasks

- The history of ice-cream can be traced back to over 3,000 years ago, when the emperors of China were the first to eat delicious "snow ice-cream" mixing snow, fruit, wine, and honey.
- Roman Emperors followed the Chinese and also enjoyed snow ice-cream.
- Italian discoverer Marco Polo added yaks milk to snow ice-cream to make it creamy, and it became popular in Europe.
- Maryland Governor Thomas Bladen first served ice-cream to guests in 1770, introducing it to the United States.
- The first ice-cream parlor in the United States opened in 1776.
- Italo Marchioni invented the ice-cream cone in 1903.
- The waffle cone was invented by E.A. Hawami during the St. Louis World's Fair in 1904.
- Ice-cream parlors became popular during Prohibition (1919-1933) as a substitute for bars that were no longer able to serve wine and beer..

Ice Cream Facts



Mmmmm, Ice Cream

- In 1846, the first ice-cream machine (hand cranked) was invented by American, Nancy Johnson.
- In 1899 August Gaulin invented the homogenizer which gave ice-cream an amazingly smooth texture, and outrageous taste.
- Most commercially-made ice cream is made in giant tubes surrounded by pipes containing freezing agents like ammonia.

Ice-Cream Machines



Ice Cream Machines

- The technique of using of liquid nitrogen to make ice-cream has been around for a long time, but not widely used (likely due to cost).
- Dippin' Dots is a well-known company using liquid nitrogen to make ice-cream.
- The extremely low temperature of liquid nitrogen causes the ingredients to freeze rapidly, allowing the fat and water particles in the ingredients to remain very small, giving ice-cream an exceptionally creamy consistency and enhancing its flavor.
- Using liquid nitrogen to make ice-cream eliminates the need for additives including stabilizers, emulsifiers, and gums making it a more natural and healthy choice than traditionally made ice-cream.

Liquid Nitrogen & Ice-Cream



Dippin' Dots

Intense Chocolate Ice Cream

- 2 1/2 c whole milk
- 4 eggs
- 1 c sugar
cook slowly to a custard, then beat in
- 1 1/8 c cocoa powder
cool, add
- 2 c whipping or heavy cream
- 2 tsp vanilla extract
chill thoroughly

Recipe for Ice-Cream



Ingredients

- My hypothesis is that using liquid nitrogen to make ice cream is faster than using water-ice and salt.
- I believe that since the temperature of liquid nitrogen (-320F) is so much lower than the temperature of water ice and salt (32F) that the ingredients will freeze faster when exposed to or mixed with it.

Hypothesis



Pouring Liquid Nitrogen

- Liquid Nitrogen
- Dewar Flask (a specialized container used to store and transport liquid nitrogen)
- Cocoa Powder
- Vanilla Extract
- Sugar
- Milk (Whole)
- Eggs
- Heavy cream
- Electric Mixer
- Whisk
- Large Sauce Pan
- Large Bowl
- Mega Freeze Ice Cream Ball
- Ice Cubes
- Rock Salt

- Face Shield
- Gloves
- Stop watch (to record how long it takes to make each batch)
- Assistant
- Kitchen or area with counters and sink
- Spatula
- Bowls & Spoons (to eat my creation with)
- Apron
- Note pads
- Pens/pencils
- Still Camera
- Video Camera

Materials



Materials and Ingredients

- Research safe handling for liquid nitrogen
- Prepare the ingredients for making ice-cream
- Place the ingredients into the mixer
- Slowly add liquid nitrogen to the ingredients while continuously mixing them until they reach the desired consistency and record the time it took.
- Prepare the Mega Freeze Ice Cream Ball with water ice and salt, add the ingredients to the internal container and shake and roll it.
- Periodically check the consistency of the ingredients, starting at a little less time than it took the liquid nitrogen to freeze the ingredients, recording the time it took to reach the same consistency.

Procedure



Preparing the Ingredients



"The Pour"



Mixing



Pouring



The Finished Product

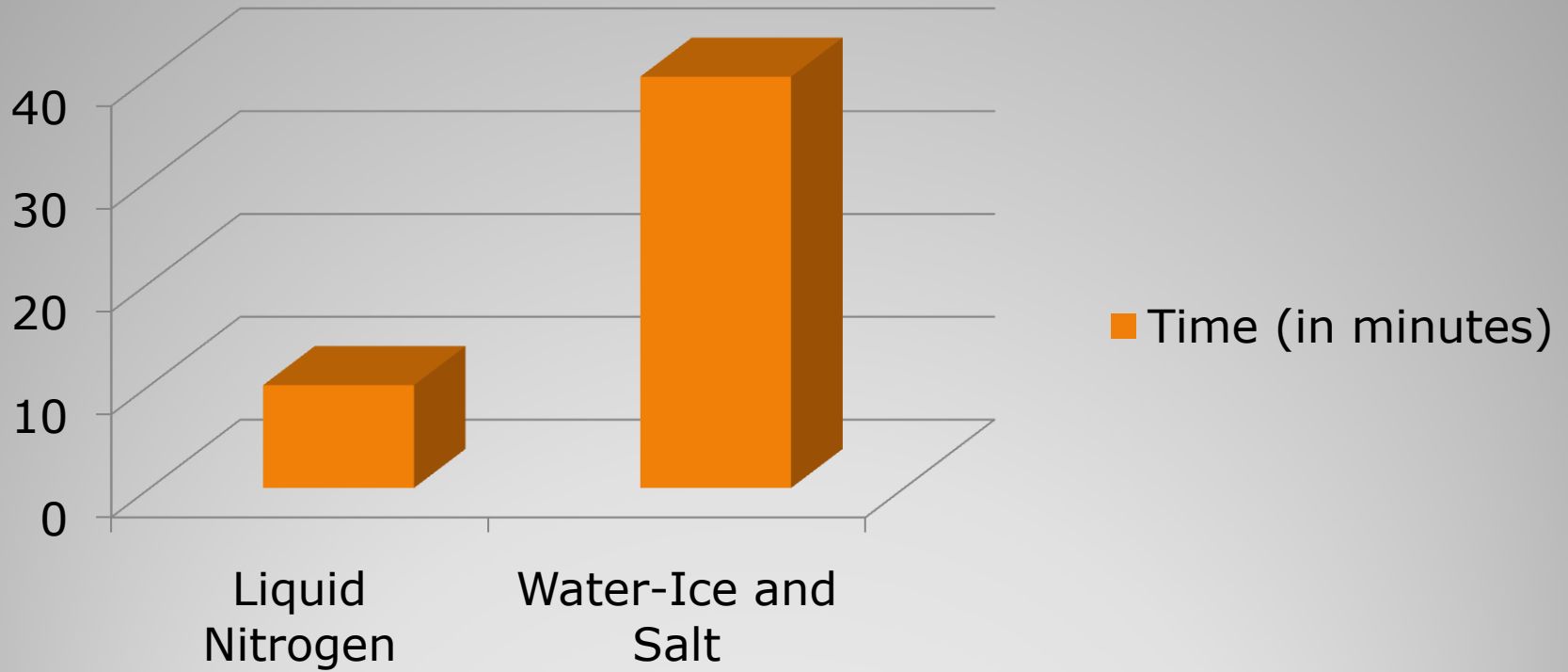


Mmmmmmm...



Mega Freeze Ice Cream Ball

Time (in minutes)



Time Chart

- **In conclusion, based on the data collected during my experiment, making ice-cream using liquid nitrogen is faster than using water-ice and salt. I also conclude that the texture of the ice-cream made with liquid nitrogen is smoother than that made with water ice and salt making the ice-cream more enjoyable.**

Conclusion