CHEMICAL LABORATORY

1. **Keep the chemical lab clean**

   Never leave any samples (even those organized in boxes, etc.) on the lab bench top or in the fume hood.

   Reasons:

   - The next person needs to use the same working spaces
   - The next person does not know what chemical you have been working with
   - The next person does not know how dangerous your chemical is
   - You may block the ventilation of the fume hood

2. **Know your chemicals**

   - Be cautious unless you are very confident about the chemical
   - Read the MSDS (Materials Safety Data Sheet).
     If not still with your product find it at *jr.chemwatch.net* or at
     www.rivm.nl/rvs/stoffen/prio/totale_prior_stoffenlijst.jsp (in Dutch)

     Especially be on the lookout for
     - carcinogenicity
     - toxicity
     - lachrymators,
     - reactivity toward water
     - reactivity toward oxygen
     - acidity / basicity
     - oxidizing / reducing agent

3. **Stocking your chemicals**

   - **Preparing for stockage**
     - Take one of designated boxes (green and yellow in the lab fridge)
     - label the box
     - label any chemical/sample you put in the box
     - make a list of the chemicals and store it in the box
     - Leave a copy of the list with either your FELIX host or with Britta, Jos or Anouk, so that it can be added to the general inventory.
       - unlabeled or inappropriately stored chemicals will be thrown away
       - throw out stock solutions of common/cheap substances, there is simply no space to store everything
       - throw out all ESI solutions you don't have explicit plans to use again

   - **Organization of the chemical inventory**

     Stock chemicals are found (organized) in the yellow cabinet, the fridge and the freezer. Please pay attention to the organization of chemicals as you find them.
     - Alphabetic ordering: return chemicals to their original location
     - For safety reasons concentrated strong acids and bases, strong oxidizing or reducing agents, etc. are stored in their own trays in the yellow cabinet
     - Three boxes in the yellow cabinet are earmarked for chemical transfers via logistics. Use them for:
       - Incoming ordered chemicals
       - Chemicals you want to return to the tracelab

4. Disposing of your chemicals

a) Non-halogenated organic waste

Generally, non-halogenated organic and (aqueous solutions containing organics) waste should always be disposed of in the designated container kept in the fume hood.
If you see that this container is getting full, order a new one via Tracelab: (#10008989, afvalvat 5 L)

Figure 1: storage container for non-halogenated waste. Fill them only up to the line (this one is almost there)

b) Halogenated organic waste

In general we should avoid generating this waste as a rule.

c) Acids (concentrated)

- Always work under the fume hood
- Always wear protective gloves and safety goggles
- When done with acids, dilute them well by pouring them into a large beaker full of water (NOT the other way round!) and throw them down the sink.
  This is OK for common acids such as HCl, H_2SO_4, but not for oxidizing acids like $HClO_4$. Seek advise for this and other acids.

d) Dry waste: powders, used towels, pipettes, gloves

- Trash any consumables in the dedicated waste bin, and close the vessel well
- If the vessel is full, bring it to Logistics
- Make sure the vessel is appropriately labeled
- Make sure to order a new vessel in time (via Tracelab: Arjan, Britta, Anouk, Jos)

e) Empty solvent containers (methanol, ethanol, water)

- Leave them opened for about a day under the fume hood to evaporate the last bit
- Erase the toxicity signs on the lable indicating that it is no longer chemical hazardous waste
- Throw out the glass bottle in the glass container in the basement (FEL -2)
- Plastic 5 liter vessels can be re-used as waste containers, provided that the proper labeling is followed.
  - Procedure for toluene, benzene?
  - Procedure for CCl_4? Don't use them?

Figure 2 Vessel for solid chemical waste

More info on chemical waste disposal can be found at

Afvalstoffenregeling voor FNWI (mrt 2014) (Dutch):
http://www.ru.nl/publish/pages/638023/afvalstoffenregeling_fnwi_def_mrt_2014.pdf

Waste Management Regulation FNWI (English):
http://www.ru.nl/publish/pages/638023/waste_management_regulation_fnwi.pdf

Lozen van vloeistoffen afkomstig van laboratoria (Dutch):
http://www.ru.nl/publish/pages/527178/lozen_van_vloeistoffen_van_laboratioria_jan_2013.pdf

5. Good practice

- **Gloves**
  - At all times, but especially when dealing with dangerous substances
- **Safety goggles**
  - At all times, but especially when dealing with dangerous substances
- **Fume hood**
  - Keep lowered: this serves to prevent you from inhaling toxic fumes
- **Stock Solvents**
  - Prevent stock solvent contamination:
    - use small Duran bottles for solvents (100 or 250ml with blue caps). Find them in the cabinet below the fume hood, right hand side.
    - Never pipet directly from the stock bottle
  - Economize: use the quality of solvent your experiment requires, but don't use too high-purity solvents: they are very expensive.
- **Tools used**
  - Spatulas, spoons, **scales**
    - Clean thoroughly after use with technical ethanol and paper towels
  - Glasswork
    - Dispose of contents properly (see section on disposal)
    - Clean thoroughly with water, soap and brushes
    - Then rinse them with water (5 times!)
    - Dry them on the drying board behind the sink
- **Transporting samples**
  - Always transport chemicals (solute or solids) in **closed** containers outside the fume hood

- **Equipment**

  - Know their limitations (i.e., read the manual!)
  - Clean after use

6. Common supplies/Ordering

There are many common laboratory supplies that we all require on a daily basis (gloves, Kimtech wipes, solvents, pipette tips, vials, etc.).
You are responsible for making sure the next guy can also work with them. If stuff is running out make sure it will be re-ordered.
Provide the following to your Tracelab ordering capable person;

- Item description
- Quantity
- Supplier
- Supplier part number
- Price

Here is a list of some frequently ordered items:

Item		Reseller	Seller's item #	Prize	Quantity
Waste container (liquids)	5 L	Tracelab	10008989		
Waste container (solids)	55L	Tracelab	10008991		
Gloves	S				
	M				
	L				
Kimtech wipes	S				
	L				
Pipette tips	1-10 u μ l				
	10-100 ul				
	100-1000 ul				
	0.1-5 ml				
Technical solvents					
	methanol				
	ethanol				
	acetone				
	isopropanol				
Higher-purity (HPLC grade) solvents					
	acetonitrile				
	water				
	methanol				
Formic acid					
Acetic acid					
Ammonium hydroxide					
Vials and caps					
Syringes (FT-ICR)					

7. **Where to store what?**
    - Yellow cabinet outside chemical lab
        - Stock solvents, 2.5L or 1L bottles
    - Cabinet under fume hood
        - Small volume 1-time use solvent bottles
        - Vials
        -
    - Fume hood
        - Temporary storage of (almost) empty containers where solvents need to evaporate.
        - No longer than 1 day (please put your name on it in case you will forget them)
    - Work bench
        - Surface:
            1. Gloves,
            2. Paper towels (KimWipes)
            3. Pipette tips
        - Drawers
            1. Pipette tips
            2. Pipettes
            3. Stirs

LASER DYES

A special chapter on laser dyes, as the quantities in which they are used leads to large quantities of waste and, alas, often to a mess…

Figure 3 Laser dye waste vessel with appropriate label

1. Empty ethanol and methanol bottles
   - Let all residual ethanol evaporate in a fume hood
   - Rinse with water
   - Erase toxicity signs on label
   - Throw in glass container (located at -2 level)

2. Solvated dye mixtures
   - Pour in plastic waste container (5 liters capacity)
   - Do not overfill, maximally to the "fill-to"-line!!
   - The container must be labeled with the correct "chemical waste stickers, indicating "non-halogenated organic" waste (see picture!)
   - Store the waste containers in the ventilated cabinet in user station XX (laser lab at level FX-2, first station on the right)
   - If there are 6 full waste containers, they must be brought to Logistics Center
   - Make sure to order a new containers and stickers in time (via Tracelab: Arjan, Britta, Anouk, Jos)

Figure 4 Vessel for solid laser dye contaminated waste

3. Used tools (scales,spatulas,bottom of fumehood)
   - Clean thoroughly with (technical) ethanol until no dye comes off any more
   - The ethanol and paper towels used should be treated as chemical waste! See 4)
   - Rinse with water
   - Put spatulas back in the labeled glass.

4. Used consumables (latex gloves, paper towels, empty dye containers)
   - Trash any laser dye contaminated consumables in the dedicated waste bin, and close the vessel well
   - If the vessel is full, bring it to Logistics
   - Make sure the vessel is appropriately labeled
   - Make sure to order a new vessel in time (via Tracelab: Arjan, Britta, Anouk, Jos)

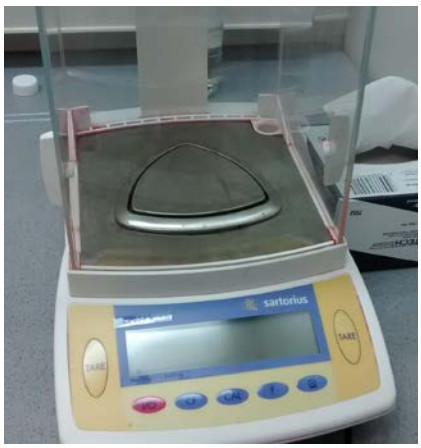

Figure 5: How it should not be done..(dye stains all over the scales).

5. A special note on powdered dyes
   - Dyes are fine powder that easily gets dispersed around the fume hood and on the balance without realizing it. Clean the surface and the scales thoroughly after mixing the dye, and ensure using ethanol that all is clean

Storage of dye related products (not waste)

Ready-made laser dyes (premixed dyes)

- Store dyes in plastic containers and label the container with
  - Dye name
  - Solvent
  - Preparation date
  - Concentration
  - Intended use (laser model, oscillator/amplifier)
  - Your name
- Store the dyes in the upright standing cabinet in user station XX
- Please label the dye bottles using the "waste" stickers that are in a plastic folder attached to the inside of the door.

Figure 6 Cabinet where laser dye, premixed laser dyes and liquid laser dye waste are stored

Solvents

- The solvents for preparing dye (methanol, ethanol, isopropanol, etc) are stored in the low yellow cabinet below the fume hood in the -2 lab (Figure 7). Since most of these solvents are also used for other purposes, they may also be found in the cabinet upstairs.

Laser dye (powdered)

- Powdered laser dyes are all stored on the top shelf of the tall yellow cabinet in the -2 lab (Figure 6). We distinguish between three different categories of dyes: Red dyes (such as Rhodamine and DCM), yellow dyes (mostly coumarines) and stilbenes. Every category has its own labeled red box for storage. If you empty a laser dye please notify XX, so that new dye can be ordered.

Figure 7: Cabinet to store ethanol for laser dyes

Ordering information

Ethanol: oracle - Alcohol-ethanol 100pct.zuiver per 5ltr 06070106 vrijdom nr3

Waste container solids: tracelab – afvalton 55 L (voor vast chemisch afval, bruin kunststof) 10008991

Waste container liquids: tracelab – afvalvat 5 L (voor vloeibaar chemisch afval) 10008989

Kasten labelen