Laboratory Safety Overview

When it comes to doing any experiment or working in *any* lab, chemical hygiene and safety are the ***most important*** considerations. We in the Tonks Lab take safety very seriously and all new members are expected to do the same. Every precaution must be taken to ensure that you and your co-workers are safe at all times. Below are some general safety guidelines; it is your responsibility to read the safe standard operating practices (SOP) for individual procedures. However, before using any instruments or techniques, you need to be trained by those who are responsible for the instruments or other senior graduate students. SOPs are only for reviewing when you have any questions.. Many SOPs will be listed later. Failure to adhere to written policies can result in injury, death or your dismissal from the lab.

A. General Safety Guidelines & PPE

1. Before you start work in the lab, you must **complete all mandated UMN Chemistry safety training**. Also, thoroughly read this document and be familiar with the UMN EH&S website http://www.dehs.umn.edu/

2. Furthermore, you must be **checked out by the Tonks Group safety officer**, so you will know where all of the group safety equipment is located and how to use it.

3. **Proper attire must be worn at all times.** Closed-toed, closed top shoes and long pants are required at all times in the lab in order to protect you from chemical spills and broken glassware. Clothing should be made out of non-flammable materials—100% polyester, Rayon, *etc*. is extremely flammable and thus dangerous in the lab. It is a good idea to keep a spare pair of 'lab clothes' at work, just in case.

4. **Safety glasses must be worn at all times.** No exceptions. Some applications will require additional face protection, such as full goggles or a face shield.

5. **Lab coats are required for all bench/hood experiments, or any time you could be in direct contact with chemicals.** Even if you're just doing a simple organic workup. Lab coats are not required while working in the glovebox. Lab coats should NOT be worn in to the lab office or other 'clean' areas.

6. **Proper gloves should be worn whenever handling chemicals.** Avoid touching door handles, computer keyboards, *etc*. with gloved hands in order to minimize contamination. Gloves should not be worn in to the lab office or other 'clean' areas. When torn, poked, or contaminated by chemicals, gloves need to be replaced with new ones. For choosing gloves, see http://www.ehs.berkeley.edu/workplace-safety/glove-selection-guide

7. **Working alone in the lab:** In an academic lab setting this is sometimes hard to avoid. In cases where no one in the Tonks group is around, you must establish a buddy system with another group member on the 6th floor (Hillmyer, Distefano, Carlson). Also, undergrads should never work in the lab alone.

Reactions that are prohibited during "alone" hours (outside of the glove box):

Large–scale reactions (> 1 g)
Pyrophoric reactions
Potentially explosive or toxic reactions

8. **If you see something, say something.** If you see a coworker doing something unsafe or find unsafe conditions in the lab, correct them! We're all in this together when it comes to safety. However, try and maintain professionalism: be polite, constructive and nonaccusatory. If the behavior or problem persists or there is a question about best practice, bring the issue to Ian.

B. Risk Identification:

In general, before you start a new reaction or follow a procedure from the literature, you need to read the SDS for each reagent you are using. Understand how to deal with the chemicals ahead of time. Here are some common situations that we encounter that require special attention:

1. **Mixing strong oxidants with organics**. Nitric acid, sulfuric acid, aqua regia (H_2SO_4/HCl) and pirhana (H_2SO_4/H_2O_2) *etc*. solutions should NEVER be put in contact with significant quantities of organics or be put in the same waste container as organic waste.

2. **Liquid oxygen.** Unexplained pale blue liquid in your cold traps? O_2 will condense at LN_2 temperatures, and is a significant explosion risk when trace organics are around. The best way to deal with liquid O_2 is to put up a blast shield and walk away. If you take down an LN_2 dewar and see liquid O_2, quickly put the dewar back up, leave the vacuum *on*, and let the O_2 and N_2 evaporate over time behind a shield. Make sure you inform your labmates of this potential hazard. Similarly, Ar is a solid at LN_2 temperatures and is also an expansion/explosion hazard. One of the most common laboratory mistakes that results in liquid O_2 is cooling a *closed system* with LN_2. Any leak in the system will bring the risk of liquid O_2; ***do not cool closed/static systems with LN_2.*** Especially vacuum transfers of solvents/reagents.

3. **Potential explosives.** Perchlorate salts, azides, diazoalkanes, hydrazines. DO NOT work with these materials unless you have discussed it with Ian and developed a plan (small scale, for example) to limit any risk.

4. **Extremely toxic compounds.** Alkyl mercury salts, thallium salts, alkyl tin compounds, cyanide salts, hydrazines. DO NOT work with these materials unless you have discussed it with Ian. Find alternative reagents; these will only be considered as an absolute last resort.

By signing below, you indicate that you have read and understand the content of this document.

Name: _____ Date: _____