Landes/Link Lab Safety and Best Practices

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Safety Training at Rice

• Mandatory annual requirement
  • General lab safety
  • Laser safety
• Landes/Link Labs
  • Must read safety manual then sign the sheet
• Lab Safety Officers
  • Joey (Landes)
  • Sergio (Link)
• Laser Safety Officers
  • Lydia (Landes)
  • Man-Nung (Link)

Safety Manual page 17
Keep MSDS Sheets Up to Date

- Know where to find MSDS sheets
- Keep the binder up to date

DBH 133  
Space Science Wet Lab

Safety Manual page 19
Use Personal Protective Equipment (PPE)

• Long pants and closed toed shows should be worn in lab at all times
• Safety glasses should be worn at all times in any room with a compressed gas cylinder
• Lab coats should be worn when working with dangerous chemicals
  • Consult MSDS sheets
Wear Appropriate Gloves

Be mindful of why you are wearing gloves

- Latex
  - Bases, alcohols, dilute solutions, aldehydes, ketones
- Nitrile
  - Oils, greases, aliphatic compounds
- Chloroprene
  - Acids, bases, alcohols
  - Compatibility charts

Dell Butcher 130
Acids and Bases

• These are strongly corrosive
• Bulk quantities (> 1 L) should always be handled in the hood
  • Small quantities can be used outside of the hood only when necessary
• Where appropriate gloves and glasses as well as a lab coat when handling concentrated acids and bases
• Ammonium hydroxide is a strong bronchial irritant and even small quantities should be handled in the hood
• Do not mix acid and base waste
• Nitric acid is an oxidizer
• Always pour acid/base into water

• If you unsure about anything, consult a senior student
Acid/Base Spills

• Spilled strong acid or base needs to be neutralized before cleanup
Use Safe Practices with Gas Cylinders

- We have compressed nitrogen and oxygen
- Always use a cart when handling cylinders.
- Always close the tank at the main valve
- Clearly label empty tanks
- Secure them to an appropriate rack
Chemical Labeling

- Proper labeling is mandatory for all samples (NO EXCEPTIONS). Include:
  - Contents
  - Date
  - Solvent (if applicable)
  - Initials

Example of how not to do it

Proper Chemical Labeling

Safety Manual page 26
Chemical Labeling

• Proper labeling is also mandatory for ordered chemicals, solvents, proteins, etc. Include:
  – Received date
  – Opened date
  – Initials

Example of how not to do it

Proper labeling
Chemical Storage

• Proper storage is required for all chemicals following the procedures of the Safety Manual (Page 43):

  – Solids
    • Oxidizers
    • Flammables
    • Water reactives
    • Others

  – Gases
    • Toxic
    • Oxidizers
    • Flammable

  – Liquids
    • Acids
    • Oxidizers
    • Flammable/combustible
    • Corrosive materials
    • Perchloric acid
Chemical Storage

Chemical incompatibility table

<table>
<thead>
<tr>
<th></th>
<th>Acids, inorganic</th>
<th>Acids, oxidizing</th>
<th>Acids, organic (bases)</th>
<th>Oxidizers</th>
<th>Poisons, inorganic</th>
<th>Poisons, organic</th>
<th>Water-reactives</th>
<th>Organic solvents</th>
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<td>Acids, inorganic</td>
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<td>Acids, oxidizing</td>
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</tr>
<tr>
<td>Acids, organic</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Alkaline (bases)</td>
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<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<td>Oxidizers</td>
<td></td>
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<td></td>
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<td>X</td>
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<tr>
<td>Poisons, inorganic</td>
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<td>Water-reactives</td>
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<tr>
<td>Organic solvents</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

X = Not compatible—do not store together
Chemical Transport

• Secondary containers (rubberized buckets) are required to transport glass bottles
• If several bottles must be carried at once, a utility cart with a simple polypropylene tray will do the job
• Wear appropriate PPE equipment when transporting chemicals
Chemical Transport

• These rubberized containers are located next to the glass waste in Space Science
Waste Disposal

• Waste should be properly disposed according to its nature:
  – Aqueous
  – Organic
  – Biohazard
    • Sharps
    • Proteins, Nucleic Acids, etc
  – Glass
    • Broken
    • Bottles

• After disposing, write down the chemical and quantity that has been disposed (for aqueous and organic waste)
Waste Disposal (Space Science)

Aqueous waste

Organic waste

Biohazard waste (sharps)

Broken glass (only)
Waste Disposal (DBH 130)

Aqueous waste

Organic waste

Glass waste, regular waste & biohazard waste (in contact with bio samples)

Secondary transport containers
Laboratory Safety Apparatus

• These include:
  – Safety showers
  – Eye wash stations
  – Fire extinguishers
  – First aid kit
  – Chemical Spill kits
Location of Safety Apparatus (Space Science)

- Fire extinguishers
- Safety shower & eye wash station
- Chemical Spill Kits
Dell Butcher 100

Fire extinguishers

Inside the wet lab

Right outside the office
Dell Butcher 130

Fire extinguishers, safety shower & eye wash station

First aid kit

Chemical Spill Kit
Emergency Exit

Basement of Space Science (Northeast wing of the building)
Lab cleanliness

- Big o' pile of Kimwipes/trash
- Glass left open
- More trash on bench
- Lab notebook left on bench
- Personal sample left out
- Lab notebook left on bench
Lab cleanliness: How it should look
Lab cleanliness

- Soldering iron left on
- Samples left uncovered
- Trash left on bench
- Unlabeled solution in syringe
- Pipette in wrong place
- Uncovered razor blade
Lab cleanliness: How it should look

- **Why?:**
  - Anyone can use this space without being a maid/janitor for 10 minutes
  - Respectful to other lab members
  - No one is your mom. We’re not picking up after you
Just Stop

Stop and Think
Before you leave for the day...

• Clean all the benchtops you used?
• Is the balance/pH meter/hot plate/etc. turned off and cleaned? ($$$ stuff!)
• Chemicals/glass disposed of/stored appropriately?
• All pipettes, tips, scissors, tape, glass, chambers, etc. back where they belong?
• Everything in your personal drawer?

It should look the same as it did when you came in
Personal storage

• Everyone should have their own personal drawer

• Keep your stuff there – not the benchtop!
Chemical storage in your drawers

• Be conscious of the chemical you have in there (nothing flammable, oxidizers, etc. that should be stored w/ like chemicals)

• Use appropriate glassware
  – For example, don’t use parafilm for long term storage (possible corrosion/opening)
  – Volumetric flasks should not be used to store buffers (salt seals glass stopper shut!)
Lab notebook

• Ideally:
  – Pages should be numbered
  – All entries dated
  – Include location where data is saved
  – Write a TOC on first page for important procedures, dilutions, experiments, etc.
  – No shorthand/unidentifiable abbreviations

• Why? Lab notebooks will likely be used by your labmates to repeat methods/analyze data

• Don’t take lab notebook home! Use copier in DBH 133
Sharing Microscope

- There are two slots on each day. Using Google Calendar to sign up the instrument time.
- Sign up the instrument on Friday for the following week. If the slots are opened on Monday, you can sign up without restriction.
Sharing Microscope

- Everyone can initially sign up for a maximum of 3 slots for week days (Mon~Fri). No consecutive slots can be signed up for during week days but there is no restriction on the weekend. If you need two slots on the same day, please do the measurement on the weekend or talk to Bosses to get permission.
Sharing Microscope

• All sample preparation should be finished prior to the measurement to save instrument time.
• Everyone needs to be on time for their time slot. Communicate with each other to ensure a smooth transition between users.
• You are responsible for making sure that the instrument/room/laser are running up to spec.
• Log in/out the log book of instrument/laser.
• If there is a problem with the instrument when you first start to use it, contact the previous user right away to jointly determine the cause.
Sharing Microscope

• There is a list of things that should never be touched.... Don’t touch them! Please see Wei-Shun for clarification of this issue.
Sharing Microscope

• Don’t share optics between different room. If you need some optics to test an experiment, you need to notify the users and return it back after the test.

• Clean up the desk and optical table after your experiment is done. Don’t leave your sample near the instruments.
Data Storage

• For Link group, transfer your experimental data to shared drive which is backup daily.
• For FCS and wide-field image data, save the data in the local drive which is backup by the USB drive for each instrument.
• Never save FCS or wide field image data on shared drive. Using the internet drive to transfer these data if necessary.
• Save all important documents in the shared drive.
Handling Optics

• Always handle optics with gloves.
• Label optics on the holder and optics itself, especially for lenses and filters.
Handling Optics

• Don’t let optics lay on the optical table to accumulate dust. Put them back into the box or have them vertically aligned on the optical table.
• Always put back the tools to the original holder, for example screwdriver, allen keys, etc.
Laser Safety
Requirements

• Watch the laser safety video on Coherent website
• Take the laser safety quiz on the website
• Read through lab-specific safety procedure/manual
• Take Rice's laser safety class
Classification

- **Class 1**
  - No hazard
  - Laser printer, CD drives

- **Class 2**
  - Visible < 1 mW
  - Barcode scanner

- **Class 3a**
  - 1-5 mW
  - Laser pointer

- **Class 3b**
  - 5-500 mW

- **Class 4**
  - > 500 mW
Laser in Landes lab

Solid state laser
532 nm
100 mW
Class 3b

Diode laser
637 nm
100 mW
Class 3b
### Laser in Link lab
#### Class 3b

<table>
<thead>
<tr>
<th>Location</th>
<th>DBH100</th>
<th>SS016A</th>
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<tbody>
<tr>
<td>Type</td>
<td>Argon</td>
<td>Helium-Neon</td>
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<tr>
<td>Wavelength</td>
<td>458 nm, 488 nm, 514 nm, 632 nm</td>
<td>785 nm</td>
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<tr>
<td>Power</td>
<td>400 mW</td>
<td>35 mW</td>
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<tr>
<td>Location</td>
<td>DBH100</td>
<td>SS016A</td>
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<tr>
<td>--------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Type</td>
<td>broadband white light laser</td>
<td>Diode-Pumped Solid-State</td>
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<tr>
<td>Wavelength</td>
<td>480 - 2000 nm</td>
<td>532 nm</td>
</tr>
<tr>
<td>Power</td>
<td>8 W</td>
<td>6 W</td>
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</tbody>
</table>

![Laser in Link lab](image-url)
Eye protection

• Damages and wavelength
  – Cornea: mid and far IR, mid UV
  – Lens: near UV
  – Retina: 400-1400 nm
Eye protection

- Goggle
  - For specific wavelength

180-450 nm OD 6+
770-1800 nm OD 2+
820-1720 nm OD 3+
870-1600 nm OD 4+
940-1070 nm OD 5+

190-449 nm OD 5+ (10^-5)
450-532 nm OD 6+
Skin protection

- Stratum Coreum
- Stratum Malpighi (1st Degree Burn Area)
- Derma (2nd Degree Burn Area)
- Subcutis (3rd Degree Burn Area)
Safety tips

• Use safety glasses
• Do not have your eye at the same level as the beam
• Remove watches, rings, jewels, etc
• Align laser at low power
• Provide enclosures for beam paths whenever possible
• Block laser beam
• The height of seat in laser lab should be appropriate
Use proper power meter

10 W

500 mW