Safe Method of Use – Liquid Nitrogen

HAZARDS

- Cold contact burns may result from contact with body
- Asphyxiation may occur due to depletion of Oxygen in surrounding air
- Explosion of storage vessels may occur as result of pressure build-up

NOTES

- The temperature of liquid nitrogen of -196°C.
- Liquid nitrogen readily evaporates back into gas and undergoes a large expansion in volume as it does so – 1L of liquid nitrogen will produce 680L of nitrogen gas.

TRAINING

- All users of liquid nitrogen must be trained the safe use of this substance – including the contents of this SMoU as well as any equipment/procedures specific to the site of use.

PERSONAL PROTECTIVE EQUIPMENT

Work with small volumes (<20L) or immersing/removing items only (no decanting)	• Wear safety glasses, laboratory coat, enclosed footwear. • Use cryoprotective gloves where practical, but disposable gloves permitted where high level of dexterity required.
Transferring/decanting liquid nitrogen from storage vessels ≥20L.	• Wear full face shield, protective apron over laboratory coat, cryoprotective gloves and enclosed footwear.

STORAGE

- Do not store in confined and/or poorly ventilated spaces, including cold rooms or basements*.
- Keep volumes stored in laboratories below 50L*.
- Use cryogenic rated storage vessels only – DO NOT use domestic thermos flasks.

*Storage of larger volumes or in poorly ventilated areas may be permitted only in association with a documented risk assessment of the Oxygen depletion hazard and with provision of additional control measures (e.g. Oxygen depletion alarms) where necessary (contact H&S Office for a risk assessment).

LABELLING

- Label storage containers (≥20L) as follows:

NITROGEN, REFRIGERATED LIQUID	
UN No: 1977	
HAZCHEM: 2T	

EMERGENCY PROCEDURES	
Cold contact burns	In event of cold cold contact burns from extended liquid nitrogen contact: • MOVE to a safe distance from any spilled liquid nitrogen • REMOVE any saturated clothing • RINSE affected area with cold/tepid water using eye-wash, drench hose or safety shower • DO NOT rub or heat the affected area – seek medical advice for burn injuires. • In event of serious injury CALL 111 (1-111 from a University phone) and ask for AMBULANCE.
Oxygen depletion/asphyxiation • An oxygen depletion alarm has been activated, or • A large spill (>2L) of liquid nitrogen has occurred, or • Personnel working with liquid nitrogen display signs of asphyxia (see below)	If Oxygen depletion or asphyxiation is suspected: • DO NOT enter a suspected Oxygen depleted area. • WARN others in vicinity and EVACUATE (activate a FIRE ALARM from a safe place). • CALL 111 (1-111 from a University phone) and ask for FIRE. Inform the Fire Service what has happened (Oxygen depletion suspected, nitrogen gas present) • Do not re-enter building until the Fire Service advise you it is safe to do so

SIGNS OF ASPHYXIA FROM OXYGEN DEPLETION	
Oxygen Concentration in the air	**Signs and symptoms of Asphyxia**
>19.5 – 21%	None (normal air concentration of oxygen is 20.9%)
>18 – 19.5%	May affect physical and intellectual performance without person's knowledge.
>15 – 18%	Decreased ability to work strenuously. May impair co-ordination and may induce symptoms in persons with coronary, pulmonary, or circulatory problems.
>12 – 15%	Respiration deeper, increased pulse rate, and impaired co-ordination, perception and judgment.
>10 – 12%	Further increase in rate and depth of respiration, further increase in pulse rate, performance failure, giddiness, poor judgment, blue lips.
> 8 – 10%	Mental failure, nausea, vomiting, fainting, ashen face, blue lips.
>6 - 8%	Loss of consciousness within a few minutes, resuscitation possible if carried out immediately.
0 – 6%	Loss of consciousness almost immediate, death ensues, brain damage even if rescued.

RECORD OF TRAINING I have read and understood the contents of this SMoU:	
Name:	
Signature:	
Date:	