

Liquid Nitrogen Ice Cream

PA State Standards:

- 3.4.10.A Explain concepts about the structure and properties of matter.
1.2.11.A Read and understand the central content of informational texts and documents in all academic areas.

Introduction:

Nitrogen has a very low boiling point (-196 °C or 77 K) and evaporates quickly at room temperature. For this reason, the nitrogen must be stored in containers called Dewar flasks. The flasks contain two layers of glass or metal separated by a vacuum. The nitrogen is cold enough that it can be added to ice cream mix to freeze ice cream very rapidly and easily.

Guiding Question:

Please answer the following question before beginning the lab.

Why is ice cream that has been frozen with liquid nitrogen safe to eat?

Equipment/Materials

Cryo-gloves	Metal spoon
Cups	Napkins
Dewar flask of liquid nitrogen	Spoons
Ice cream mix	Toppings (opt.)
Metal bowl	

Safety:

- Goggles must be worn by the person or people making the ice cream.
- Liquid nitrogen is extremely cold and can cause burns. Gloves specially designed for cold temperatures (cryo-gloves) must be worn by anybody handling the metal bowl.

Procedure:

1. Pour ice cream mix into the large metal bowl.
2. Add a small amount of liquid nitrogen from the Dewar flask slowly while mixing with the metal spoon.
3. When the nitrogen has evaporated, add another small amount slowly while stirring. Continue adding small amounts until the ice cream is the proper consistency.
4. Serve in cups and add toppings as desired.

Questions:

1. Why does the nitrogen evaporate so quickly at room temperature?
2. What is a vacuum? Why does the Dewar flask contain a vacuum between the layers of glass or metal?
3. The lid on the metal Dewar flask sits on top of the flask very loosely. Why?
4. When the nitrogen is poured out of the Dewar flask, a fog-like substance appears. What causes this, and where else can this phenomenon be seen?
5. Why is ice cream that has been frozen with liquid nitrogen safe to eat?