MIND TREKKERS

Liquid Nitrogen Ice Cream Lesson Plan

Amount of time Demo takes: 10-15 mins
# times per hour: 4-5
Container: Large bin

Materials:
1. 3 or more liters of liquid nitrogen (per demo)
2. Goggles and gloves for handling liquid nitrogen (2)
3. Half and half in quarts (1 qt per demo)
4. Sugar (1/2 cup per demo)
5. Vanilla (3 tsp/demo)
6. Chocolate, Strawberry, Caramel, Cookies, etc. for flavor (1/2 bottle/demo)
7. Wooden spoon (2)
8. Wire whisk (2)
9. Large plastic bucket, to mix ice cream in (2)
10. Serving items, dixie cups, small plastic spoons, napkins

Set up instructions:
1. Pour the half and half, sugar, vanilla, and flavoring into the bucket and mix thoroughly with a wire whisk. Show the students this mixture, talking about ice cream, liquid nitrogen, and such as you mix. Let the audience choose a flavor! The recipe is:
   a. 3 or more liters of liquid nitrogen
   b. Goggles and gloves for handling liquid nitrogen
   c. 1 quart of half and half
   d. 1/2 cup of sugar
   e. 3 teaspoons of vanilla
   f. Half bottle of whatever flavor you like (or, crumbled up cookies! To make vanilla ice cream, simply use a few more tsp of vanilla extract)
2. One person pours in liquid nitrogen very slowly, while another person holds the bucket and stirs with the wooden spoon. Mix until ice cream has reached the correct consistency -- don’t ever stop stirring! You can always take a break to peek at it to check for consistency.
3. Serve in small cups to as many people as you can!

SAFETY!
1. Goggles and protective gloves must be worn at all times while handling the liquid nitrogen, because liquid nitrogen is -321 °F, it can cause frostbite if it touches skin. Use caution when pouring it and follow appropriate LN2 SOP procedures. Make sure the participants stay back
far enough not to be hit by splashing liquid nitrogen. Don’t be afraid to tell the kids to step back when they try to touch the vapor coming from the bucket. We don’t want to cause injury to the public.

3. Keep half and half stored in cooler. Please don’t serve soured half and half to the public.

4. Follow basic food safety precautions. Wear a hat, headband, or hair net. If you are sick, please don’t help with this demo. Wash hands or rubber gloves (for pouring liquid nitrogen) before serving ice cream. Wipe down table with Clorox disinfectant wipes regularly. Keep the students’ hands out of the serving spoons container. Put the spoon in the ice cream and serve them. Make sure that the area is clean and you are serving them food that is not contaminated.

5. Wash and sanitize plastic bucket, spoons and whisk between demos.

Lesson’s big idea
This demonstration uses the extreme cold of liquid nitrogen (-321°F) to make ice cream in just 60 seconds!

Background Information
1. Liquid nitrogen is −321 °F, which allows it to rapidly freeze the ice cream mixture. Liquid nitrogen is different than most liquids because its freezing point is so low. Liquid nitrogen freezes at -346 °F, compared to water that freezes at 32 °F. The ice cream becomes colder because the heat/energy from the warm moisture is transferred to the very cold liquid nitrogen. This causes the nitrogen to boil, evaporate into the cool fog, and leave us with ice cream!

2. If you don’t mix while pouring the liquid nitrogen, you will get freezer burn on the ice cream.

Assessment:
1. Does it taste good?
2. How did we make the ice cream so fast?

Clean Up
Wipe down the tables between demos to keep sticky ice cream spills under control. Thoroughly rinse buckets, spoons, whisks, etc. in between demonstrations and at the end of the day. Do not pack away any equipment that is sticky! Clean it up with soap or throw it away if it is beyond cleaning. Make sure everything is dry, containers of ingredients are sealed/won’t spill, and packaged neatly back in the bins.

References:
http://www.stevespanglerscience.com/experiment/liquid-nitrogen-ice-cream

National Standards:
K-4: Physical Science -- Light, heat, electricity, and magnetism
5-8: Physical Science -- Transfers of energy
9-12: Physical Science -- Interactions of energy and matter