

Section 5.25 Title: Handling Liquid Nitrogen
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Revision Date: 11/01/19
P.I.: Prof. John F. Berry

Prior Approval: This procedure is NOT considered hazardous enough that prior approval is needed from the Principal Investigator.

Involves Use of Particularly Hazardous Substance (PHS)? No
 Carcinogen Reproductive Toxin High Acute Toxicity
Does this procedure require medical surveillance? No
Does this require use of a fit-tested respirator? No

Brief Description of Procedure:

Use of small quantities of liquid nitrogen in the lab; refilling liquid nitrogen from the filling room.

Location: *List the locations (buildings/rooms) where this procedure may be performed. For use of a PHS indicate a more precise location within the room, if appropriate, as a designated area.*

Daniels Chemistry - All Berry group labs

Chemicals Involved:

Chemical	Physical or Health Hazard (e.g. carcinogen, corrosive)
Nitrogen, liquid	None (inert)

Other Hazards: *Include hazards, other than chemical, that may be present during operation of the procedure.*

Cryogenic liquid (frostbite, asphyxiation)

Exposure Controls: *(Check all that apply)*

PPE: Safety Glasses Face Shield Chemical Splash Goggles
 Chemical Apron Gloves (Nitrile or insulated) Lab Coat
 Respirator (type) Other:

Engineering Controls:

Fume Hood Biosafety Cabinet Glove box
 Vented gas cabinet Other:

Administrative Controls: *List any specific work practices needed to perform this procedure (e.g., cannot be performed alone, must notify other staff members before beginning, etc.).*

Do not handle liquid nitrogen when ventilation is reduced or disrupted. Receive training for refilling liquid nitrogen by a senior group member.

Task Hazard Control Table: *For procedures involving numerous steps, it may be convenient to indicate specific requirements for individual tasks in the table below:*

Task	Required PPE and/or Engineering Controls
Lab use	Nitrile gloves, lab coat, safety glasses, fume hood
Refilling storage dewars	Insulated gloves

Waste Disposal: *Describe any chemical waste generated and the disposal method used.*

N/A

Accidental Spills: *Describe the procedure for handling small chemical spills that may occur during this procedure. Note that for large spills it may be appropriate to call 911.*

Small quantities of liquid nitrogen will evaporate harmlessly.

Decontamination Procedures (required for PHS use): *Describe the procedure for decontamination of personnel and equipment.*

N/A

Training: *Describe any training needed prior to performing this procedure. Include training performed in-lab and any required demonstrations of competency.*

No formal training or documentation is required. New lab members must be trained on refilling the storage dewar by a senior lab member and observed at least once before refilling on their own.

Principle Investigator Approval: I have reviewed this procedure and approved it for use. Note: Modifications to the procedure may require update to this form.

Name: John F. Berry

Signature: _____

Date: _____

Handling Liquid Nitrogen

Liquid nitrogen, often abbreviated LN₂, is a potent cooling agent, causing most common solvents to freeze. It is useful in preventing volatile solvents from entering vacuum pumps, freezing solvent for freeze-pump-thaw degassing, and preparing frozen samples for low-temperature spectroscopy.

Liquid nitrogen has two primary safety concerns: it is cold enough to cause severe frostbite, and when it boils rapidly it can displace large volumes of oxygen from the atmosphere.

General handling:

1. Work in a well-ventilated space, such as a fume hood or an open room free from obstructions to air flow. Never work with liquid nitrogen in a non-ventilated area.
2. Wear liquid-proof gloves whenever working closely with liquid nitrogen. The blue heavily-insulated gloves are available for significant handling of cryogenically cooled items. Nitrile gloves over cotton glove liners are fine for short contact. A lab coat can offer significant protection from small splashes, but be aware that any fabric that gets soaked with liquid nitrogen (lab coat, clothing, mesh shoes) and lays against your skin can cause frostbite.
3. Pour liquid nitrogen from a 10 L or 20 L storage dewar into the smaller dewar you intend to use. Note that a significant amount of nitrogen will boil off as it cools down your dewar.
4. If using liquid nitrogen to trap volatile solvents, ensure that the trap is already evacuated before cooling. Cooling traps that are filled with air, or have air flowing through them, can create pools of condensed O₂. If this O₂ gets pulled into the vacuum pump, the pump will likely explode. Aside from that, liquid O₂ can react violently with organic solvent or other materials. Liquid O₂ is pale blue in color, so if you see blue condensate in your traps be extremely cautious! Usually it is best to close the valve in between the traps and vacuum, open one of the vacuum lines to air, close the hood sash panels and allow system to warm up slowly. Be sure to warn other lab members present and seek the advice of a senior group member in how best to handle these situations.
5. Keep liquid nitrogen covered as much as possible. This insulates the nitrogen, helping it last longer. It also reduces the condensation of ice and O₂ into your dewar.
6. When you are finished with your liquid nitrogen, return larger quantities to the storage dewar, carefully avoiding any ice. Small amounts, or the last bit of a larger amount, can be disposed of by pouring it onto the floor in a well-ventilated area. Liquid nitrogen in an open dewar will develop ice, which sinks to the bottom, which is why it is preferred to pour the last bit of nitrogen out onto the floor.

Refilling large liquid nitrogen dewars:

1. If you notice that one of the 10 or 20 L storage dewars is empty or nearly empty, it is your responsibility to refill the dewar as soon as you conveniently can.
2. Using the push cart, take the dewar(s) to the first-floor nitrogen filling room using the freight elevator and bringing the blue liquid-proof gloves.

3. Position the dewar below the dispensing head and raise the height using the foot pedal so that the phase separator (the sintered metal at the end of the head) is approximately 2-3 inches into the dewar.
4. Open the dispensing valve completely, then close at least half a turn. If the nitrogen is splashing vigorously out of the dewar, turn close the valve further until the splashing reduces or raise the dewar using the foot pedal.
5. Wait outside of the room until you hear the dewar become full and nitrogen begins to splash out of the dewar. Wearing an insulated glove, close the dispensing valve.
6. Lower the dewar using the handle on the lift cart and replace the cap. Using insulated gloves, move the dewar to the push cart. Note that the full 20L dewar is quite heavy. Do not lift it if you are not completely confident in your physical ability to move it; ask another lab member to assist you.
7. Make sure you fill out the log on the computer for the volume of liquid nitrogen.
8. Return the dewar(s) to the lab using the cart and freight elevator.