

## Recipe for Making Liquid Nitrogen Ice Cream

Serves about 18-20 students

**Note:** This is not a regular ChemDemo activity but rather a “treat” to go along with a regular ChemDemo.

1. Add 1 quart Half and Half *and* 1 quart Heavy Whipping Cream into a large plastic or glass salad or punch bowl.
2. Add  $\frac{3}{4}$  to 1 cup of granulated sugar (1 cup is a little on the sweet side).
3. 4-5 teaspoons of vanilla.
4. Optional: 1 pound of fresh fruit or preserves (not jelly). Strawberry or peach works best. If using fresh fruit, cut into small pieces. Chocolate syrup (8 oz) works well to make chocolate ice cream. If using chocolate syrup use less sugar ( $\frac{1}{2}$  to  $\frac{3}{4}$  cup).
5. Stir the mix for 2-3 minutes to dissolve the sugar.
6. Add about 2-3 liters of liquid nitrogen slowly and in small portions into the mix and stir with a **wooden** spoon. Pour a little at a time and stir; then continue adding small amounts of liquid nitrogen until you have the desired consistency. One person should be stirring while another gradually pours in the LN<sub>2</sub>. Another person may be necessary to hold the container when it starts getting thick.
7. Allow any excess liquid nitrogen to boil off.
8. Serve to your audience. Enough for 20 students (half a cup each).
9. Wash equipment and enjoy.

**Safety:** LN<sub>2</sub> is extremely cold (-196°C, -321°F, 77 K)!! Spilling it on you can cause serious frostbite burns! Pouring some on unprotected skin is actually less dangerous than on clothing in contact with skin. Your skin is so hot relative to LN<sub>2</sub> that there is an initial shielding effect called the *Leidenfrost Barrier* that offers short-term protection against the freezing effects of LN<sub>2</sub>. You will notice this if you pour some on a non-carpeted floor. The LN<sub>2</sub> rolls around as if it is a little hover-craft. This is actually the case as the floor temperature is so hot relative to the very cold LN<sub>2</sub> that as the LN<sub>2</sub> comes in contact with the floor the vaporization of LN<sub>2</sub> to gaseous N<sub>2</sub> causes an insulating layer of N<sub>2</sub> gas to form between the LN<sub>2</sub> and the floor. This cushions the LN<sub>2</sub> and allows it to “float” above the hot floor. The same effect will briefly protect you skin from contact with LN<sub>2</sub>. Thus, you can quickly dip your hand into the LN<sub>2</sub> with no ill effect (aside from it feeling a little cold). **Keeping it in contact with LN<sub>2</sub> for more than a few seconds, however, will cause enough heat to be drained away from your skin to minimize the *Leidenfrost Barrier* effect and allow the LN<sub>2</sub> to come in contact and cause extremely serious frostbite burns.** Once you tell the students about how cold the LN<sub>2</sub> is they will usually be quite good about NOT touching it. Short contacts with LN<sub>2</sub> should NOT cause any damage. Pouring it on clothing is potentially more dangerous since it “soaks” into cloth and if the cloth is right against the skin that can cause quicker frostbite burns. On the other hand if the cloth is NOT right against the skin little to any damage should be done.

**Make sure that the LN<sub>2</sub> dewar is well-secured (seat belted in) when you put it in your car to drive to the school.** If the dewar tips over, the LN<sub>2</sub> will spill out. The cap on the dewar is loose to let the nitrogen gas that is always evaporating off the LN<sub>2</sub> to escape.

**Disposal:** No problems disposing of the final product. Any leftover liquid nitrogen may be disposed of outside by pouring it on the ground and letting it boil away/evaporate.