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| **Chemical Class: Hydrofluoric Acid****STANDARD OPERATING PROCEDURES****Type of SOP:** [ ] **Hazardous Class** [ ] **Hazardous Chemical** [ ] **Process**According to the Safety Data Sheets (SDS) for Hydrofluoric Acid, special precautions must be taken when working with these chemicals. This Standard Operating Procedure (SOP) briefly describes the use of equipment and supplies maintained in the lab/facility, procedures that must be followed, and the responsibilities of personnel when working in these labs/facilities. PI or the designee should **amend this SOP template by entering text in the highlighted yellow area to include specifics for your lab/facility. Add *NA* if no additional lab-specific information for the Section. Users shall** not conduct experiments, even pilot studies, which are not described in this approved SOP. It is essential that all personnel follow the appropriate procedures outlined in this SOP. **Please provide the SDS associated with these chemicals to all lab personnel working with them.** |
| **PI Information**

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| PI’s Name: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | PeopleSoft ID: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Department:  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Building/Room# | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| **1. PI Responsibilities**  |
| * Perform hazard assessments, develop/approve SOPs for the hazardous chemicals and procedures;
* Provide laboratory-specific training to laboratory personnel on the use of hazardous chemicals and the procedures described in this SOP and retain training records and all documentation;
* Implement and enforce rules and standards concerning health and safety for laboratories;
* Ensure compliance of laboratory personnel with this SOP;
* Ensure the availability and enforce the use of: appropriate Personal Protective Equipment, safety equipment, emergency equipment, Safety Data Sheets (SDSs), and relevant reference materials;
* Remain cognizant of chemicals stored and used in laboratories and their associated hazards;
* Dispose of chemicals no longer needed by submitting an on-line waste pick up request to Environmental Health and Safety;
* Provide SDS and Laboratory-specific SOP via email to ehs@uh.edu upon request.
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| **2. Chemical Information** |
| * Chemical Name: Hydrofluoric Acid (HF)
* CAS Number: 7664-39-3
* HF is very corrosive and destroys skin tissue even in dilute solutions. It readily penetrates skin to destroy tissues, decalcify bone and interfere with nerve function. Exposure to highly concentrated solutions can cause acute hypocalcemia (low level of calcium in the blood) followed by cardiac arrest and death. In lower concentrations, exposure may not be apparent for several hours, but can still cause burns and further damage if not washed off. Exposure to eyes may result in permanent eye damage or blindness. It is highly toxic by inhalation, skin contact or ingestion. Absorption of substantial amounts of HF by any exposure route may be fatal.
* Routes of exposure: skin/eye contact, inhalation, ingestion
* How exposure might occur: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Signs/symptoms of exposure: Skin contact with concentrated HF (48% or greater) causes immediate serious and painful tissue destruction. Contact with lower HF concentrations may not cause pain or other symptoms until several hours after contact. All contact or suspected contact with HF must be treated immediately.
* Special Circumstances of Use in your lab:
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|  **3. Engineering Controls** |
| * Please review the section on[” Engineering Controls”](#_Hazard_Controls) of UH Guideline for Acutely Toxic Chemicals.
* Any work with Hydrofluoric Acid must be done in a properly functioning chemical fume hood.
* An eyewash/drench hose combination unit must be available in the immediate work area for any work with corrosive materials.
* For many uses of Hydrofluoric Acid, a safety shower will also be necessary. Contact EHS at 713-743-5858 for a determination of the need for a safety shower if there is not one available.

Please list the locations of the eye wash, safety shower and fume hood below.

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| Type | Location (Building and Room Numbers) |
| Fume Hood(s) |  |
| Safety Shower (s) |  |
| Glove Box (if applicable) |  |
| Eyewash Station(s) |  |

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| **4. Personal Protective Equipment (PPE)** |
| * Please review Section on [”*PPE*”](#_Hazard_Controls) of the UH Guideline for Acutely Toxic Chemicals.
* Wear a fully buttoned lab coat with sleeves extended to wrists, face shield and safety goggles, neoprene outer gloves and nitrile inner gloves, long pants (or other clothing covering the entire leg), rubber apron, and closed toed shoes. Do not use latex gloves. Dispose of gloves after each use.
* For small amounts of HF (<50 ml), double nitrile gloves can be used but must be changed immediately if splashed or thought to be contaminated.
* Respiratory protection may be needed if aerosol or vapor hazard is present and work is conducted outside of a fume hood. If any procedure may pose an external hazard it should be eliminated or strictly isolated. If a potential exposure hazard cannot be eliminated, please contact the EHLS Respiratory Protection Program administrator to discuss respiratory protection or to enroll in the program. Program enrollment includes medical evaluation, training and fit testing for an appropriate respirator. For information see EHS Respiratory Protection Program or email ehs@uh.edu.

 **More lab-specific information regarding PPE to train users:**   |

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|  **5&6. Work Practice Controls (Preparation, Handling, Storage and Transport)** |
| * Please review Section on [*“Plan and Preparation for use” and “Handling & Storage Precautions”*](#_Hazard_Controls) of the UH Guideline for Acutely Toxic Chemicals.

**Preparation*** Consider alternate methods and use a less dangerous acid if possible.
* If other specific written procedures are required for work with HF (e.g. heated process, large quantities), step-by-step procedures must be listed in *Section 10. Lab-specific Protocol/Procedure* in this SOP.
* This SOP must be approved in advance by the Principal Investigator.
* Purchase HF in the smallest amounts possible.
* Stock calcium gluconate gel and calcium carbonate antacid tablets (Tums) to be used as first aid in case of an HF burn. (Medical attention should still be sought immediately for HF burns.) Prior to using HF, make sure the calcium gluconate tube is unopened and that neither the gel nor the tablets have reached their expiration date. Replace after one-time use.
* Calcium gluconate gel and calcium carbonate are stored (list location \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) in this lab.
* Provide hazardous chemical and specific SOP training by PI or designee to personnel working with HF and any other personnel authorized or required to be in the laboratory or shared space during work with HF.
* Enter HF into chemical inventory. Make sure the safety data sheet (SDS) in the process.
* Ensure all containers of HF are appropriately labeled according to UH Guidelines.
* Obtain 2.5% calcium gluconate gel (Calgonate Corp.) for potential skin exposures. Store in a cool area, and replace before the expiration date. Replace after one-time use.
* Obtain sterile 1% calcium gluconate emergency eyewash solution (Calgonate Corp.) for potential eye exposures. Store in same location as the gel. Replace after one-time use.
* Ensure that a HF spill kit is available and maintained.
* Obtain calcium carbonate powder for preparing solutions to routinely clean surfaces and decontaminate surfaces after spills are absorbed.
* Confirm emergency eyewash and/or shower are located within HF working area and have a current certification date.
* Ensure all staff are trained to use HF safely and to manage emergencies.

**Handling**Work with HF should only be done during business hours and when there is someone else available to assist with procedures and emergencies.Preparation* For use, transport Hydrofluoric Acid from the storage area to the fume hood in a labeled, sealed non-breakable secondary container. Always remove Hydrofluoric Acid from its secondary container in a fume hood in order to safely vent any accumulated vapor.
* All preparation of Hydrofluoric Acid will be performed over plastic-backed absorbent pads in a fume hood. Pads will be disposed of as hazardous waste immediately upon contamination and after completion of tasks.
* Ensure compatibility of HF before mixing with other chemicals or disposing in a hazardous waste container. Review the SDS for incompatibilities. HF reacts with some metals and liberates flammable hydrogen gas.

Use* HF will be stored in designated areas. Store and/or label Hydrofluoric Acid so it will only be handled by those trained to use it. Post a sign at the door to the room when HF is in use.
* Do not heat hydrofluoric acid.
* Dispose of waste Hydrofluoric Acid and empty containers as hazardous waste appropriately before they are removed from the fume hood.
* Clean the fume hood upon completion of tasks with a 10% calcium carbonate solution, followed by soap and water.
* Clean all contaminated surfaces with a 10% calcium carbonate solution, followed by soap and water.
* Place all contaminated disposable items in appropriate laboratory waste for disposal.
* Non-disposable/re-usable utensils, containers, and other surfaces contaminated with Hydrofluoric Acidmust be decontaminated using a 10% calcium carbonate solution or 10% sodium carbonate (known as soda ash) solution, followed by soap and water, at the end of the laboratory work session. Complete this inside the fume hood before removing any of the items.
* When work completed, dispose of gloves and wash hands with soap and water.

Gas hydrogen fluoride:* Follow SOP for compressed gas guidelines.
* If you have any HF in lecture bottles, be aware that it can be extremely dangerous. Contact EHLS at 713-743-5858 immediately to arrange disposal.

STORAGE* Hydrofluoric Acid will be stored in an acid cabinet in *[room #]*.
* Do not store with organic acids, ammonia or other alkaline chemicals. Store on lower shelf.
* Keep away from heat, light, air, flames and sources of ignition.
* Never store or work with HF in incompatible containers of glass, metal or ceramic.
* Store Hydrofluoric Acid in labeled, sealed, non-breakable secondary compatible (plastic or Teflon) container within storage area, if potential for disturbance or breakage exists.

TRANSPORT Hydrofluoric Acid will be transported in labeled and sealed non-breakable secondary container.**More lab-specific information regarding work practice to train users:**  |

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| **7. Spill and Accident Procedures****[Specific cleaning and waste disposal procedures must be determined.]** |
| Chemical spills must be cleaned up as soon as possible by properly protected and trained personnel. All other persons should leave the area. Spill response procedures must be developed based on the chemical and potential spill or release conditions. Clean up spills using contents of the laboratory spill kit. Do not attempt to clean up any spill if not trained or comfortable. If trained and equipped, only clean up small (less than 100 ml) and dilute (less than 1%) spills that occur in a fume hood. If the spill is larger or more concentrated or people have been exposed, evacuate the area and call 911 on campus phone or 713-743-3333 for help. If a person is exposed follow EXPOSURE PROCEDURES in section 8 below.**SPILL CLEANUP PROCEDURES****Small spills (less than 100 ml) of dilute HF (less than 1%) inside fume hood** 1. Close hood sash, cordon off area.
2. If you need help, call EHLS (during business hours (M-F/8-5) 713-743-5858, outside business hours call 911 on campus phone or 713-743-3333). Tell them that an Hydrofluoric Acid spill has occurred and you need advice or assistance. Notify supervisor.
3. Personnel must wear a fully buttoned lab coat with sleeves extended to wrists, face shield and safety goggles, neoprene outer gloves and nitrile inner gloves, long pants (or other clothing covering the entire leg), rubber apron, and closed toed shoes. Never use latex gloves.
4. Wipe up spilled liquids with absorbent pads. HF spill kit is located at XXXX
5. Clean the spill area thoroughly with a 10% calcium carbonate or sodium carbonate solution, followed by soap and water. Dry.

**Do NOT attempt to neutralize HF with the following because of potential adverse reactions: sodium or potassium carbonate, potassium or sodium hydroxide, silicon-based absorbent materials such as sand, vermiculite or kitty litter.**1. If spill is extensive within the containment, clean all interior surfaces after completion of the spill cleanup.
2. Bag all waste in plastic bags labeled as HF spill debris and store in fume hood away from incompatible chemicals or procedures. Submit request to EHLS for hazardous waste pickup.

**All other spills including:*** **Spills greater than 100 ml in size**
* **Spills greater than 1% in concentration**
* **Any spill of HF outside of fume hood regardless of concentration**
1. Evacuate all personnel from the laboratory and restrict access. Call 911 on campus phone or 713-743-3333 for help.
2. As soon as possible report the spill by notifying EHLS (during business hours (M-F/8-5) 713-743-5858, outside business hours 911 on campus phone or 713-743-3333); tell them that a spill has occurred, and that you need help managing the spill. EHLS will contact a spill cleanup contractor. Notify supervisor.
3. Be prepared to provide the following information:
* Name and phone number of knowledgeable person that can be contacted
* Name of chemical spilled, concentration and amount spilled, liquid or solid type spill
* Number of injured, if any (refer below to EXPOSURE PROCEDURES)
* Location of spill

Any spill incident requires the involved person or supervisor to complete and submit the Injury Forms within 24 hours (8 hours if serious injury or hospitalization) of the incident to Risk Management.For questions on spill cleanup, contact EHLS at 713-743-5858.**More lab-specific information regarding Storage and Transport to train users:** |

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|  **8. Exposure Procedures in Case of Emergency** |
| 1. **Provide First Aid Immediately**
* For **inhalation** exposure, move out of contaminated area. Call 911 on campus phone or 713-743-3333.
* For **skin** exposure, Call 911 on campus phone or 713-743-3333. If calcium gluconate gel is available, use the nearest safety shower for 5 minutes. Stay under the shower and remove clothing. Use a clean lab coat or spare clothing for cover-up. With gloved hands, apply calcium gluconate gel to the skin liberally and massage it into the affected site. Apply the gel as soon as the washing is done. Affected area does not need to be dried prior to application. Reapply gel continually every 10-15 minutes and massage into the skin until medical treatment is given. If calcium gluconate gel is not available, continue flushing with water for at least 15 minutes or until medical treatment is given.
* For **eye** exposure, call 911 on campus phone or 713-743-3333. If sterile 1% calcium gluconate emergency eyewash solution is available, use the nearest safety eyewash for 5 minutes while holding eyelids open. Then apply the calcium gluconate solution as a continuous drip into. If sterile 1% calcium gluconate solution is not available, use the safety eyewash for at least 15 minutes or until medical treatment is given.
1. **Get Help**
* Call 911 on campus phone or 713-743-3333 or go to nearest Emergency Department to seek medical attention. Give details of exposure:
	+ Chemical name and concentration
	+ Amount of exposure
	+ Route of exposure (skin, eyes, respiratory)
	+ Time since exposure
* Bring the SDS and SOP or HF Fact Sheet to the Emergency Department.
* Notify your supervisor as soon as possible for assistance.
* Secure area before leaving. Lock doors and indicate spill if needed.
1. **Report Incident to Environmental Health and Life Safety**
* Notify EHLS immediately after providing first aid and/or getting help.
	+ During business hours (M-F/8-5) call 713-743-5858.
	+ After hours call 911 on campus phone or 713-743-3333 to be routed to EHLS staff on call.

For all incidents and near misses, the involved person or supervisor should report to EHLS at 713-743-5858.**More lab-specific information regarding Storage and Transport to train users:** |

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|  **9. Waste Disposal** |
| **WASTE COLLECTION AND DISPOSAL**1. **HF Liquid Waste Collection**
* Waste bottles of concentrated or dilute solutions of HF must be collected by EHS as a hazardous waste.
* Label with EHS Hazardous Waste label that states HF waste and the primary hazards (corrosive, toxic), PI name. Hazardous waste labels are available for on [EHS’s website](https://uh.edu/ehs/waste-management/labels/).
1. **Other HF waste**

 Grossly contaminated gloves, absorbent pads, and all spill cleanup materials are hazardous waste.* Accumulate waste in a plastic bag.
* Label with EHS Hazardous Waste label as above.
1. **Disposal**

For chemical waste pickup: Complete Online [waste pickup request form](https://uh.edu/ehs/waste-management/). 1. **Contacts**

 For questions regarding chemical and hazardous chemical collection* visit the EHS [Hazardous Chemical Waste](https://www.uh.edu/ehls/waste/) website or,
* email ehs@uh.edu or,
* call 713-743-5858

**More lab-specific information regarding Storage and Transport to train users:** |

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|  **10. Lab-specific Protocol/Procedure**  |
|  This SOP must be customized for each lab using Hydrofluoric Acid. Use this section to describe or attach what is being done with the chemicals, including specific laboratory procedures and quantities used.  |

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| Particularly hazardoussubstance involved? | X YES: | Blocks #11 to #13 are Mandatory |
|  NO: | Blocks #11 to #13 are Optional. |
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| **11. Approval Required** |
| All staff working with Hydrofluoric Acid must be trained on this SOP prior to starting work. They must also be trained on the Hydrofluoric Acid SDS, and it must be readily available in the laboratory. All training must be documented and maintained by the PI or their designee. |
| **12. Decontamination** |
| All surfaces and non-disposable equipment will be decontaminated with 10% calcium carbonate or sodium carbonate solution, followed by soap and water. |
| **13. Designated Area** |
| Please indicate the designated area for storing and handling the chemicals in this SOP.  |
| PI’s Name: | Date: |
| Signature: |

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| **[Laboratory Name]****Documentation of Training\*****Standard Operating Procedure for Hydrofluoric Acid** |
| *“I have read and understand this SOP. By signing below, I agree to fully adhere to its requirements.”* |
| Last | First | PSID | Email | Signature | Date |
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\* This document, including the signature page with signatures by all involved personnel shall be maintained by the Principal Investigator or Designee, and be submitted to EHS either electronically via the ehs@uh.edu or hard copy upon request.

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|  **Template Revision History** |
| Version | Date Approved | Author | Revision Notes: |
| 1.0 | 07/16/2021 | EHS Chemical Safety  | New Guideline with Template. |
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