Principal Investigator: _____ ***Date Approved:*** _____

This document covers basic chemical safety information for dry ice, liquid nitrogen, and other cryogens. The use of dry ice, liquid nitrogen, and other cryogens is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. PI and/or Supervisor may use the sheet attached to this SOP to document any lab specific training for Cryogens.
DO NOT USE DRY ICE, LIQUID NITROGEN, OR ANY OTHER CRYOGEN UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

Dry Ice, Liquid Nitrogen, and Other Cryogens

Cryogens are liquefied gases which boil below -180 °C. The most common cryogens used in research laboratories are dry ice and liquid nitrogen. Liquid helium is used in operations which require even colder temperatures.

Tissues exposed to cryogens can freeze, causing severe frostbite. Cryogens can also embrittle plastic or rubber components of equipment, and crack glass through thermal shock. Cryogens expand dramatically upon evaporation (1:845 for dry ice; 1:694 for liquid nitrogen). This can displace oxygen in the event of their rapid vaporization in a poorly-ventilated space and cause asphyxiation. Vaporization of cryogens within a sealed vessel can cause an explosion.

Personal Protective Equipment & Personnel Monitoring			
 **Lab Coat**	 **Gloves**	 **Eye Protection**	 **Face Shield**
Traditional lab coat. For operations where a significant splash hazard is present, an apron may be required.	Wear insulated, impermeable, elbow-length gloves.	ANSI Z87.1-compliant safety glasses or safety goggles **and** a face shield when dispensing cryogens from a cylinder.	

Labeling & Storage

Cryogens should be handled and stored in well-ventilated rooms. Cryogen cylinders are typically equipped with a handling ring which can protect the valves and regulators in the event of a fall. Whenever possible, store cryogen cylinders such that the venting valve is pointed away from paths of egress or regular foot traffic (e.g. towards a wall). Do not store dry ice, liquid nitrogen, or any other cryogen inside of a tightly-sealed container (e.g. refrigerator, freezer, or gasketed cooler) as the pressure resulting from evaporation can cause an explosion.

Transportation

Large mobile dewars or cylinders used for transporting cryogens within a building or between buildings should be equipped with a braking mechanism. Do not use one's feet to "brake" wheels. Outside transport of wheeled dewars should be undertaken by no less than two persons. Care must be taken to stay completely clear of sewer grates, large cracks in the pavement, or any other hazards which could catch the wheels and cause tipping. Inside buildings the best transport from room to room is by using a dewar that is equipped with carrying handles or is on wheels. The dewar must have pressure relief valves or pressure venting lids.

Elevators

Care must be exercised when transporting pressurized cryogenic containers on an elevator. Due to the confined nature of an elevator. When a cryogenic liquid cylinder has been placed on an elevator, the elevator must travel between floors unoccupied. All elevator doors must be manned to prevent entry by person/s. Person/s must be stationed at all "in-between" floors to prevent riders from entering elevator. The sender should remain outside the elevator and activate it to the desired floor. Another person should be available on the receiving floor to take the liquid container off the elevator at its destination. **DO NOT** transport a pressurized container of liquid nitrogen or cryogenic material at any time in an elevator with any other person/s in the elevator car.

Engineering Controls, Equipment & Materials

Oxygen Sensor

Oxygen sensors may be necessary in rooms where large quantities of cryogens are stored or handled. Never enter a room if an oxygen sensor is in alarm.

Ordering & Disposal

As of *July 1st 2022, Receiving & Stores will no longer coordinate the cylinder gas program for campus departments.* Beginning on July 1, departments will enter requisitions for cylinder gases into 49er Mart directly to the mandatory State Term Contract #1214A vendors, Airgas or ARC3 Gases, and deliveries/pickups will be made by the vendors directly to the department. Any order or service issues should be communicated directly to the vendor supplying the cylinder gas, or to the Purchasing Office who will assist the department with any issues encountered.

First Aid & Emergencies

Release

In the event of an uncontrolled release, assume that oxygen may be displaced. Notify others in the area of the release and evacuate the room until an adequate supply of oxygen can be confirmed.

Skin or Eye Contact

If any tissues appear to have frozen, get medical attention immediately. Apply a dry, sterile bandage. Do not rub the affected area.

Inhalation

If you suspect that a person has lost consciousness due to oxygen deprivation, call 911 and **DO NOT** enter the room. Move person into fresh air only if safe to do so. If symptoms persist, get medical attention.

Name	Signature	Date