

LIQUID NITROGEN ICE CREAM

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Materials Needed

Ice Cream components

4 cups milk

6 cups heavy cream (Note: half-and-half is an acceptable substitute for the milk and heavy cream)

1 cup granulated sugar (if a sweeter ice cream is desired, add additional sugar)

2 Tbs. Vanilla extract

Optional:

Egg beaters. Add one 4 oz container (from a standard 3-pack) of egg beaters to the ice cream mix. This acts as an emulsifier to prevent separation of components.

For chocolate ice cream: add 1 cup cocoa powder and ½ cup additional sugar. (Omit the extra sugar for a bittersweet chocolate ice cream)

For chocolate chip ice cream: add 12 ounces (one bag) of chocolate chips (mini chocolate chips or chocolate flakes can be used).

For fruit flavors: add 1 to 2 cups chopped fruit or fruit preserves of your choice to the ice cream mix.

Other additives can include crushed candy bars (toffee bars, Twix, etc...), crushed cookies such as Oreos, pieces of fresh or frozen cookie dough, etc..

Chemicals:

Liquid nitrogen, at least 4 liters

Equipment:

Large Dewar flask to hold the liquid nitrogen

Stainless steel mixing bowl, 5 quart or larger (Do not use plastic, glass, or ceramic bowls as they may crack due to the temperature of the liquid nitrogen.)

Large wood spoon

Gloves (Important! This gets cold.) .Cryogenic gloves preferred, but heavy insulated gloves will work

Goggles

Large spoon or scoop for serving the ice cream

Plastic spoons for tasting

Paper or plastic cups or bowls for serving. (Optional: ice cream cones.)

Napkins or paper towels

Safety

Liquid nitrogen is extremely cold, -196°C (-320°F). It should be stored in a large Dewar flask. Under no circumstances should the liquid nitrogen container be tightly sealed. Vented tops or covers must be used. If a large cork or stopper is used, there should be a hole drilled through the center of the stopper. Vaporizing liquid nitrogen can cause moisture in the air to freeze around the openings of the covers or caps on a liquid nitrogen container and can result in a pressure explosion.

Wear heavy insulated or cryogenic gloves when working with liquid nitrogen. (Any helpers should also wear gloves.) Keep all spectators at a safe distance.

Wear goggles while performing this experiment.

All materials used in this experiment must be reserved for food use only. The materials must be stored in an area where there is no possibility of contamination from laboratory chemicals.

Disposal

There are no disposal problems with materials in this experiment.

Procedure

Combine all ice cream materials in a large stainless steel bowl. Stir to dissolve all the sugar.

Note: If making chocolate ice cream, mix the cocoa with some milk or cream in a separate container (plastic preferred) before adding it to the ice cream mix. Shaking the cocoa and milk/cream in a sealed plastic container works well.

Slowly add some liquid nitrogen to the ice cream mixture while stirring. CAUTION: A fog will be formed and some liquid nitrogen will splatter from the container.

Continue to stir while adding additional liquid nitrogen in small quantities. It will take approximately 2 liters of liquid nitrogen to freeze a single batch of the mixture.

References

Kurti, Nicholas, and This-Benckhard, Hervé, *Chemistry and Physics in the Kitchen*, **Scientific American**, 270, No. 4, 66, (April 1994)