# Lab 1033 Safety Plan

**8/25/2022**

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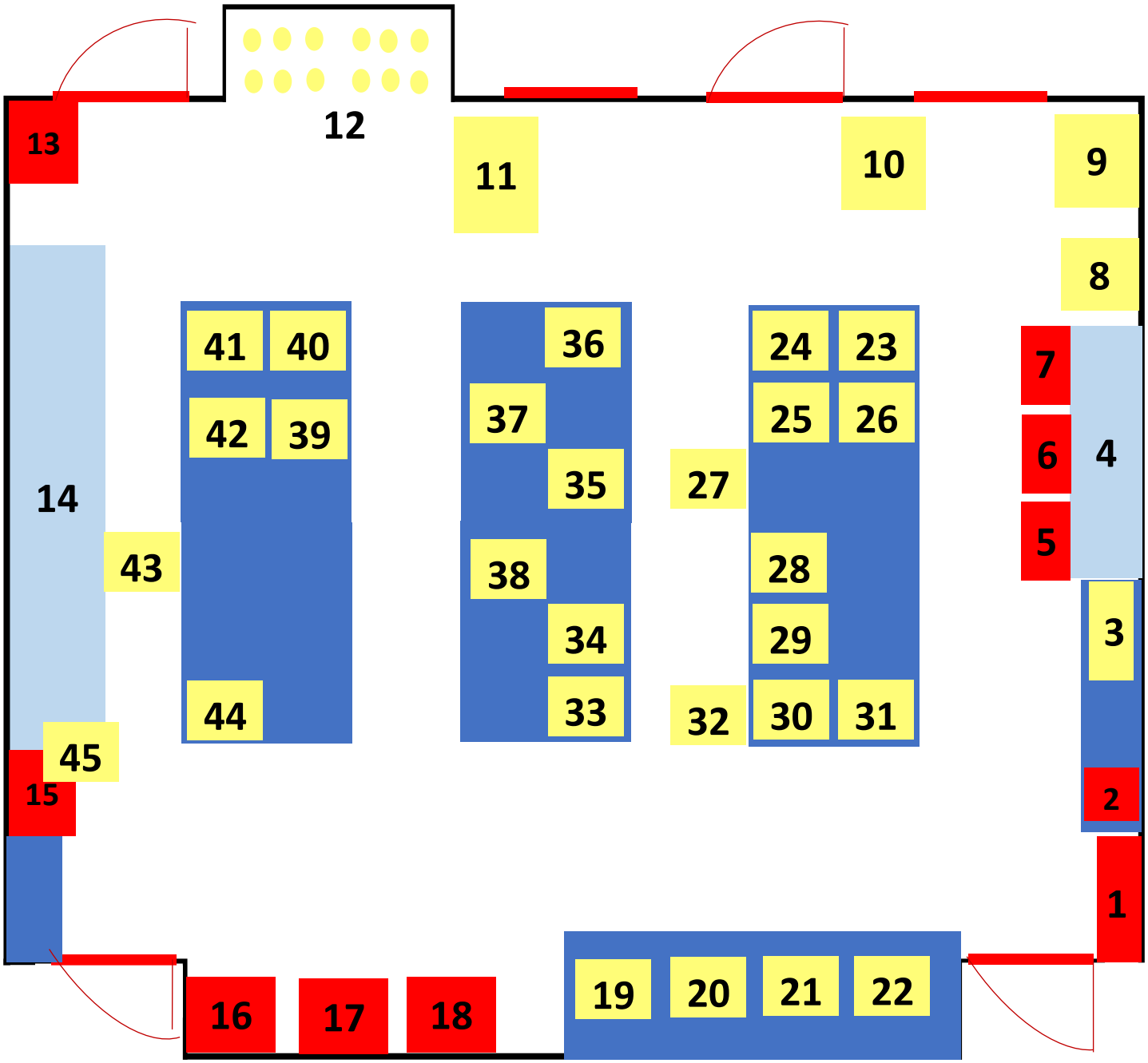
**Chemical Engineering Laboratory RBN 1033**



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## 2 Responsible parties for the laboratory locations

| | |
|---|---|
| Dr. Fernando Resende | 206-617-8440 |
| Dr. Aaditya Khanal | 832-607-1689 |
| Dr. Carla Lacerda | 970-672-7752 |
| Dr. Zishu Cao | 513-356-3676 |

## 3 Emergency contact information

**University Police**

Emergency – 911

Non-Emergency – 903-566-7300

**Environmental Health and Safety**

Emergencies (24 hrs/day, 7 days/week) – 903-566-7011

**Facilities**

Any Time – 903-566-7060

**AFTER** emergency is reported, contact one of the responsible parties above.

## 4 Location of SDSs, Chemical Hygiene Plan and any other laboratory documents

| | |
|---|---|
| Safety Data Sheets | https://uttyler.bioraft.com/raft/research_tools/SDS |
| Chemical Inventory | https://uttyler.bioraft.com/ |
| Chemical Hygiene Plan | https://www.uttyler.edu/safety/files/chemical-hygiene-plan.pdf |
| Laboratory Safety Manual | https://www.uttyler.edu/safety/files/laboratory-safety-policy.pdf |
| Waste Pickup Requests | https://uttyler.bioraft.com/ |

## 5 Identification of chemical and biological hazards in the laboratory

| Hazard | Specific Name | Location | Mitigation | References |
|---|---|---|---|---|
| Flammability | Acetone, Ethanol, Methanol, Hexane, Propanol, Butanol, Decane, Ethyl Acetate | Flammables cabinet | Use of hood, PPE | SDS, spill containment |
| Acid | Acetic Acid, Hydrochloric Acid, Formic Acid, Propionic Acid | Acid storage locations | Use of hood, PPE | SDS, spill containment |
| Base | Sodium Hydroxide, Potassium Hydroxide | Base storage cabinets | Use of hood, PPE | SDS, spill containment |
| Corrosive | Hydrogen Peroxide, Cerium Nitrate | Corrosive storage location | Use of hood, PPE | SDS, spill containment |
| Biologicals | Cell cultures | $CO_2$ incubators and -80 freezer | Use of bio hood, PPE | Cell datasheet |
| Gas release | Carbon dioxide, Hydrogen | Gas cylinders | Use of purge, PPE | SDS, ventilation |

## 6 Identification of physical hazards in the laboratory

| Hazard | Specific Unit | Mitigation | References |
|---|---|---|---|
| Low Temperature | -80 freezer, lyophilizer | Use of PPE | User manual |
| High Temperature | Hot plates, all reactors, distillation column, heat exchange apparatuses | Use of PPE | User manual |
| Pressure | Gas cylinders, high pressure reactor | Use of PPE | User manual |
| Puncture | Bioprinter needles, broken glass | Use of PPE | User manual |
| Electrical | All equipment | Use of PPE | User manual |

## 7 Clean-up procedures in case of a spill

To determine whether a spill is simple or complex, you need to know (1) the hazard posed by the spilled chemical and (2) the spill's potential impact. Both these factors are, in large part, determined by the spill's size. The following information will help you determine whether you have a simple spill:

- the type of chemical(s) spilled,
- the amount (< 1 L),
- the hazardous characteristics of the spilled chemical,
- the location,
- the proper method for cleaning up the spill,
- the personal protective equipment available, and
- the training of the laboratory's personnel.

For simple spills, emergency responders do not need to be notified. However, you should contact the environmental health and safety office or other responsible person within your facility. Most importantly, before cleaning up a simple spill, be sure that you can do so safely. You must have the right personal protective equipment, including, at a minimum, appropriate eye protection, protective gloves, and a lab coat. Additional protective equipment may be required for spills that present special hazards (such as corrosive or reactive spills or spills that have a splash potential). The following steps should be taken during spill cleanup:

**a. Prevent the spread of dusts and vapors.**

If the substance is volatile or can produce airborne dusts, close the laboratory door and increase ventilation (through fume hoods, for example) to prevent the spread of dusts and vapors to other areas.

**b. Neutralize acids and bases, if possible.**

Spills of most liquid acids or bases, once neutralized, can be mopped up and rinsed down the drain (to the sanitary sewer). However, be careful because the neutralization process is often vigorous, causing splashes and yielding large amounts of heat. Neutralize acids with soda ash or sodium bicarbonate. Bases can be neutralized with citric acid or ascorbic acid. Use pH paper to determine when acid or base spills have been neutralized.

**c. Control the spread of the liquid.**

Contain the spill with the spill kit materials located under the lab sink. Make a dike around the outside edges of the spill. Use absorbent materials such as vermiculite, cat litter, or spill pillows.

**d. Absorb the liquid.**

Add absorbents to the spill, working from the spill's outer edges toward the center. Absorbent materials, such as cat litter or vermiculite, are relatively inexpensive and work well, although they are messy. Spill pillows are not as messy as other absorbents, but they are more expensive. Note that special absorbents are required for chemicals such as hydrofluoric and concentrated sulfuric acids.

**e. Collect and contain the cleanup residues.**

The neutralized spill residue or the absorbent should be scooped, swept, or otherwise placed into a plastic bucket or other container. For dry powders or liquids absorbed to dryness, double bag the residue using plastic bags. Additional packaging may be required before the wastes can be transported from your laboratory. For spills of powders or solid materials, you may need to add a dust suppressant. Be sure to place descriptive labels on each container.

**f. Dispose of the wastes.**

Keep cleanup materials separate from normal trash. Contact your environmental health and safety officer for guidance in packaging and labeling cleanup residues. Promptly place cleanup wastes in an appropriate hazardous waste receptacle.

**g. Decontaminate the area and affected equipment.**

Ventilating the spill area may be necessary. Open windows or use a fan unless the area is under negative pressure. In some instances, your environmental health and safety officer can test the air to ensure that hazardous vapors are gone. For most spills, conventional cleaning products, applied with a mop or sponge, will provide adequate decontamination. If you have any question about the suitability of a decontaminating agent, seek expert advice.

## 8 Guidance on what to do in a case of emergency (e.g. fire, medical emergency, severe weather, etc.)

### FIRE EMERGENCY GUIDANCE

- If there is ever immediate danger to your person, leave laboratory immediately and call 911.
- In this laboratory, possible fires will require the use of lab fire extinguisher (see map for location).
- If the building fire alarm sounds, follow emergency shutdown procedures for all running equipment and leave the building through the nearest exit.

### MEDICAL EMERGENCY GUIDANCE

- Know the first aid treatment for the potential hazards of your equipment that may cause bodily injury or chemical exposure. For example, some liquids when exposed to the skin should be washed with water and some should not. KNOW THE HAZARDS YOU ARE DEALING WITH BEFORE AN EMERGENCY.
- For minor physical injuries, the first aid kit is located in the sink area cabinet (see map).
- If exposed to liquid chemicals, follow directions on SDS. If you suffer any acute symptoms call 911.
- If exposed to vapors, leave area and go outside for fresh air. If you suffer any acute symptoms call 911.
- If you are uncertain of what to do due to an exposure to a particular substance, call EH&S emergency number: 903-566-7011

### SEVERE WEATHER EMERGENCY GUIDANCE

- -RBN 1034 or basement restrooms

# Notices for Lab 1033

**Since 1033 is a SHARED space, the following personal protection equipment is required at all times:**
**Goggles**
**Gloves**
**Closed Toe Shoes**
**Lab Coat**

All personnel in the laboratory areas must be familiar each instrument operation. This includes on the job training on each instrument. DO NOT ATTEMPT TO USE any lab instrument without proper training by CHEN faculty.

## 9 SOPs for laboratory 1033

### 1.First Aid Cabinet

- Item # on lab map: **1**
- Use: **ALL**

**Emergency Care:**

In the event of any injury or illness where medical assistance is needed, and for all life-threatening emergencies, immediately call 911.

*Blood and Body Fluid Exposures/Infectious Agents Exposures*

If you are exposed to an infectious agent by a needlestick or glass sharp it may be necessary to seek medical counsel immediately. For some high risk exposures, the CDC recommends prophylactic drug treatment be initiated within 1 to 2 hours of the exposure. Follow up with lab personnel after proper medical advice is sought.

**Non-emergency Care:**

You may also seek medical attention at the UT Tyler Health Clinic or at the closest available medical facility through your own healthcare provider.

*Burns*

For severe burns call 911 immediately and do not attempt to remove charred clothing. For minor burns, soak in cold water until the pain stops. Do not break any blisters. Wrap the burned area to protect from infection. Seek medical attention if necessary.

*Cryogenic Burns/Frostbite*

Remove any clothing that is not frozen to the skin. Do not rub the affected tissues. Re-warm the affected area as quickly as possible by immersing it in warm, but not hot, water (not above 40°C). Do not apply heat lamps. Do not break any blisters. Seek medical attention.

*Cuts*

Wear gloves when treating someone with a puncture wound or cut. Cleanse the wound with soap and water, then pat with clean towel to dry. Apply antibiotic ointment to the wound and bandage to prevent contamination. Seek medical attention if necessary.

*Exposures to Infectious Agents*

For all injuries or possible exposure to infectious materials (e.g., face or eye splash, cut or puncture with sharps, contact with skin), encourage needle sticks and cuts to bleed, gently wash with soap and water for 5 minutes; flush splashes to the nose, mouth, or skin, with water; and flush eyes at the nearest eyewash station with clean water for 15 minutes. If emergency medical assistance is required, call 911.

## 2. Eye Wash and Shower Stations

- Item # on lab map: **2 and 15**
- Use: **ALL**

### General Chemical Exposure Procedures

Immediately flush affected areas with water *for no less than 15 minutes*. For larger splashes the safety shower should be used. While rinsing, quickly remove all contaminated clothing or jewelry. Use caution when removing pullover shirts or sweaters to prevent further contamination of the eyes. Immediately flush the eyes at an emergency eyewash station for at least 15 minutes. Remove contact lenses, if you are wearing them. Check the Safety Data Sheet to determine if any delayed effects should be expected. Seek medical attention as needed.

Discard contaminated clothing or launder them separately from other clothing. Leather garments or accessories cannot be decontaminated and should be discarded.

### Chemicals in Eyes

Most standard sources recommend that water rinsing/flushing following skin or eye contact with a chemical should continue for 15 or 20 minutes. However, all chemicals do not cause the same degree of effects (some are non-irritants while others can cause severe corrosive injury). Tailor the duration of flushing to the known effects of the chemical or product, as follows:

- Remove contact lenses, if wearing them
- 5 minutes for non-irritants or mild irritants
- 15-20 minutes for moderate to severe irritants and chemicals that cause acute toxicity if absorbed through the skin
- 30 minutes for most corrosives
- 60 minutes for strong alkalis (e.g. sodium, potassium or calcium hydroxide)
- Seek medical attention

It is important that water flushing start immediately following skin or eye contact with a chemical. It is better if complete water flushing occurs on-site. However, moving the victim to an emergency care facility earlier may be necessary depending on the victim's condition (e.g. compromised airways, breathing or circulation) and/or the availability of a suitable water supply. If it is necessary to transport the victim before completing flushing on-site, flushing should continue during emergency transport, taking proper precautions to protect emergency services personnel. There may also be an SDS recommended cleansing agent (e.g. non-abrasive soap) if appropriate, if water is inappropriate.

## 3. Water Purification System

- Item # on lab map: **3**
- Manufacturer and Model: **Milli Q IQ 7005**
- Use: **ALL**

### Accidental Release Procedures

This equipment processes and stores large volumes of purified water. Follow procedures for chemical spill containment as detailed on pages 6-7. Any accidental release is pure water.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

To avoid electrical shock and personal injury:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Do not mount directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard.
3. Replace fuses with those of the same type and rating.
4. Disconnect from the power supply prior to maintenance and servicing.
5. Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such materials.
6. This device is to be used with water feeds only. Cleaning agents must be used in compliance with instructions in this manual. Failure to comply with the above could result in explosion and personal injury.
7. Avoid splashing cleaning solutions on clothing or skin.
8. Ensure all piping connections are tight to avoid leaks.
9. Ensure adequate ventilation.
10. Depressurize system prior to removing the cartridge pack. A full cartridge pack may weigh 20 lbs.
11. Refer servicing to qualified personnel.
12. “Wet floor” warnings should be displayed when appropriate.
13. Electrical devices in the vicinity of the equipment must be suitable for use in wet environments or be properly protected from wetting.

## 4.Fume Hoods

- Item # on lab map: **4 and 14**
- Manufacturer and Model: **Fisherbrand Fume Hoods**
- Use: **ALL**

### Accidental Release Procedures

This equipment is where large volumes of highly volatile liquids typically generating hazardous fumes are handled. Follow procedures for chemical spill containment as detailed on pages 6-7 if necessary. Any accidental gas release must be ventilated immediately. Ensure hood is certified and handling airflow as expected.

### Protocols

- Verify the exhaust system is operating before each use.
- Verify operation of the fume hood alarm before each use by opening the sash.
- Close the sash as much as possible when working at the fume hood - use the glass as a face shield.
- Close the sash completely when not working at the fume hood.
- Avoid placing your head inside the fume hood.
- Avoid rapid movements in front of and inside the fume hood. This can cause air current to draw contaminants out of the fume hood.
- Avoid raising the sash too quickly.
- Never work with sashes set higher than the established working height.
- Turn on the lights. Good illumination will reduce eyestrain.
- Do not block airflow.
- Never store large quantities of chemicals in the fume hood. Chemical containers block airflow and create unnecessary hazards. Use cabinets designed to store chemicals instead.
- Clean up chemical spills as soon as possible. Avoid damage to countertops and buildup of large quantities of vapors.
- Avoid heat within the fume hood.
- Baffles should be adjusted by qualified air flow experts or safety officers only.
- Never allow the area immediately in front of a fume hood in use to become a traffic area. Others walking by the hood face will adversely affect containment.
- Avoid filling the hood with excessive equipment or materials. As a rule, no more than 50% of the available work surface should be covered with materials or equipment.

**Fume Hood Alarms**

The low airflow alarm is designed to protect the user from exposing themselves to hazards by alarming when low face velocity is detected. Do not mute the alarm or otherwise defeat its operation. When the alarm sounds immediately close the sash and step away from the hood. If the alarm does not reset itself, evacuate the area and contact facilities. There may be a malfunction in the exhaust system serving the hood.

Under certain circumstances, it may be necessary to raise the sash above the established working height to allow materials and apparatus to enter the hood. In this case, wait two minutes after all hazard generating activity has ceased and all containers of materials are tightly closed. The sash may then be raised as high as needed for setup operations. During this time only, it is safe to temporarily mute the alarm by pressing the enter button.

**Training**

For minimum training on this equipment, consult Dr. Lacerda or your research advisor. Do not attempt to conduct any experiments without proper training.

**Specific guidelines for walk-in fume hood**

A floor-mounted hood is used for large apparatus and storage of containers that pose some hazard, but will not fit into an approved storage cabinet. A floor mounted hood is suitable for the same type of work conducted in bench-top hoods and distillation hoods. Floor mounted hoods are typically equipped with horizontal sliding sashes, although some models are equipped with multiple vertical sliding sashes.

The name “walk-in hood” implies that the hood can be entered; however, the name is a misnomer, as the same safety precautions should be applied to this hood, as those required for a bench-top hood. The hood must never be entered during generation of hazardous materials or while concentrations exist within the enclosure. For this reason, these structures should be designated as floor mounted fume hoods.

Floor mounted hoods are particularly susceptible to variations in face velocity across the opening and room air disturbances due to the large opening area afforded by the hood design. For this reason, it is prudent not to use a floor mounted hood for work with highly toxic materials. It is recommended that only one sash be fully opened during hood operation on floor mounted hoods with multiple sashes. Multiple sashes are to be fully opened during set up only.

**5.Cabinets for acid/alkali storage and waste accumulation area**

- Item # on lab map: **5-7**
- Use: **ALL**
- **Segregate incompatible chemical groups**

**Accidental Release Procedures**

Follow procedures for chemical spill containment as detailed on pages 6-7. By default, contain the spill and make sure it is not mixed. Clear all contents from the cabinet before cleaning the spill. Ensure you have proper PPE and proceed with proper procedures whether it is acid or base.

**Waste Disposal Procedures**

Liquid wastes from this cabinet must be stored segregated in the waste accumulation area. Do not store wastes in the cabinets designated for virgin chemicals. Make sure all wastes are segregated and properly labeled.

**Training**

For minimum training on these cabinets, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

**Waste accumulation area must adhere to the following requirements:**

1. Storage area must be:
    1. Separated from virgin materials.
    2. Maintained and cleaned properly of any spill residues.
    3. Kept neat and orderly and arranged with adequate aisle space to allow access for emergency personnel and equipment.
    4. Equipped with:
        1. Spill response materials.
        2. Fire extinguisher.
        3. Eyewash and shower which are tested weekly.
        4. Water at an adequate volume and pressure to supply water hose streams, or automatic sprinklers.

5. Clearly posted with:
    1. “Hazardous Waste” signage provided by EH&S.
    2. Incompatible Waste chart.
    3. “No Smoking” sign.
    4. Emergency information.
2. Waste containers are labeled with the yellow waste label stating the:
    1. Words “Hazardous Waste”.
    2. Start date, full date, the date the waste enters the accumulation area.
    3. Names of chemicals in the container (not a chemical formula) including approximate volume/concentration.
    4. Appropriate waste characteristics box(s) marked by test or knowledge.
3. Containers:
    1. Must always be closed during storage, except when it is necessary to add or remove waste.
    2. Holding hazardous waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.
    3. Must be in good condition; if it begins to leak, bulge, rust, or is otherwise damaged, place the degraded container into a larger secure container or, if this is not possible, carefully transfer the hazardous waste to a container that is in good condition.
    4. Must be compatible with the waste being stored. Waste must not be placed in the same container or in an unwashed container that previously held an incompatible waste or material.
4. Container storage:
    1. Flammable storage cabinets must be used when storing greater than 25 gallons of flammable waste.
    2. Incompatible wastes must be segregated to the greatest extent using secondary containment distance.
    3. Store potential explosives securely and separately. (peroxides, perchlorates, picrics, etc.)
5. Hazardous Waste Log:
    1. Accumulation area must be inspected weekly.
    2. Download and complete log when waste enters the accumulation area.
    3. Enter date waste is received in accumulation area on container hazardous waste label.

## 8.Anaerobic Tank Reactor

- Item # on lab map: **8**
- Manufacturer and Model: **Armfield BE4**
- Use: **Undergraduate**

### Accidental Release Procedures

This equipment involves handling large volumes of liquid. Follow procedures for chemical spill containment as detailed on pages 6-7.

### Waste Disposal Procedures

Biohazards are generated through use of this equipment. Liquid wastes from this reactor must be treated with 1% bleach before disposed of as liquid wastes, which may or may not contain hazardous chemicals.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

### Wet Environment

The equipment requires a header tank containing water. During use it is possible that there will be some spillage.

- “Wet floor” warnings should be displayed when appropriate.
- Electrical devices in the vicinity of the equipment must be suitable for use in wet environments or be properly protected from wetting.

## 9.Ion Exchange Unit

- Item # on lab map: **9**
- Manufacturer and Model: **Armfield W9**
- Use: **Undergraduate**

### Accidental Release Procedures

This equipment involves handling large volumes of liquid. Follow procedures for chemical spill containment as detailed on pages 6-7.

### Waste Disposal Procedures

Use of this equipment inherently results in generation of salts. Please collect and segregate wastes as instructed and submit a Waste Pickup Request as soon as possible.

### Training

For minimum training on this equipment, consult Dr. Khanal. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

### Wet Environment

The equipment requires a header tank containing water. During use it is possible that there will be some spillage.

- “Wet floor” warnings should be displayed when appropriate.
- Electrical devices in the vicinity of the equipment must be suitable for use in wet environments or be properly protected from wetting.

**Electrical Safety**

- The equipment described in the Instruction Manual operates from a mains voltage electrical supply. It must be connected to a supply of the same frequency and voltage as marked on the equipment or the mains lead.
- The unit incorporates an Earth Leakage Circuit Breaker (ELCB). If through misuse or accident this equipment electronically dangerous, an ELCB will switch off the electrical supply and reduce the severity of any electric shock received by an operator.
- At least once each month, check that the ELCB by pressing the TEST button. The circuit breaker MUST trip when the button is pressed. Failure to trip means that the operator is not protected, and the equipment must be checked by an electrician before it is used.

**Water Borne Hazards**

- Any water contained within the product must not be allowed to stagnate.
- Any rust, scale, or algae must be removed regularly.
- When practicable the water should be maintained below 20°C. If this is not practicable, the water should be disinfected if it is safe and appropriate to do so.

**High Pressure**

The apparatus is designed to operate with internal pressures greater than that of the surrounding atmosphere.

- Adjust the bypass on the feed pump to allow liquid to return to the feed tank and avoid excessive pressure in the pipework.
- Ensure that the selector valves are set correctly to configure the follow through the apparatus before switching on the feed pump.

**10. Distillation Column**

- Item # on lab map: **10**
- Manufacturer and Model: **Armfield UOP3CC**
- Use: **Undergraduate**

**Accidental Release Procedures**

This equipment contains Raschig rings. If broken, use spill kit to contain and dispose of in broken glass box. This equipment involves handling large volumes of liquid. Follow procedures for chemical spill containment as detailed on pages 6-7. Any spills associated with this instrument may result in the formation of vapors – maintain the area properly ventilated and evacuate in necessary.

**Waste Disposal Procedures**

Use of this equipment inherently results in generation of ethanol and water wastes. Please collect wastes and submit a Waste Pickup Request as soon as possible.

**Training**

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

**Protocols**

Please consult digital manufacturer booklet for tested protocols used with this equipment.

**Water Borne Hazards:**

- Any water contained within the product must not be allowed to stagnate.
- Any rust, scale, or algae must be removed regularly.
- When practicable the water should be maintained below 20°C. If this is not practicable, the water should be disinfected if it is safe and appropriate to do so.

**Electrical Safety:**

- The equipment described in the Instruction Manual operates from a mains voltage electrical supply. It must be connected to a supply of the same frequency and voltage as marked on the equipment or the mains lead.
- The unit incorporates an Earth Leakage Circuit Breaker (ELCB). If through misuse or accident this equipment electronically dangerous, an ELCB will switch off the electrical supply and reduce the severity of any electric shock received by an operator.
- At least once each month, check that the ELCB by pressing the TEST button. The circuit breaker MUST trip when the button is pressed. Failure to trip means that the operator is not protected, and the equipment must be checked by an electrician before it is used.

**Hot Surfaces/Liquids:**

- Allow time for equipment to cool before handling any of the components.
- Do not touch any surfaces with “Hot Surfaces” warning label.
- Do not allow the apparatus to come into contact with flammable materials or liquids.
- Do not cover or store equipment until it has cooled.
- The apparatus should not be left unattended to when switched on.
- Allow time for the apparatus to cool before disconnecting the tubing.
- Avoid skin contact with hot liquids.

## 11. Gas Absorption Column

- Item # on lab map: **11**
- Manufacturer and Model: **Armfield UOP7-MKII**
- Use: **Undergraduate**

### Accidental Release Procedures

This equipment contains Raschig rings. If broken, use spill kit to contain and dispose of in broken glass box. Use of this equipment may result in the release of carbon dioxide. Please walk towards a ventilated area in case of exposure.

### Training

For minimum training on this equipment, please consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

### Water Borne Hazards:

- Any water contained within the product must not be allowed to stagnate.
- Any rust, scale, or algae must be removed regularly.
- When practicable the water should be maintained below 20°C. If this is not practicable, the water should be disinfected if it is safe and appropriate to do so.

### Electrical Safety:

- The equipment described in the Instruction Manual operates from a mains voltage electrical supply. It must be connected to a supply of the same frequency and voltage as marked on the equipment or the mains lead.
- The unit incorporates an Earth Leakage Circuit Breaker (ELCB). If through misuse or accident this equipment electronically dangerous, an ELCB will switch off the electrical supply and reduce the severity of any electric shock received by an operator.
- At least once each month, check that the ELCB by pressing the TEST button. The circuit breaker MUST trip when the button is pressed. Failure to trip means that the operator is not protected, and the equipment must be checked by an electrician before it is used.

## 12. Gas Cylinders and Manifold

- Item # on lab map: **12**
- Manufacturer and Model: **GCE Druva Pur**
- Use: **ALL**

### Accidental Release Procedures

Use of this area may result in the release of gases. Please walk towards a ventilated area in case of exposure.

### Training

For minimum training on this equipment, please consult any of the faculty. Do not attempt to conduct any experiments without proper training at least by a graduate student previously training.

### Protocols

Please consult the gas cylinder safety booklet.

## 13. Fire Extinguisher Station

- Item # on lab map: **13**
- Use: **ALL**

### Protocols

Please consult the reference manual for fire extinguishers.

## 16. Ultrafreezer

- Item # on lab map: **16**
- Manufacturer and Model: **Thermo Forma FDE**
- Use: **Lacerda**

### Training

For minimum training on this equipment, please consult Dr. Lacerda. Do not store any samples without proper training. . This equipment achieves extremely low temperatures. Ensure proper PPE are worn including temperature insulating gloves.

### Protocols

Please consult the safety and maintenance guidelines for the ultrafreezer.

## 17. Flammables Cabinet

- Item # on lab map: **17**
- Manufacturer and Model: **JustRite**
- Use: **ALL**

### Training

For minimum training, please consult any of the faculty members. Do not attempt to store anything without proper training.

### Protocols

Please consult the guidelines for safe storage of flammables.

## 18. Explosion-Proof Refrigerator

- Item # on lab map: **18**
- Manufacturer and Model: **Thermo Scientific GT20**
- Use: **ALL**

### Training

For minimum training on this equipment, please consult any of the faculty members. Do not attempt to store anything without proper training.

### Protocols

Please consult the refrigerator manual.

## 19. Ovens

- Item # on lab map: **19 and 22**
- Manufacturer and Model: **Thermo Scientific Thermoline**
- Use: **Resende**

### Training

For minimum training on these ovens, please consult Dr. Resende. Do not attempt to conduct any experiments without proper training. This equipment achieves extremely high temperatures. Ensure proper PPE are worn including temperature insulating gloves.

### Protocols

- Inspect the oven prior to each use and ensure it is in good operating condition. Check the cord and outlet for any damage. Ensure any temperature sensing devices are properly installed and will turn off power in the event of overheating.
- If the oven is not operating within normal operating parameters, it must be taken out of service and not used until repairs are made. Unplug and place “Defective Equipment” tags on the plug and oven door to prevent use.
- Regularly check oven calibration to ensure the temperature read-out is accurate. This is normally performed with a thermometer. Never use a mercury thermometer.
- Use the correct oven for the work intended. Consider the maximum temperature needed and the temperature range of the oven. Do not use an oven that will significantly exceed the maximum safe working temperature.
- Ensure that the oven is set to the proper temperature required for the experiment. This includes the high temperature shut-off set point.
- Do not heat closed containers unless using specifically authorized equipment that includes an approved pressure relief device.
- The oven should remain clean and free of chemical spills and residues.
- Do not use materials in the oven that are flammable or can create flammable vapors. This presents a fire or explosion hazard.
- Use of plastics in ovens must be avoided due to the possibility of melting. Many plastics have melting points within the range of a drying oven. If plastic melts, it can cause a fire.
- Ensure that the heating process will not create any hazardous fumes. If there is a possibility of generating fumes, the oven must be connected to an approved ventilation system.
- Do not store combustible materials such as plastics, paper and cardboard on top, under, behind, or next to ovens. Store flammable liquids and combustible materials away from hot surfaces.
- Always have a pair of hot gloves available near the oven for protection from hot surfaces. Hot glass looks just like cold glass. Do not test temperatures with fingers. Always wear BOTH hot gloves as a precaution.
- Open hot ovens with care. Stand to one side when opening the door to avoid high temperature.

## 23. Batch Enzyme Reactor

- Item # on lab map: **23**
- Manufacturer and Model: **Armfield BE1**
- Use: **Undergraduate**

### Accidental Release Procedures

Use of this equipment involves circulating water. Follow procedures for water spill containment as detailed on pages 6-7. Release of liquid biological reactants and products should be handled as small spill, that can be neutralized with 1% bleach.

### Waste Disposal Procedures

Biological wastes from this reactor are < 1 L and can be neutralized with a 1:10 volume of 1% bleach prior to disposal into running water.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

### Water Borne Hazards:

- Any water contained within the product must not be allowed to stagnate.
- Any rust, scale, or algae must be removed regularly.
- When practicable the water should be maintained below 20°C. If this is not practicable, the water should be disinfected if it is safe and appropriate to do so.

**Electrical Safety:**

- The equipment described in the Instruction Manual operates from a mains voltage electrical supply. It must be connected to a supply of the same frequency and voltage as marked on the equipment or the mains lead.
- The unit incorporates an Earth Leakage Circuit Breaker (ELCB). If through misuse or accident this equipment electronically dangerous, an ELCB will switch off the electrical supply and reduce the severity of any electric shock received by an operator.
- At least once each month, check that the ELCB by pressing the TEST button. The circuit breaker MUST trip when the button is pressed. Failure to trip means that the operator is not protected, and the equipment must be checked by an electrician before it is used.

**Hot Surfaces/Liquids:**

- Allow time for equipment to cool before handling any of the components.
- Do not touch any surfaces with “Hot Surfaces” warning label.
- Do not allow the apparatus to come into contact with flammable materials or liquids.
- Do not cover or store equipment until it has cooled.
- The apparatus should not be left unattended to when switched on.
- Allow time for the apparatus to cool before disconnecting the tubing.
- Avoid skin contact with hot liquids.

## 24. Biohood

- Item # on lab map: **24**
- Manufacturer and Model: **Air Clean 600**
- Use: **Dr. Lacerda**

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for protocols used with this equipment.

## 25. Bio Imager

- Item # on lab map: **25**
- Manufacturer and Model: **Slite 600 Bioimager**
- Use: **Dr. Lacerda**

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 26. Cell Scale

- Item # on lab map: **26**
- Manufacturer and Model: **CellScale Mechanoculture MCJ1**
- Use: **Dr. Lacerda**

### Accidental Release and Waste Disposal Procedures

This unit may show leaks of maximum 0.5 L, of buffering salts which may or may not contain cellular material. If in doubt, neutralize wastes with 1% bleach prior to drain disposal. Spills can be contained with absorbent material and disposed of in the trash (biosafety level 1).

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 27. Incubator

- Item # on lab map: **27**
- Manufacturer and Model: **Thermo Scientific MIDI 40**
- Use: **Dr. Lacerda**

### Operating Conditions

The incubator should operate at 37°C and 5% CO2 gas. If the incubator is not operating at these conditions, an alarm will sound. Contact Dr. Lacerda if this occurs.

### Accidental Release and Waste Disposal Procedures

All liquid wastes and spills should be neutralized with 1% bleach prior to drain disposal. Spills can be contained with absorbent material and disposed of in the trash (biosafety level 1).

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 28. Electrophoresis Unit

- Item # on lab map: **28**
- Manufacturer and Model: **GE Healthcare miniVE**
- Use: **Dr. Lacerda**

### Accidental Release and Waste Disposal Procedures

This unit may leak or will require disposal of a maximum 1 L of liquids containing 1% sodium dodecyl sulfate (a hazardous chemical). If run routinely, submit request for hazardous waste pickup on a regular basis..

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 31. Lyophilizer

- Item # on lab map: **31**
- Manufacturer and Model: **LABCONCO 7522700**
- Use: **Dr. Lacerda**

### Training

For minimum training on this equipment, please consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training. This equipment achieves extremely low temperatures. Ensure proper PPE are worn including temperature insulating gloves.

### Description

Chamber, 8.8" dia. x 9.8" h type 304 stainless steel with 12 valves and capacity of 1 liter of ice. Valves accommodate either 1/2" or 3/4" flask adapters. Includes dry ice/solvent center well with 1.92 liter capacity and cover, 1/2" OD port for connection to vacuum pump and 3/8" OD port for connection to vacuum gauge. Dry ice, heat transfer solution, vacuum pump, vacuum gauge, tubing and glassware are required.

## 32. Autoclave

- Item # on lab map: **32**
- Manufacturer and Model: **Fisher Sterilite 16**
- Use: **Dr. Lacerda**

### Accidental Release and Waste Disposal Procedures

All liquid wastes and spills should be neutralized with 1% bleach prior to drain disposal. Spills can be contained with absorbent material and disposed of in the trash (biosafety level 1). Potential leaks can be water, but it originating inside the autoclave, watch for its potentially high temperatures.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training. This equipment achieves high temperatures and pressures. Ensure proper PPE are worn including temperature insulating gloves. DO NOT OPEN DOOR until pressure has achieved atmospheric pressure.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 33. Bioprinter

- Item # on lab map: **33**
- Manufacturer and Model: **Lulzbot Bioprinter**
- Use: **Dr. Lacerda**

### Accidental Release and Waste Disposal Procedures

If printing with cells, all liquid wastes and spills should be neutralized with 1% bleach prior to drain disposal. Spills can be contained with absorbent material and disposed of in the trash (biosafety level 1). Any other small spills are nonhazardous.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment. Be cautious of puncture hazard around syringe needles.

## 35. Centrifuge

- Item # on lab map: **35**
- Manufacturer and Model: **Fisher Accuspin 8C**
- Use: **Dr. Lacerda**

### Accidental Release Procedures

Wastes are only generated due to container breakage and spills. If centrifuging cells, all liquid wastes and spills should be neutralized with 1% bleach prior to drain disposal. Spills can be contained with absorbent material and disposed of in the trash (biosafety level 1). Any other small spills are nonhazardous.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 37. Chemical Reactors

- Item # on lab map: **37**
- Manufacturer and Model: **Armfield CEY**, **CEM-MKII**, **CEB-MKII**, **CET-MKII**
- Use: **Dr. Lacerda**

### Accidental Release Procedures

This equipment contains glass beads. If broken, use spill kit to contain and dispose of in broken glass box. This equipment involves handling large volumes of recirculating liquid. Follow procedures for chemical spill containment as detailed on pages 6-7.

### Waste Disposal Procedures

Use of this equipment typically requires reaction of ethyl acetate and sodium hydroxide, to produce sodium acetate and ethanol. Please collect and segregate wastes as instructed and submit a Waste Pickup Request as soon as possible.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklets for tested protocols used with these instruments.

## 38. Fixed and Fluidized Beds

- Item # on lab map: **38**
- Manufacturer and Model: **Armfield CEL-MKII**
- Use: **Dr. Lacerda**

### Accidental Release Procedures

This equipment contains glass beads. If broken, use spill kit to contain and dispose of in broken glass box. Otherwise, circulating liquid is water.

### Training

For minimum training on this equipment, consult Dr. Lacerda. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

### Water Borne Hazards:

- Any water contained within the product must not be allowed to stagnate.
- Any rust, scale, or algae must be removed regularly.
- When practicable the water should be maintained below 20°C. If this is not practicable, the water should be disinfected if it is safe and appropriate to do so.

### Electrical Safety:

- The equipment described in the Instruction Manual operates from a mains voltage electrical supply. It must be connected to a supply of the same frequency and voltage as marked on the equipment or the mains lead.
- The unit incorporates an Earth Leakage Circuit Breaker (ELCB). If through misuse or accident this equipment electronically dangerous, an ELCB will switch off the electrical supply and reduce the severity of any electric shock received by an operator.

- At least once each month, check that the ELCB by pressing the TEST button. The circuit breaker MUST trip when the button is pressed. Failure to trip means that the operator is not protected, and the equipment must be checked by an electrician before it is used.

**Wet Environment:**

The equipment requires a header tank containing water. During use it is possible that there will be some spillage.

- “Wet floor” warnings should be displayed when appropriate.
- Electrical devices in the vicinity of the equipment must be suitable for use in wet environments or be properly protected from wetting.

## 39.Calorimeter

- Item # on lab map: **39**
- Manufacturer and Model: **Shimadzu DSC60 Plus**
- Use: **Dr. Khanal**

### Training

For minimum training on this equipment, consult Dr. Khanal. Do not attempt to conduct any experiments without proper training. This equipment achieves high temperatures and pressures. Ensure proper PPE are worn including temperature insulating gloves.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 40.Hydraulic Press

- Item # on lab map: **40**
- Manufacturer and Model: **Shimadzu SSP 10A**
- Use: **Dr. Khanal**

### Training

For minimum training on this equipment, consult Dr. Khanal. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 41.Pyroprobe

- Item # on lab map: **41**
- Manufacturer and Model: **CDS Analytical Pyroprobe 5000 Series**
- Use: **Dr. Resende**

### Training

For minimum training on this equipment, consult Dr. Resende. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 42. Gas Chromatography System

- Item # on lab map: **42**
- Manufacturer and Model: **Agilent 8890**
- Use: **Dr. Resende**

### Training

For minimum training on this equipment, consult Dr. Resende. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 44. High Pressure Reactor and Controller

- Item # on lab map: **44**
- Manufacturer and Model: **Parr 4848 controller and pressure vessel**
- Use: **Dr. Resende**

### Training

For minimum training on this equipment, consult Dr. Resende. Do not attempt to conduct any experiments without proper training. This reactor operates at extremely high pressures.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.

## 45. Hydrogen Sensor

- Item # on lab map: **45**
- Manufacturer and Model: **Sensalert ASI**
- Use: **Resende**

### Training

For minimum training on this equipment, please consult Dr. Resende. Do not attempt to conduct any experiments without proper training.

### Protocols

Please consult digital manufacturer booklet for tested protocols used with this equipment.